Att: City / Hovi FILE

Office of the Mayor

Lorraine R. Inouye
Mayor

25 Aupuni Street, Rm. 213 • Hilo, Hawaii 96720 • (808) 961-8211 • Fax (808) 961-6553

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OFC. OF ENVIRONMENTAL QUALITY CONTROL

April 30, 1991

Office of Environmental Quality Control
220 South King Street, 4th Floor
Honolulu, HI 96813

Gentlemen:

Final EIS - Waikoloa Affordable Housing Project
Determination of Acceptability

We have reviewed the Final EIS for the proposed Waikoloa Affordable Housing development. Chapter 343, Hawaii Revised Statutes, requirements were triggered as the proposed development involves the use of County lands.

We have determined the Final EIS to be acceptable as we find that said document has satisfied the following criteria:

1. Procedures for assessment, consultation, review and revisions required for the EIS have been complied with;

2. Content requirements for a Final EIS have been satisfied; and

3. Comments submitted during the review process have been responded adequately, and revisions have been incorporated or appended to the final document.

Acceptance of the Final EIS is with the understanding, however, that the unresolved issues as stated in Section 9 are to be resolved in the context of subsequent regulatory approvals.

As the proposed project is still at a conceptual master plan stage, detailed and site specific plans have yet to be prepared. Thus, a supplemental EIS may be required should there be major changes to the proposed project from that which is described in the Final EIS.

Should you have any questions, please feel free to contact me.

Aloha,

LORRAINE R. INOUYE, MAYOR

cc: Brian Nishimura, Housing Administrator
Norman Hayashi, Planning Director

FINAL
ENVIRONMENTAL IMPACT STATEMENT for the

WAIKOLOA AFFORDABLE HOUSING PROJECT
Waikoloa, South Kohala, Hawaii

MARCH 1991

PREPARED FOR:

Office of Housing and Community Development
County of Hawaii

RMTC
R. M. Towill Corporation

420 Waiakamilo Rd., Suite 411
Honolulu, Hawaii 96817-4941
(808) 842-1133 • Fax: (808) 842-1937

FINAL

ENVIRONMENTAL IMPACT STATEMENT

FOR

WAIKOLOA AFFORDABLE HOUSING PROJECT

Waikoloa, South Kohala, Hawaii

This document has been prepared pursuant to
Chapter 343, Hawaii Revised Statutes

PROPOSING AGENCY:

COUNTY OF HAWAII
OFFICE OF HOUSING AND COMMUNITY DEVELOPMENT

RESPONSIBLE OFFICIAL:

Brian T. Nishimura

BRIAN T. NISHIMURA, Housing Administrator

3/13/91

Date

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PREFACE

This document is a final environmental impact statement that documents analysis and conclusions for the proposed Waikoloa Affordable Housing Project and the surrounding environment, located in South Kohala on the Island of Hawaii. The document is divided into sections describing the master plan, the affected environment, alternatives considered during the planning stages of the master plan and impacts that may result from the proposed development. Additionally, separate studies of traffic, air quality, flora and fauna, archaeology, and the market, conducted by technical consultants, are provided as appendices.

Consulted agencies and organizations were requested to submit their comments, corrections, and/or clarifications on the draft environmental impact statement to the County of Hawaii Planning Department.

SECTION 1

INTRODUCTION AND SUMMARY

SECTION 1 INTRODUCTION AND SUMMARY

1.1 INTRODUCTION AND BACKGROUND

The Office of Housing and Community Development (OHCD) of the County of Hawaii is proposing a unique, quality affordable residential development in Waikoloa Village, in the South Kohala district of West Hawaii. This master planned development is proposed to contain approximately 1,200 single- and multi-family housing units all of which will be available for rent or sale in the affordable price ranges, as defined by federal, state and county standards.

The project site is currently undeveloped and is located at the north end of the existing Waikoloa Village. Ownership of 279 acres of the 340-acre site is being conveyed from the present land owner, Waikoloa Land Company, to the County of Hawaii through an agreement between the two parties. Development of the remainder parcel will be undertaken by Waikoloa Land Company in conjunction with other developers.

Master planning of the Waikoloa Affordable Housing project began in summer 1989 when the Office of Housing and Community Development issued a request for proposals to develop a conceptual master plan including preliminary infrastructure development plans. In September 1989, R. M. Towill Corporation was selected to prepare the Master Plan. A land use plan, backbone infrastructure plans, and development costs have been completed.

This Final Environmental Impact Statement (FEIS) will evaluate the Master Plan components -- i.e., the land use plan and backbone infrastructure plans. While the developer of this project may have a somewhat different plan, it will not be substantively different from the current Master Plan. Thus, the impacts, analysis, and applicable mitigation measures as discussed in this environmental impact statement will apply to the overall development project.

1.2 INTENDED USES OF THIS DOCUMENT

This environmental impact statement has been prepared in accordance with Chapter 343,

Hawaii Revised Statutes and the rules and regulations of the Office of Environmental Quality Control. It has been determined that an environmental impact statement is required pursuant to Chapter 200 of Title 11, Administrative Rules, Subchapter 5(b).

The purpose of the environmental impact statement is to provide information to public officials and members of the community on the nature of the subject action; to assess existing environmental conditions of the property and surrounding areas; to evaluate potential impacts that may result from development of the project and to propose mitigating measures for those impacts; and to consider alternatives to the proposed action.

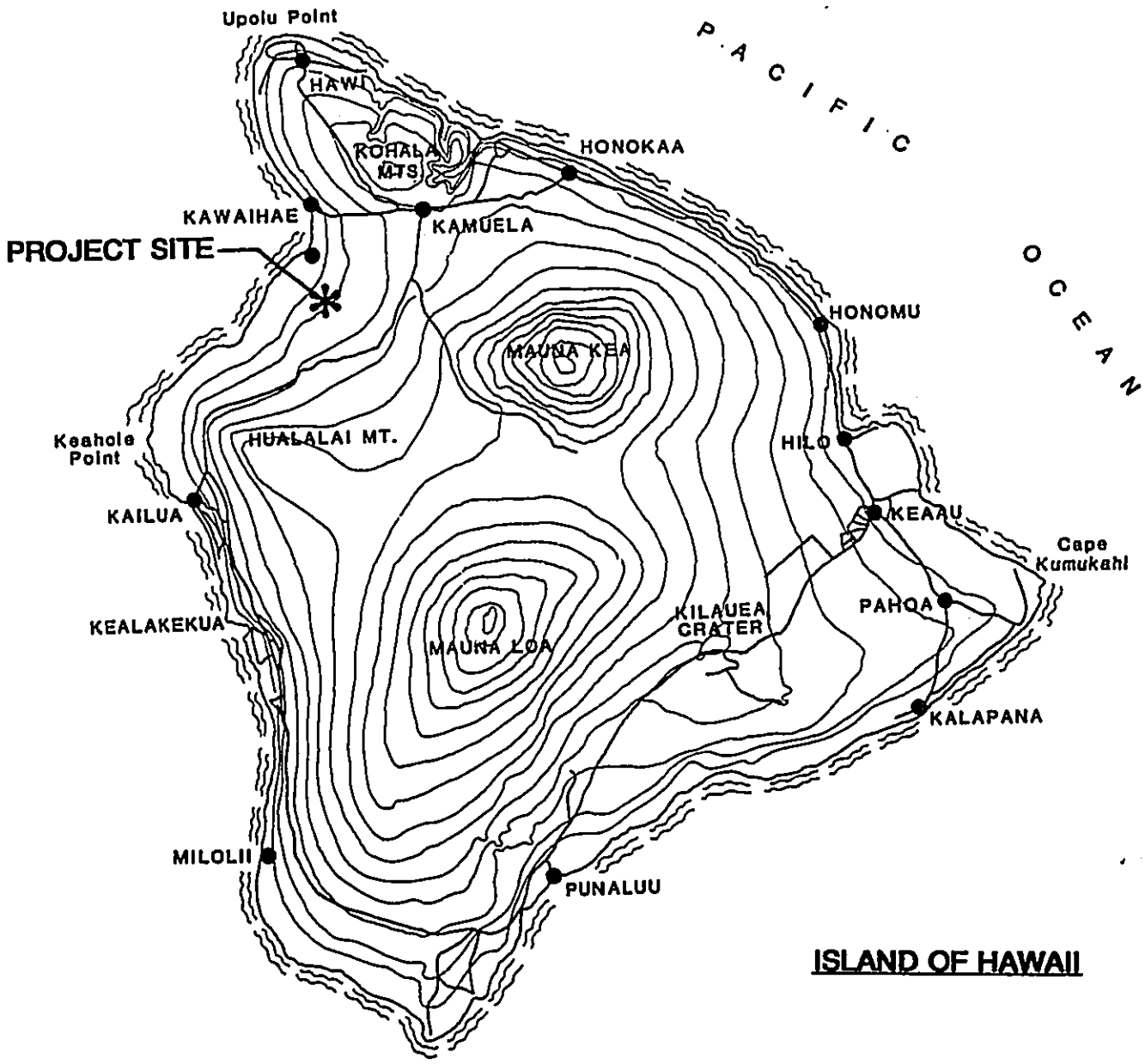
1.3 DEVELOPMENT SUMMARY

Applicant:	Office of Housing and Community Development
Accepting Authority:	Mayor of the County of Hawaii
Approving Agency:	Planning Department
Tax Map Keys:	6-8-02:31 and por. 26, Third Division
Area:	279 acres
Location:	South Kohala District, at the north end of the existing Waikoloa Village; bounded to the west by conservation lands and to the north, east and south by vacant lands that are planned for future Waikoloa development.

Owner:	Waikoloa Land Company; transfer to County of Hawaii imminent
Existing Land Uses:	Undeveloped
State Land Use Designation:	Urban District
County General Plan Land Use Pattern Allocation Guide Map:	Low Density Urban Development
County Zoning:	RS-10, Residential Single-Family
Proposed Uses:	Residential, Neighborhood Commercial, Parks
Proposed Action:	The applicant proposes to develop 279 acres of land in Waikoloa, South Kohala. Development of the master planned community will offer a mix of residential housing, church/commercial areas, and recreation facilities. The proposed project is designed to offer a unique mix of housing that will be 100% affordable (targeted to households from less than 80% up to 140% of the County's median family income).

1.4 LOCATION AND OWNERSHIP

The proposed project is located in the South Kohala district of West Hawaii, at the north end of the existing Waikoloa Village (see Figure 1-1). The property is located approximately 4 miles east, or mauka of Queen Kaahumanu Highway. The project site is bounded to the west by conservation lands and to the north, east and south by vacant lands that are planned for future Waikoloa development.



WAIKOLOA AFFORDABLE HOUSING PROJECT MASTER PLAN

For: County of Hawaii Dept. of Housing & Community Development
Hilo, Hawaii

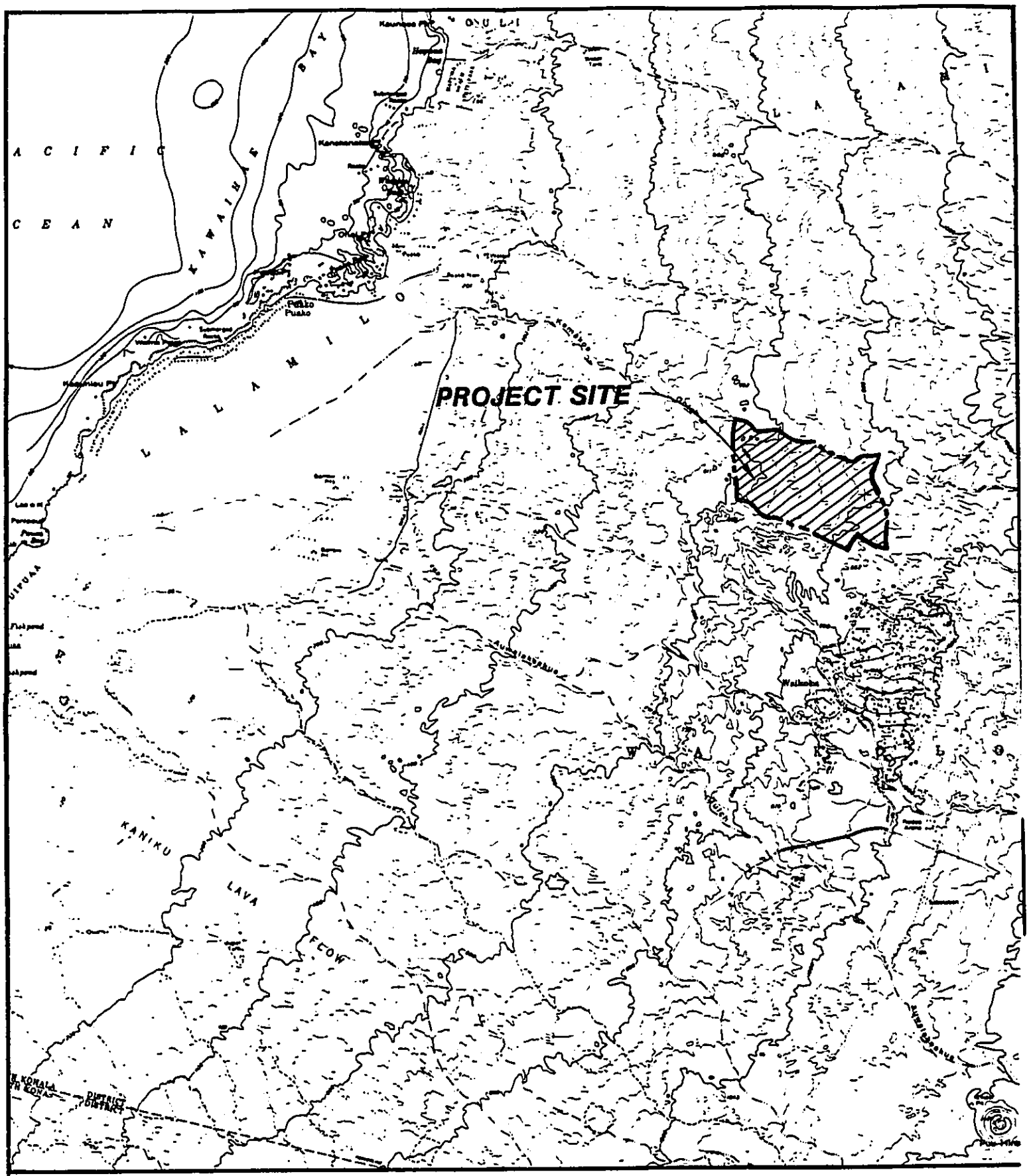
By: R. M. Towill Corporation
Honolulu, Hawaii

NOVEMBER 1989

NORTH

0 4 8
Miles

FIGURE 1-1
PROJECT LOCATION MAP



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NOVEMBER 1990

SCALE IN FEET

AREA MAP

FIGURE 1-2

Situated at the 700-foot elevation of the Kohala region, the site has views of the peaks of Mauna Kea to the east, the Kohala Mountains to the north, and the Kohala coastline to the west. Southeast of the project area are residential units nestled in the rolling hills of Waikoloa Village. The south slope of Haleakala Crater on Maui is visible on a clear day.

Paniolo Drive, an 80-foot wide public right-of-way, currently provides access to the site from Waikoloa Road. The completed or improved portion of Paniolo Drive terminates near the eastern border of the site. Extension of Paniolo Drive over an existing dirt road is expected to be completed no later than March 1993 when development in the eastern section of Waikoloa Village occurs.

Ownership of this parcel is currently being conveyed by Waikoloa Land Company to the County of Hawaii for the purpose of enabling the County to develop affordable housing units on this site. Surrounding parcels are owned by Waikoloa Land Company/Waikoloa Development Company and several other development companies.

1.5 SUMMARY OF PROBABLE IMPACTS AND MITIGATION MEASURES

1.5.1 Traffic

The proposed project will increase traffic on the existing and proposed roadways in the area of the project. Projected traffic volumes resulting from development of the Waikoloa Affordable Housing project include the following:

PROJECT TRAFFIC

Land Use (Parameter)	Daily (vpd)	A.M. Peak Hour Enter (vph)	A.M. Peak Hour Exit (vph)	P.M. Peak Hour Enter (vph)	P.M. Peak Hour Exit (vph)
Single-family (560 d.u.)	3644	104	283	346	203
Multi-family (840 d.u.)	5024	76	348	263	124
Park (9.2 acres)	336	6	16	8	23
Commercial (5,000 s.f.)	4435	169	169	182	174
Church (75,000 s.f.)	577	4	1	21	18
Total:	14,016	359	817	820	542

NOTE:
vpd = vehicles per day
vph = vehicles per hour

The Waikoloa Affordable Housing project proposes a loop road system in which two 60-foot wide rights-of-way will intersect the improved extension of 80-foot wide Paniolo Drive.

The total estimated project traffic volumes at full development will impact the existing regional transportation network, however, at or near over capacity conditions will exist at peak periods even without the affordable housing project.

1.5.2 Air Quality

The major short-term air quality impact will be the potential emission of significant quantities of fugitive dust during project construction phases. Uncontrolled fugitive dust emissions from construction activities are estimated to amount to about 1.2 tons per acre per month. During the period of construction, emissions from engine exhausts (primarily consisting of carbon monoxide and nitrogen oxides) will also occur both from on-site construction equipment and from vehicles used by construction workers and from trucks travelling to and from the project.

Mitigation measures will include the establishment of a regular dust-watering program and covering of dirt-hauling trucks in compliance with State of Hawaii Air Pollution Control Regulations.

The primary long-term air pollution impact from the project will arise from the increased motor vehicle traffic associated with the project. Potential increased levels of carbon monoxide concentrations along roadways leading to and from the proposed development will be the primary concern. The "with the project" carbon monoxide concentrations along roadways in the project vicinity will unavoidably be higher at several locations compared

to the "without project" case, but worst-case concentrations will remain within the national standards. With or without the project, the more stringent State standards may be exceeded near traffic-congested areas. The highest concentrations will occur in the vicinity of Queen Kaahumanu Highway at Waikoloa Road.

Mitigation measures available to minimize traffic-related air pollution include the improvement of roadways, reduction of traffic or reduction of individual vehicular emissions. Roadway improvements recommended in the traffic study will be implemented to move traffic efficiently through the project area. Traffic will be reduced to the extent possible by encouraging bus use, car pooling, and/or the adjustment of local school and business hours to begin and end during off-peak times. Reduction of individual vehicular emissions is beyond the control of the project.

Some long-term impacts on air quality also could occur due to indirect emissions from power generating facilities supplying the project with electricity and from the disposal of waste materials generated by the project. Impacts will be small, however, due to the magnitude of the project electrical and solid waste demands compared to the present and future County demands.

Indirect emissions from project electrical demand could be reduced somewhat by utilizing solar energy design features to the maximum extent possible. This would include installing solar water heaters, designing homes and building spaces so that window positions maximize indoor light without unduly increasing indoor heat, and using landscaping where feasible to provide afternoon shade to cut down on the use of air conditioning.

1.5.3 Socio-Economic Conditions

The Waikoloa Affordable Housing project will increase the population in the area by an estimated 3,600 persons, assuming average persons per household of 3.0 to 3.3. This total represents approximately 15 percent of the South Kohala district's population per DBED's M-K Series B and County Planning Department's population projections by the

year 2005. The Waikoloa Affordable Housing project is expected to provide a wide range of housing opportunities, all in the affordable range, for varied levels of family incomes. Total housing units are estimated at approximately 1,200 to 1,400 units for the development.

This development will provide badly needed affordable housing in the West Hawaii region; and by increasing the supply of affordable housing units, the project will facilitate an expanded labor force for the area's resorts.

1.5.4 Topography and Soils

Slopes in the project area range from 0 percent to over 20 percent. The northern portion of the site has an average slope of 6 to 10 percent and the southern portion has an average slope between 11 percent and 20 percent. Elevations range from 550 feet above sea level near the makai boundary to 900 feet near the mauka boundary of the site.

Two soil types are found on the project site: Kawaihae (KNC) and Very Stony Land (rVS). Hard pahoehoe lava bedrock can be found at a depth of about 33 inches in the areas where Kawaihae soils occur. Bedrock occurs at a depth of 5 to 20 inches in areas where Very Stony lands occur.

The varying topography and elevations of the project site will necessitate careful siting of roadway and other utility systems as well as residential lots, in order to minimize construction costs for this affordable housing project.

1.5.5 Flora and Fauna

According to the Botanical Survey Report written by Char & Associates, the proposed project is not expected to have a significant impact on flora as the site consists primarily of cultivated lands. According to the Survey of Avifauna and Feral Mammals undertaken by Phillip L. Bruner, there are no rare, threatened or endangered vertebrate animal species known to exist on the project site.

1.5.6 Water

The Waikoloa Water Company owns the wells, reservoirs, and primary transmission mains that supply potable water to Waikoloa Village. The Waikoloa Water Company's potable water wells draw from the Waikoloa aquifer. It has been determined that the project will require a 12-inch water line laid along the entire length of backbone roadways.

The proposed project will require approximately 560,000 gallons per day at build-out. The Waikoloa water system has adequate capacity to provide for these needs.

1.5.7 Sewer

At present, there is no sewer system in the immediate vicinity of the project area. The nearest sewer system is located approximately 7,000 feet southwest of the project site, and serves the commercial and multi-family areas of Waikoloa Village. This existing sewer system is not available for use by the proposed project.

Preliminary analysis of the sewer system needs for the project indicates that the project will generate a total average flow of 0.5 million gallons per day (mgd). The proposed on-site improvements will primarily include 8-inch and 12-inch gravity lines. Sewage treatment facilities are to be provided off-site by Waikoloa Sanitary Sewer Company.

The plans for these new facilities are still at a very early stage. The new sewage treatment plant and its associated effluent disposal system will be designed, constructed, and operated in accordance with applicable Federal, State and County rules and regulations.

1.5.8 Drainage

A new drainage system consisting of a ten-foot concrete channel running along Paniolo Drive, and two mauka-makai concrete channels to divert runoff to offsite drainageways will be constructed as part of the project. Other major improvements will include 2-foot and 5-foot channels to be built on the project site. Among the necessary infrastructure improvements and associated costs to be borne by the project, drainage improvement

costs are the highest -- approximately $12 million. Unlined channels may be possible under certain conditions. Other offsite mitigation measures are being evaluated and may further reduce direct project costs.

A mitigation measure will be to attribute the cost of constructing the ten-foot channel along Paniolo Drive to Transcontinental Development Company, based on the Agreement dated February 25, 1988. In this scenario, cost of this item would be attributed to the original landowner, thereby reducing the drainage improvement costs to $8.6 million.

1.5.9 Solid Waste

Solid waste generated by the project when fully completed is expected to amount to about 10 tons of refuse (approximately one 12-ton truckload) per day. At present, the refuse district handles about 100 tons daily. The nearest existing solid waste transfer station is located at Puako, however, a new transfer station is being planned near a former quarry site immediately adjacent ot Waikoloa Village. This transfer station should be operational before this project breaks ground.

Currently, solid waste is disposed of at the Kailua-Kona landfill located at Kealakehe. The Kealakehe Landfill is scheduled to close within the next 24 months and is not expected to continue to function as the refuse disposal site for the West Hawaii region. A new sanitary landfill site has been selected, and plans are being put together for its development. This facility will accommodate the proposed project's solid waste disposal needs.

1.5.10 Power and Communications

At present power and communications are provided by an existing underground duct bank containing a 750 MCM cable (14.47 KVY) which originates from a substation located mauka of the Waikoloa Village general store and runs along Paniolo Avenue to the project area. A new substation will be necessary to provide power to the project. The Hawaii Electric Light Company (HELCO) is developing additional electrical energy generating capacity, and therefore it is expected that HELCO will be able to provide the required

electricity to meet this additional demand.

1.6 ALTERNATIVES CONSIDERED

The economic mix of housing units was reviewed and analyzed to preliminarily determine financially feasible scenarios. Numerous cash flow analyses were conducted, each containing different sets of assumptions, such as varying per square foot building construction costs, and dwelling unit sizes. One scenario indicates that total revenues from the sale of 1,000 units are $129.4 million, while total development costs (including building construction, subdivision or on-site development, backbone infrastructure, sales/processing fees, indirect costs for design, management, loan points, contingencies at 15%, and developer's profit at 5% of revenues) are $131.7 million. At an annual deficit financing rate of 12%, the deficit after financing will be $17 million.

Achieving a balance between the project's social objectives of providing all housing units at affordable rent and sales price levels while maintaining the project's overall economic feasibility will have a significant influence on the final mix of unit types and sizes.

It is recognized that the modification of certain subdivision standards may result in significant cost savings, and may result in more affordable housing. These modifications need, however, to ensure that such cost-saving methods, (1) will not result in health and safety risks; (2) will not result in significant added post-construction maintenance costs for the County and/or for the residents; (3) will not have an adverse visual impact; (4) will clearly result in a greater number of affordable houses and/or lower prices for some or all of the homes.

1.7 NECESSARY PERMITS AND APPROVALS

A. Federal

U. S. Army Corps of Engineers:	Dept. of the Army Permit for Streambank Improvements Along Kamakoa Gulch

B. State of Hawaii

Department of Health:	Approval of new distribution systems for public water. UIC permits for proposed drywells.

C. County of Hawaii

Mayor and County Council	Experimental and Demonstration Housing Project Designation (46-15, HRS)
Planning Department:	Subdivision Approvals
Department of Water Supply:	Water Master Plan Approval
Department of Public Works:	Building Permits; Grading Permits; Drainage Master Plan Approval; Sewer Master Plan Approval

D. Other

Waikoloa Water Company:	Water Master Plan Approval. Subdivision Plan Approval.
Waikoloa Sanitary Sewer Co.:	Sewer Master Plan Approval. Subdivision Plan Approval.

SECTION 2

PROJECT DESCRIPTION

SECTION 2 PROJECT DESCRIPTION

2.1 INTRODUCTION

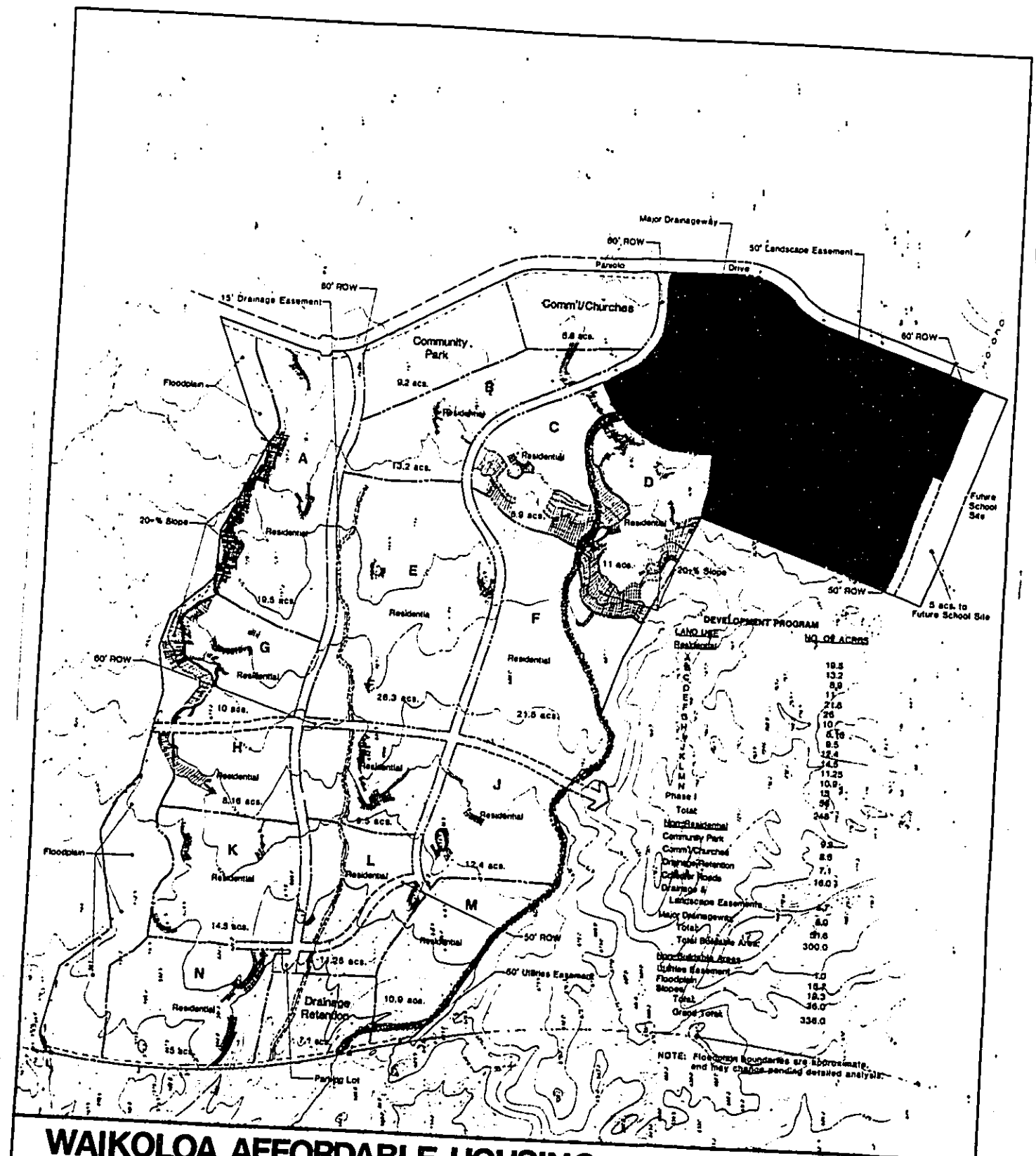
The Waikoloa Affordable Housing project will consist of approximately 279 acres. Envisioned is a 1,200 to 1,400 dwelling unit mix of single family and multi-family homes on finished lots (see Figure 2-1). Master planned as a 100 percent affordable residential community, the project will offer unique rental and homeownership opportunities to families whose incomes fall within the 50 percent to Hula Mae Program financing limits. The project will also include a parcel for churches and a small commercial area near the Paniolo Drive entrance. A community park will be located next to the commercial/churches area at the entrance to the project at Paniolo Drive. A public school site is planned near the southeastern edge of the project site near the Ho'oko Street and Paniolo Drive intersection.

2.2 THE MASTER PLAN

Single family detached dwellings are proposed in the Master Plan to have lots averaging 7,500 square feet in size, depending on the topography and location of the lot. Some of these lots will have dramatic views of the ocean and mountains. The selected developer may ultimately provide smaller lots in order to achieve a greater number of house lots for project feasibility.

In response to the topographic conditions, steep slopes will be utilized as buffers between clusters of houses. Other open spaces will be created by the preservation of drainageways. The use of unbuildable lands for open space creates a more pleasant, natural environment.

Multi-family units will vary from duplex units with lot sizes of 3,750 square feet per unit, to other multi-family housing types such as row houses, six-plex or eight-plex units. Gross project density for multi-family projects will be no more than 15 units per acre. To maintain the low density nature of the overall development, multi-family projects will not be more than 15 acres in size.



WAIKOLOA AFFORDABLE HOUSING PROJECT MASTER PLAN

For: County of Hawaii Dept. of Housing & Community Development
Hilo, Hawaii

By: R. M. Towill Corporation
Honolulu, Hawaii

NOVEMBER 1989

PRELIMINARY LAND USE PLAN

Figure 2-1

4-27-90

An overall sense of neighborhood identity will be created by physically identifiable "villages" or neighborhoods within the 279 acre project. This will be achieved through the creative use of roads, drainageways, topography, views and vistas, as well as through varying site layouts and architectural design. The Land Use Plan identifies a total of 14 development clusters.

A 9-acre community park has been located at the Paniolo Drive entrance to serve the wider Waikoloa Village community. This recreational facility will also function as an entry feature/statement to the overall development. A drainage retention parcel of 7 acres has been located at the makai or western end of the project site. This parcel will be grassed over and will serve a dual function as a second recreational field for this family-oriented project.

An 8.6-acre parcel has been set aside for churches and a small convenience commercial area adjacent to the community park at the Paniolo Drive entrance. This grouping of uses is proposed for the optimum use of parking facilities at this site.

Near the southeastern boundary of the project site is a future 36-acre public school and recreation complex located near the Ho'oko Street and Paniolo Drive intersection. Waikoloa Land Company is in the process of conveying this land to the State Department of Education for this purpose.

The major roadway network consists of 50-foot and 60-foot wide rights-of-way, with curbs, gutters and sidewalks, and dry wells for drainage. Roadway grades were maintained at a maximum slope of eight-percent, with a few exceptions where ten or twelve-percent was used because of the steep character of the area. The Land Use Plan shows a 60-foot right-of-way to be reserved in the mid-section of the site. This right-of-way would be a part of a collector roadway that would be constructed to provide the project site and other area developments with a second route to Waikoloa Road.

Off-site infrastructure systems, including access roadway, potable water, and sewage treatment and disposal will be provided by the Waikoloa Land Company at no cost to the County or to the prospective developer.

The acreage allocations for the various land uses are shown in the accompanying table below:

TABLE 2-1
Development Program

LAND USE	NO. OF ACRES
Residential:	
A	19.5
B	13.2
C	8.9
D	11.0
E	21.8
F	26.0
G	10.0
H	8.1
I	9.5
J	12.4
K	14.5
L	11.2
M	10.9
N	15.0
Total:	**192.0**
Non-Residential:	
Community Park	9.2
Comm'l/Churches	8.6
Drainage Retention	7.1
Collector Roads	16.0
Drainage & Landscape Easements	5.7
Major Drainageway	5.0
Total:	**51.6**
Total Buildable Area:	**243.0**
Non-Buildable Areas	
Utilities Easement	1.0
Floodplain	15.7
Slopes	19.3
Total:	**36.0**
Grand Total:	**279.0**

2.3 SUPPORT INFRASTRUCTURE

An evaluation of existing sewer, water, and drainage systems was conducted in March 1989 to determine necessary improvements for the project. Preliminary backbone infrastructure requirements and associated costs were documented in a report prepared by R. M. Towill Corporation in June, 1990. These findings are subject to further in-depth study. The following infrastructure system requirements were discussed in the report:

2.3.1 Wastewater System

At present, there is no sewer system in the immediate vicinity of the project area. The nearest sewer system is located approximately 7,000 feet southwest of the study area and serves the commercial and multi-family areas of Waikoloa Village. This existing sewer system is not available for use by the proposed project. A preliminary analysis of the sewer system needs for the project indicates that the project will generate a total average flow of 0.5 million gallons per day (mgd). The proposed on-site improvements will consist primarily of 8-inch and 12-inch gravity lines.

A new sewage treatment and disposal facility will be provided by the Waikoloa Land Company, through its subsidiary, the Waikoloa Sanitary Sewer Company. This new facility is presently in the early stages of planning. Thus, the capacity and general mechanical characteristics of the plant, as well as its service area, location, and effluent disposal method have yet to be determined. Preliminary concepts for this new facility suggest an off-site location near the makai boundary of the County's land.

The new sewage treatment and disposal system will be designed and constructed in accordance with applicable Federal, State, and County rules and regulations.

2.3.2 Water System

The Waikoloa Water Company owns the wells, reservoirs and primary transmission mains that supply potable water to Waikoloa Village. The Waikoloa Water Company's potable water wells draw from the Waikoloa aquifer. These wells, known as Parker wells No. 4

and No. 5, and Waikoloa Wells No. 1 and 2 (under construction), are located at the 1,200-foot level nearly five miles inland from Puako Bay. These wells tap high quality water (25 ppm chloride content) from the Waikoloa aquifer.

The point of connection to the water system from the project area is an 8-inch main at Paniolo Drive and Ho'oko Street. It has been determined that the project will require a 12-inch water line laid along the entire length of main roadway. Fire hydrants were assumed to be spaced every 300 feet.

2.3.3 Drainage System

The approximately 58,000-acre watershed located mauka of the site produces about 12,000 cubic feet per second (cfs) of runoff during a "100-year" storm, which naturally collects in Kamakoa Gulch. Kamakoa Gulch is a natural major drainageway which forms the northern boundary of the project site. Under existing conditions, a portion of this mauka-generated runoff runs through the project site before entering Kamakoa Gulch. The preliminary analysis, using the 100-year, 24-hour storm, indicates that the project will generate an on-site increase in peak runoff of approximately 380 cfs. Based on the County of Hawaii's Standards of 5 cfs per well of 20 foot depth, 76 dry wells are required to control the increase in runoff. Because a portion of the runoff runs through the site before entering Kamakoa, a ten-foot concrete channel running along Paniolo Drive will be used to divert this runoff to Kamakoa before it can enter the site. Alternatively, a channel could be considered along the mauka boundary of other developments that are located mauka of the County's project site.

A subdivision drainage plan provided by Imata and Associates shows over 750 cfs entering the project site from future developments located mauka of the site.

Two concrete channels are needed to divert runoff to off-site drainageways. A trapezoidal channel, with a ten-foot bottom width and 1:1 side slopes, will run along the lower, or west side of Paniolo Avenue to collect approximately 1,600 cfs of runoff from the 1,500 acre drainage area directly above the site and divert it into Kamakoa Gulch, which runs

along the north side of the project site. A second similar channel, with a 5-foot bottom width, running from Paniolo Drive to the lower end of the project site is needed to carry approximately 550 cfs to an off-site drainageway that eventually empties into Kamakoa Gulch. Unlined channels may be possible, provided that erosion can be controlled and that maintenance does not become a major problem.

Swale and dry well systems will be used to collect runoff from roads and road rights-of-way. Dry wells are to be spaced every 250 feet along both sides of all roadways. The swales, drywells, and related drainage facilities will need to be properly maintained.

2.3.4 Electrical/Telephone

An existing underground duct bank which contains a 750 MCM cable (14.47 KVY) originates from a substation located mauka of the Waikoloa Village's general store and runs along Paniolo Avenue to the project site. Conduits to accommodate cable and telephone lines are also located within this same duct bank.

The project's electrical and telephone utilities will be located underground. In general, underground electrical and telephone lines within dedicable roadways will be concrete jacketed.

2.3.5 Infrastructure Costs

Preliminary infrastructure cost estimates were prepared in June, 1990 by R. M. Towill Corporation. The following is a summary of the estimates:

* Roadway System and Landscaping. This cost includes the construction of the backbone roadways with curbs, gutters, and sidewalks, and of 2 major and 5 minor intersections.

$2,996,000.00

* Sewer System. The system will include 8" and 12" gravity sewers and manholes.

$836,000.00

* Water System. This will involve a 12" water line, fire hydrants and fittings.
$988,000.00

* Drainage System. These major infrastructure improvements assume 2-foot, 5-foot, and 10-foot channels, catch basins, dry wells, 18-inch drains, and culverts. There is also an assumption that the cost to construct the 10-foot channel will be assumed by Transcontinental Development Corporation per the Memorandum of Agreement dated February 25, 1988.
$8,614,000.00

* Power and Telephone. It is assumed that these utilities will be underground.
$1,461,000.00

* Site Work. This cost involves excavation for roadways and drainage channels.
$1,442,000.00

A drainage study for Kamakoa Gulch is needed and is currently underway. The cost of any required drainage improvements to Kamakoa Gulch will depend on what is designed and any cost sharing agreement that can be worked out with other affected parties.

The total cost estimate for these infrastructure improvements (including a 15% construction contingency, and 10% for survey and design work) is $20,665,000. This will be approximately $17,221 per dwelling unit if the total number of units is 1,200.

2.4 MIX/TYPES OF UNITS

The Waikoloa Affordable Housing development will have units for rent and for sale to families whose incomes are between 50% of the County's median income ($16,000) to Hula Mae program limits ($45,800).

In order to achieve the County's objectives relative to affordable housing, the distribution of the types of units will be focused on providing as many units as possible for families at the lower end of the income scale. The overall project size will be approximately 1,200 to 1,400 units. A recommended mix of unit types and prices is provided below:

- 200 Multi-Family rental units -- possibly developed by the State;
- 1,000 Multi-Family and Single Family For Sale units.

The multi-family rental units could be developed under the State's Rental Housing System (RHS). Under this program, rental projects are financed with the proceeds of tax-exempt revenue bonds issued by the State's Housing Finance and Development Corporation (HFDC). The RHS could be used in conjunction with HFDC's Rental Assistance Program which provides rent subsidies to lower the rent for eligible tenants.

Consideration will also be given to Policy C(7) of the State Housing Functional Plan which strives to integrate special needs housing into new and existing neighborhoods.

The suggested mix of for-sale homes is as follows:

# of Units	Income Group	Sale Price Per Unit	Type of Unit
400	100% of Median	$ 95,952	Duplex/Fourplex
200	120% of Median	$117,876	Single Family
200	140% of Median	$140,160	Single Family
200	Hula Mae Limit*	$167,000	Single Family

*Numbers are currently being updated in the Hula Mae program. The $167,000 sales price may be feasible for families within the Hula Mae income limits; however, new mortgage limits have not yet been made official.

2.5 PROJECT CASHFLOW SUMMARY

As part of the master planning process, a projection of project development costs (including financing) and revenues from home sales was prepared, assuming project build out within six years. The Cash Flow Analysis model has been summarized and is shown below as Table 2-2.

The following assumptions were made in the preparation of this cash flow analysis:

1) Sales price limits for homes targeted for each of the income groups are:

Price	Income Group
$ 95,952	100% of Median
$117,876	120% of Median
$140,160	140% of Median
$167,000	Hula Mae Limit* (see above)

2) The assumed mix of the units will be 40% or 400 units for the 100% of median income group, 20% or 200 units for the 120% of median income group, 20% or 200 units for the 140% of median income group, and 20% or 200 units for households whose incomes are up to the Hula Mae program limit.

3) Cost of construction for the multi-family units is assumed to be $75 per square foot, while for single family units it is $70 per square foot.

4) Dwelling unit sizes are assumed as: up to 800 square feet for duplex/fourplex units; 1,000 square feet for units built for the 120% of median income group; 1,200 square feet for the 140% of median income group; and 1,250 square feet for the Hula Mae limit group.

5) The project will be developed in 6 years, with the dwelling units being constructed starting with year 2; 77 units constructed in Year 2; 311 units constructed in Year

3; 272 units constructed in Year 4; 119 units constructed in Year 5; and 221 units constructed in Year 6. Unit counts for each year were derived from the Land Use Plan.

Several iterations of the cash flow analysis were conducted, each containing different sets of assumptions, such as varying per square foot building construction costs, and dwelling unit sizes. The rental units were not included in the analysis as these will be developed either by the State or private developer(s). The total number of units for sale was 1,000 in this analysis.

TABLE 2-2
WAIKOLOA AFFORDABLE HOUSING PROJECT
PRELIMINARY CASHFLOW ANALYSIS SUMMARY
(1990 Dollars - In Thousands)

REVENUES	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Totals By Items
Home Sales	0	11376	36380	33017	16882	25745	123400
MF Site Sales	0	2000	2000	0	2000	0	6000
TOTAL REVENUES	0	13376	38380	33017	18882	25745	129400 (1000 Units)
DEVELOPMENT COSTS							
Building Construction	6300	21605	19552.5	9590	15252.5	0	72300
On-Site	1694	6230	5524	2618	4334	0	20400
Backbone Infra-structure*	4572	3878	3258	3600	0	0	15308
Fixed Sales Fees @ $1000/unit	0	77	311	27	119	221	1000
Indirect Costs @ 15% for Design, Manage-ment, Loan Points, Contingencies	1885	4757	4250	2371	2938	0	16201
Developers Profit @ 5% of Revenues	0	669	1919	1651	944	1287	6470

TOTAL DEVELOPMENT COSTS	14451	36547	32896	18451	22643	6691	131679
REVENUES minus COST	-14451	-23171	5484	14566	-3761	19054	-2279
CUMULATIVE REVENUES BEFORE FINANCING	-14451	-37622	-32138	-17572	-21333	-2279	-2279
FINANCING @ 12%	-1734	-4515	-3857	-2109	-2560	0	-14774
CUMULATIVE REVENUES AFTER FINANCING	-16185	-43871	-42243	-29786	-36107	-17053	-17053

*Total estimated cost of $3,703,000 will be assumed by Transcontinental based on agreement regarding offsite infrastructure.

Total revenues from the sale of the 1000 units are $129.4 million, while total development costs (including building construction, subdivision or on-site development, backbone infrastructure, sales/processing fees, indirect costs for design, management, loan points, contingencies at 15%, and developer's profit at 5% of revenues) are $131.7 million. At an annual deficit financing rate of 12%, the deficit after financing will be $17 million.

Project backbone infrastructure requirements are assumed to conform to County subdivision standards, and to the requirements of the County Department of Public Works. However, it is recognized that the modification of certain standards may result in significant cost savings, and may result in more affordable housing opportunities. These modifications need, however, to ensure that such cost-saving methods, (1) will not result in health and safety risks; (2) will not result in significant added post-construction maintenance costs for the County and/or for the residents; (3) will not have an adverse visual impact; and (4) will clearly result in a greater number of affordable houses and/or lower prices for some or all of the homes.

Any substantive cost-savings methods in infrastructure and subdivision design will help to reduce the project deficit that is indicated in Table 2-2. Further, if the construction cost per square foot-- i.e., $75 per square foot for multi-family units, and $70 per square foot for single family units -- can be reduced, additional reduction of the project deficit can be realized.

2.6 PROJECT SCHEDULE

Construction of the model units in the Phase 1 development is expected to begin in the first quarter of 1991, while construction of the rest of the homes is projected to begin during the third quarter of 1991. Construction of the County's portion of the project will commence with the construction of the initial infrastructure -- this is expected to begin in early 1992. Construction of homes can be expected to begin in mid-1992.

SECTION 3

PHYSICAL ENVIRONMENT

3.1 TOPOGRAPHY AND SOILS

3.1.1 Topography

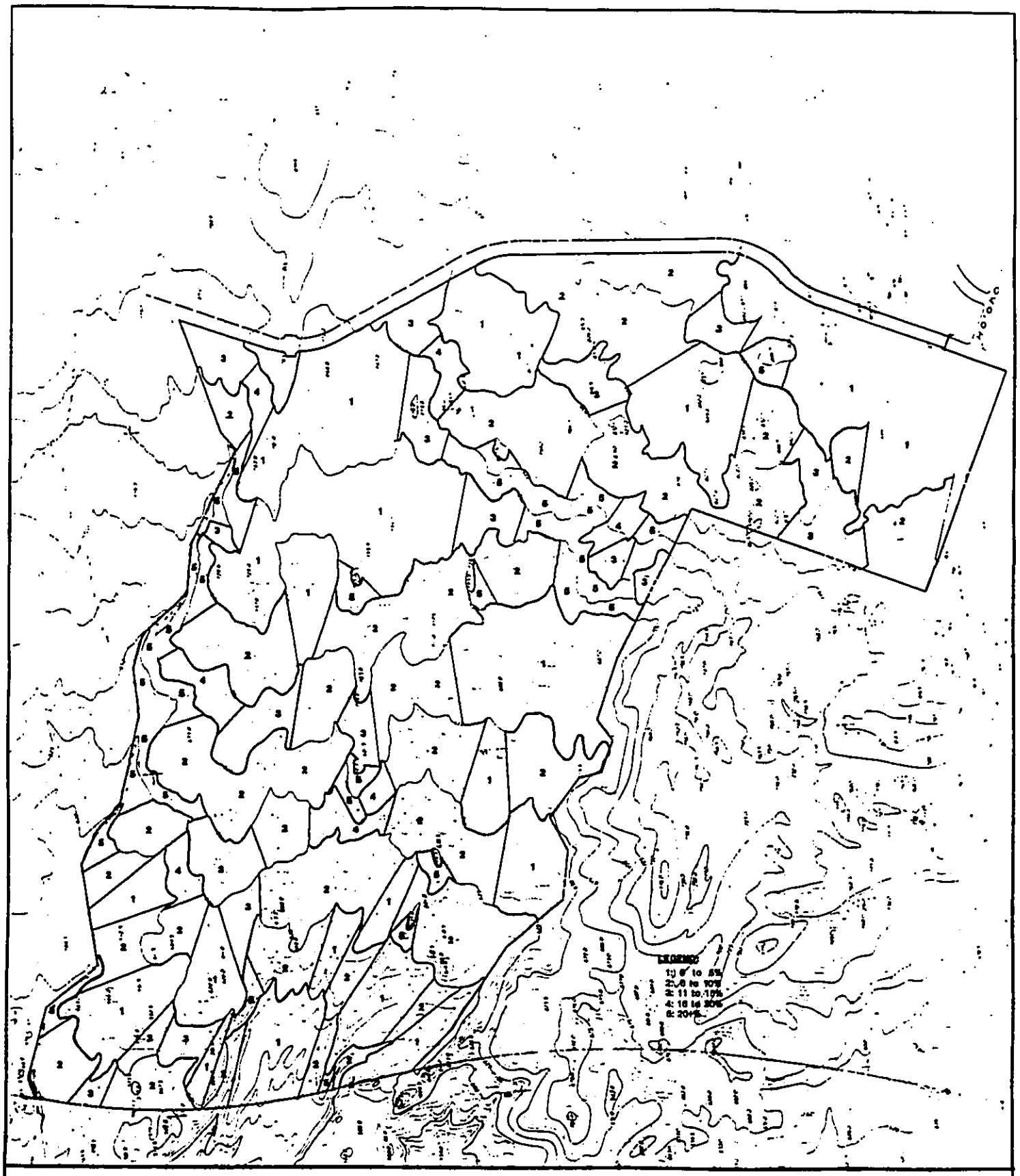
Slopes in the project area range from 0 percent to over 20 percent. Gently rolling hills, low-lying grasslands with scattered kiawe trees and rock outcroppings characterize the terrain of the project site. The northern portion of the site has an average slope of 6 to 10 percent and the southern portion has an average slope between 11 percent and 20 percent. Approximately 40 percent of the site consists of slopes of 0 to 5 percent; 33 percent consists of slopes of 6 to 10 percent; 17 percent consists of slopes of 11 to 20 percent; and 10 percent of the site consists of slopes greater than 20 percent (see Figure 3-1).

Elevations range from 550 feet above sea level near the northwest boundary of the project site to 900 feet near the southeast boundary. Kamakoa Gulch and an unnamed gulch border the northern and southern boundaries, respectively.

Impacts and Mitigation

The site's varying topography with its gradually increasing elevation in the makai to mauka direction will necessitate some excavation and grading of the ground for construction of the homes. This natural topographic variation also offers creative site planning opportunities in that houses of varying architectural styles including split-level and pole designs can be incorporated to adapt to these conditions. Design adaptation to the existing topography offers the potential to develop more interesting and attractive residential structures.

However, the disadvantages of working with a site that has a varying topography are that excavation, infrastructure systems design, and multiple architectural designs add to overall development costs. Such additional costs may affect the financial feasibility of any development, but this is particularly so for a project whose homes are all targeted to fall within the "affordable" range.



WAIKOLOA AFFORDABLE HOUSING PROJECT MASTER PLAN

SLOPE MAP

For: County of Hawaii Dept. of Housing & Community Development
Hilo, Hawaii

By:– R. M. Towill Corporation
Honolulu, Hawaii

NOVEMBER 1989

SCALE IN FEET

FIGURE 3-1

Costs can be contained through careful siting of residential lots, roadways, and utility systems.

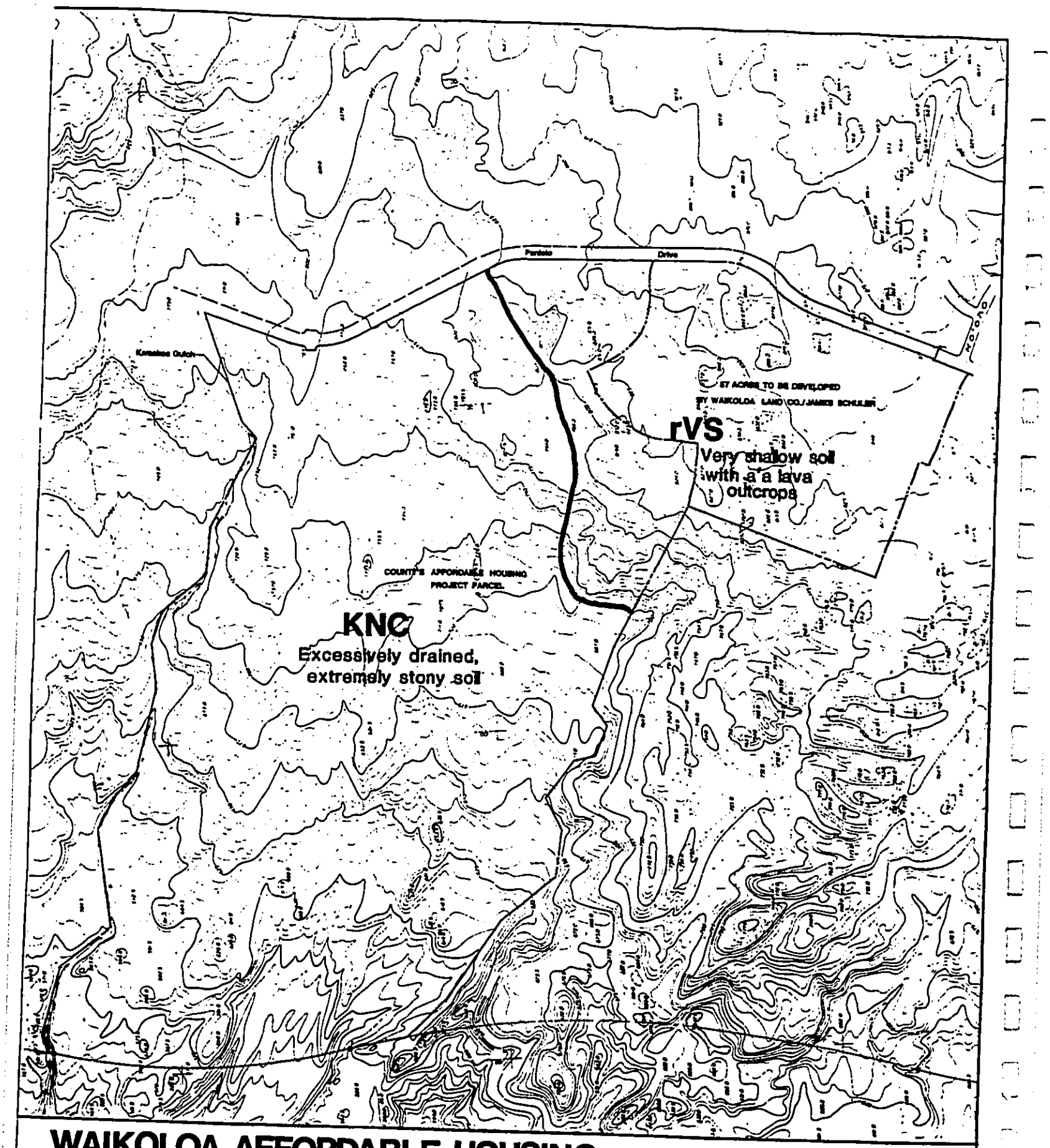
3.1.2 Soils

The U. S. Department of Agriculture, Soil Conservation Service (SCS) identified and mapped two soil types within the project site: Kawaihae (KNC) and Very Stony Land (rVS). The Kawaihae soil type characterizes the major portion of the project area. This series consists of somewhat excessively drained extremely stony soils that formed in volcanic ash. A representative profile contains a surface layer of dark reddish brown extremely stony very fine sandy loam about two inches thick. Below this is dark reddish brown and dusky red stony silt loam and loam. Hard pahoehoe lava bedrock is at a depth of about 33 inches. Kawaihae land is commonly used for pasture, wildlife habitat and recreation areas (see Figure 3-2).

The southeastern sector is characterized by the Very stony land (rVS) soil type. This soil consists of very shallow soil material and a high proportion of Aa lava outcrops. Between the lava outcrops and in the cracks of the lava, the soil material extends to a depth of 5 to 20 inches. The typical vegetation is a sparse cover of grass and kiawe trees in dry areas. The erosion hazard is slight. Very Stony Land is commonly used for pasture, watershed and wildlife habitat.

Impacts and Mitigation

No significant impacts are expected with regard to existing soils and soil conditions on the project site. Standard grading procedures, in accordance with State and County public works requirements will be adhered to in the design and site preparation stages of development. Any specific considerations in the grading plan(s) will be adhered to during the engineering design phase of the project.



WAIKOLOA AFFORDABLE HOUSING PROJECT MASTER PLAN

For: County of Hawaii Dept. of Housing & Community Development
Hilo, Hawaii

By: R. M. Towill Corporation
Honolulu, Hawaii

NOVEMBER 1989

Figure 3-2:
Soil Types

The ash-soil in the northeastern section of the site appears to be subject to rapid erosion. It should be landscaped as soon as possible after disturbance. This would also mitigate problems with dust.

3.2 SEISMOLOGY AND VOLCANIC ZONES

The Island of Hawaii is classified as Seismic Risk Zone 3 on a scale of 1 to 4 (4 being higher). The earthquake of 1868 was estimated to have had a magnitude of 7.25 to 7.75 on the Richter scale at its epicenter along the Kau District Coast; and at the Waikoloa Beach Resort, located 5.5 miles west of the study area, intensities were only slightly less. The 1951 and 1975 earthquakes were estimated to have had intensities of about 5 at the Waikoloa Beach Resort.

The study area location on the flanks of Mauna Kea places the property in Lava Flow Risk Zone 8 for Mauna Kea and close to the edge of the boundary of Lava Flow Risk Zone 3 for Mauna Loa. Lava Flow Risk Zones 1 to 9 - 1 being highest risk - are based upon the probability of coverage by lava flows. The risk of damage from new lava flows from either volcano within the next 100 years is remote.

Impacts and Mitigation

Site development standards and criteria applicable to areas classified as Risk Zone 3 for seismologic risks shall be adhered to by the developer(s) of this site. Although the risk of direct damage from new lava flows within the next 100 years is reportedly remote, the possibility of a lava flow from Mauna Loa crossing and blocking one or more of the major area roadways should be considered.

3.3 CLIMATE

Regional and local climatology significantly affect the air quality of a given location. Wind, temperature, atmospheric turbulence, mixing height and rainfall all influence air quality. Although the climate of Hawaii is relatively moderate throughout most of the state and most of the year, significant differences in these parameters may occur from one location to another. Most differences in regional and local climates within the state are caused by the mountainous topography.

South Kohala, the district in which the project site is located, is situated on the northwestern side of the island of Hawaii. The topography of this island is dominated by the great volcanic masses of Mauna Loa (13,653 feet), Mauna Kea (13,796 feet), and of Hualalai, the Kohala Mountains and Kilauea. The island consists entirely of the slopes of these mountains and of the broad saddles between them. Mauna Loa and Kilauea, located on the southern half of the island, are still active volcanoes. The site of the proposed project occupies a portion of the lower northwestern slope of Mauna Kea, extending from an elevation of about 550 feet near the northwest boundary up to an elevation of about 900 feet near the southeast boundary.

Hawaii lies well within the belt of northeasterly trade winds generated by the semi-permanent Pacific high pressure cell to the north and east. Nearly the entire western coast of the island of Hawaii, however, is sheltered from the trade winds by high mountains, except when unusually strong trade winds sweep through the saddle between the Kohala Mountains and Mauna Kea and reach the areas to the leeward side. Due to wind shadow effects caused by the terrain, winds in the South Kohala area are predominantly light and variable. Local winds such as land/sea breezes and/or upslope/downslope winds tend to dominate the wind pattern for the area. During the daytime, winds typically move onshore because of seabreeze and/or upslope effects. At night and during the early morning hours, winds generally are land breezes and/or drainage winds which move downslope from the east and out to sea; oftentimes, early morning drainage winds are quite strong for a few hours just near sunrise and then subside. Calms occur about 9 percent of the time at nearby Kawaihae.

In Hawaii, the annual and daily variation of temperature depends to a large degree on elevation above sea level, distance inland and exposure to the trade winds. Average temperatures at locations near sea level generally are warmer than those at higher elevations. Areas exposed to the trade winds tend to have the least temperature variation, while inland and leeward areas often have the most. The project site's leeward location and low-level elevation result in a relatively moderate temperature profile compared to windward locations near sea level. At Kamuela, located to the northeast of

the project and at an elevation on about 2,700 feet, average daily minimum and maximum temperatures are 55 degrees Fahrenheit and 73 degrees Fahrenheit, respectively. The extreme minimum temperature on record at this location is 34 degrees Fahrenheit, and the extreme maximum is 90 degrees Fahrenheit. Temperatures at the project site are estimated to be about 5 to 10 degrees warmer on the average than those at Kamuela due to the lower elevation.

Rainfall in Hawaii is highly variable depending on elevation and on location with respect to the trade winds. The lower elevations of South Kohala are some of the driest areas in the state. Some of the rainfall occurs in conjunction with winter storms, and some occurs during summer afternoons and evenings as a result of the onshore and upslope movement of moisture laden marine air. Annual rainfall reported for Waikoloa Village during 1988 was about 18 inches. This may vary substantially from one year to the next.

Humidity at the project site is relatively constant year round. It is generally below 40 percent during the late morning and afternoon hours.

Impacts and Mitigation

The project will have no significant impacts on the existing climatic conditions. The dwelling units and other project buildings are expected to be constructed to take advantage of the natural ventilation that the prevailing winds can provide in this area.

3.4 HYDROLOGY AND DRAINAGE

The project area is bordered on the northern side by a major drainage way, Kamakoa Gulch, which originates in the upper slopes of Mauna Kea and terminates in the coastal plain above the Puako shoreline. A large portion of the site is part of the Kamakoa Gulch drainage area. Branch tributaries, which vary in size, enter the site on the east side, traverse through the site and join the main branch located downstream of the site. It appears from field observations, that these branch tributaries are partially diverted toward

of the project site (Figure 3-3).

The approximately 58,000 acre watershed located mauka of the site produces about 12,000 cubic feet per second (cfs) of runoff during a "100-year" storm," which naturally runs through Kamakoa Gulch.

Bordering the site to the south is an unnamed gulch with a tributary area that originates in the existing subdivision to the southeast. Only a small portion of the study area drains to this gulch.

As indicated on the drainage map and through field observations, it is evident that over the years, the project site has been subjected to significant drainage impacts from areas mauka.

The proposed project is situated above the Underground Injection Control line (UIC line) as established by the State Department of Health.

According to the Map Index and Street Index of the Federal Emergency Management Agency's latest Flood Insurance Rate Map (FIRM), dated July 16, 1990, the project area lies within the borders of Panel 283C, which has not yet been printed. However, all areas covered by this panel have been designated Zone X, areas determined to be outside the 500-year flood plain (U.S. Army Engineer District, Sept., 1990).

Low-lying areas adjacent to Kamakoa Gulch, however, appear to be prone to minor flooding based on field observations conducted during the master planning process (September 1989 to March 1990).

A detailed analysis of the project's drainage system and floodway boundaries will be conducted for the design and development phases. The detailed study is intended to verify and refine the preliminary engineering analysis, and to set floodway boundaries along the northern border which is defined by Kamakoa Gulch.

of the project site (Figure 3-3).

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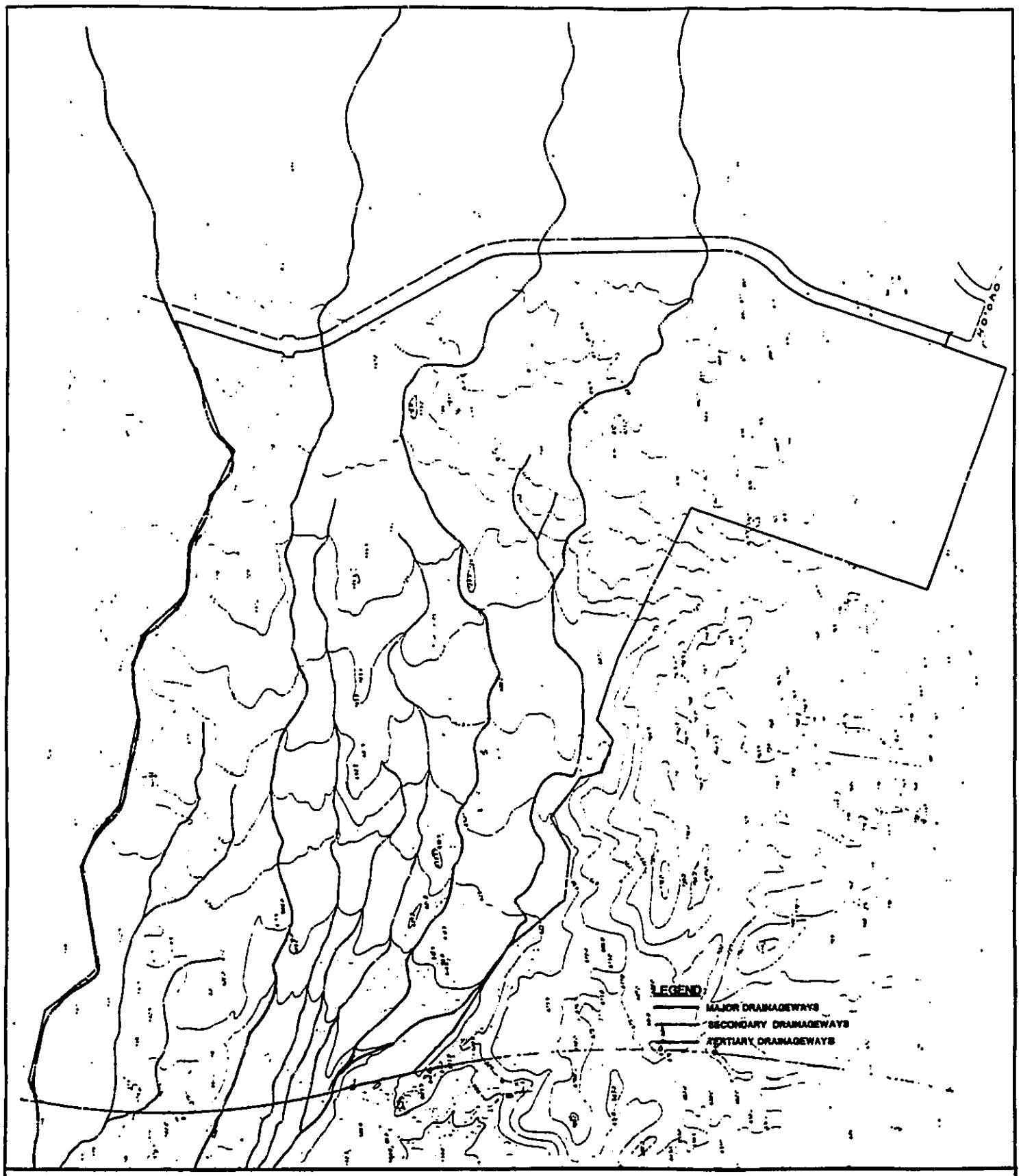


WAIKOLOA AFFORDABLE HOUSING PROJECT MASTER PLAN

DRAINAGE MAP

For: County of Hawaii Dept. of Housing & Community Development
Hilo, Hawaii

By: R. M. Towill Corporation
Honolulu, Hawaii

NOVEMBER 1990

SCALE IN FEET

FIGURE 3-3

Impacts and Mitigation

Preliminary backbone infrastructure requirements and associated costs were projected by R. M. Towill Corporation in June, 1990. The following describes and summarizes the necessary system improvements and assessment of the impacts:

County of Hawaii subdivision standards which will apply to the affordable housing project require that surface runoff levels shall be no more than the levels prior to development. Because a portion of the mauka-generated runoff flows through the County site before entering Kamakoa Gulch, a ten-foot concrete channel running along Paniolo Drive will be constructed to divert this runoff to Kamakoa before it can enter the project site. This will be a trapezoidal channel with a ten-foot bottom width and 1:1 side slopes, and will collect approximately 1,600 cfs of runoff from the 1,500 acre drainage area directly mauka of the project site and divert it into Kamakoa Gulch.

The Preliminary Engineering Report shows this channel located on the lower, or west side of Paniolo Drive. However, further study indicated that the preferred location for this channel would be the upper, or east side of Paniolo Drive. This issue will have to be resolved through further discussions with Transcontinental Development Corporation. The cost to construct this channel has been estimated at $3.36 million. Other offsite mitigation measures are being evaluated and may alter the drainage improvements that will be required.

As a mitigation measure to minimize project infrastructure costs, the $3.36 million cost to construct this channel should not be incurred by the Waikoloa Affordable Housing project due to the fact that the origin of the mauka flows are other developments off-site.

To control project-generated surface flows, a second similar channel, with a 5-foot bottom width, running from Paniolo Drive to the lower or makai end of the project site, is needed to carry approximately 550 cfs to an off-site drainageway that eventually empties into Kamakoa Gulch. Other onsite improvements include swale

and dry well systems which will be used to collect runoff from roads and road rights-of-way. Dry wells and catch basins are to be spaced every 250 feet along both sides of all roadways. Total estimated cost for these improvements is approximately $8.6 million.

Given the project's location above the UIC line, care must be taken to avoid contamination of groundwater resources. Among other measures, UIC permits will be required for all proposed drywells, and disposal of sewage effluent by means of injection wells will not be permitted.

3.5 FLORA AND FAUNA

3.5.1 Flora

Char and Associates conducted a botanical survey on the project site in August, 1988. This report is included in its entirety as Appendix A in this Final Environmental Impact Statement.

The survey was conducted with the use of a walk-through method with plants identified by sight. Plants that could not be positively identified were collected for later determination by comparison with known specimens in the herbarium and reference to standard taxonomic literature. Taxonomy of ferns is based on Wagner and Wagner (1987). Taxonomy and nomenclature of the flowering plants follows Wagner et al. (in press).

The entire site is a prehistoric lava field, though the substrate was of two distinct types. In the northeast portion of the site, the soil was a fine yellowish ash, with occasional rock outcroppings. Erosional features revealed that the ash was, at least in some places, more than three feet thick and divided into two soil zones marked by a change in color. The upper layer was approximately one foot deep. A herd of approximately 50 goats was found in a large cave in the south bank of Kamakoa Gulch. Such evidence as tracks and droppings indicated that they travel widely through the site, and may contribute to the composition of the vegetation.

In general, vegetation in the northeast portion of the site consists of rolling grasslands with widely scattered trees. The soil is a deep, yellow ash with occasional rock outcroppings. In the southwest section, vegetation consists of savannah-scrubland. This substrate is overlain by a thick, weathered a'a. The soil is thinner and rock outcroppings predominate. For the most part, the species composition is the same throughout the site.

In specific areas, fountain grass (Pennisetum setaceum) predominates along the dirt road and Paniolo Avenue, and in the bottom of Kamakoa Gulch. Away from the road the predominant grass is native hard-stemmed love grass (Eragrostis atropiodes). Where erosion or disturbance by animals was heaviest, the exotic buffel grass (Cenchrus cillaris) has replaced the native grass. The only tree species on the site is kiawe (Prosopis pallida). This tree is found in increasing density toward the southwest section of the property.

A total of 46 plant species were found, an extremely low number for an area of this size. Of these, 40 (87 percent) were identified as exotic weeds or introduced plants, and 6 (13 percent) native, or presumed native plants.

Impacts and Mitigation

No listed, proposed, or candidate threatened and endangered species, as designated by the Federal and/or State governments (U.S. Fish and Wildlife Service 1985; Herbst 1987) were found on the site. The Eragrostis grassland appears to be a remnant native plant community, but is so disturbed that essentially only the grass remains. Most other native plants associated with this grassland community are either so uncommon on the site as to have all but disappeared, or like wiliwili (Erythrina sandwicensis) and a'ali'i (Dodonaea viscosa), were observed a short distance outside of the site, but were not found on the site itself.

Native plants should be used in future landscaping of the site. A number are both attractive and adapted to the present climate, while others would thrive with

common landscape practices. Some control should be exercised in bringing in exotic species. A number of undesirable weedy species (toxic, invasive, or both) could potentially escape from cultivation and become serious problems in the future. Examples are a cactoid euphorbia (Euphorbia lactea) and Aloe, both of which were found on or near the site.

The presence of exploded ordnance on the site suggests that unexploded ordnance may be present, though none was seen during the survey. Another problem is that the ash-soil in the northeastern half of the site appears to be subject to rapid and severe erosion. It should be landscaped as soon as possible after disturbance. This would also mitigate problems with dust.

3.5.2 Fauna

A three-day field survey of the avifauna and feral mammals at the study area was conducted by Phillip L. Bruner in August, 1988. This report in its entirety is included as Appendix B in this document.

The objectives of the field survey were to:

- Document what bird and mammal species occur on the property or may likely occur given the range of habitats available.
- Provide some baseline data on the relative density of each species.
- Determine the presence or likely occurrence of any native fauna particularly any that are considered "endangered" or "threatened." If such occur or are likely to occur on the property identify what features of the habitat may be essential for these species and suggest how those resources may be protected.

No endemic or native birds were recorded during the course of the field survey. The Short-eared Owl or Pueo (Asio flammeus sandwichensis) is relatively common on the Island of Hawaii and potentially could occur on the site (Berger 1972, Hawaii Audubon Society 1984, Pratt et al. 1987). This endemic subspecies is listed as endangered on

Oahu by the State of Hawaii Department of Land and Natural Resources Division of Forestry and Wildlife, but not elsewhere in Hawaii. No other endemic birds would be expected given the location and type of habitat.

Migratory shorebirds migrate to Hawaii between the months of August and May. Some juveniles will stay through the summer months (Johnson et al. 1981, in press). Of all the shorebird species that winter in Hawaii the Pacific Golden Plover (Pluvialis fulva) is the most abundant. Plovers prefer open areas such as mud flats, lawns and grazed pasture land. They arrive in Hawaii in early August and depart to their arctic breeding grounds during the last week of April (Johnson et al. 1981). A total of only two plover were counted during the survey. These plover were seen flying over the property. No plover were actually seen on the ground. Both plover observed had some remaining breeding plumage which would indicate they had recently returned from the arctic.

No resident indigenous or native birds were recorded or expected in this habitat at this project site. Further, no resident indigenous or native seabirds were observed on the property.

A total of nine species of exotic or introduced birds were recorded during the field survey. No species were abundant. Populations of all species were smaller than expected. Given the type of habitat and its location and based on earlier studies (Bruner 1979, 1980, 1984a, 1984b, 1984c, 1985a, 1985b), and information provided in Berger (1972), Hawaii Audubon Society (1984) and Pratt et al. (1987) the following exotic species might also be expected to occur on the property: Ring-necked Pheasant (Phasianus colchicus), Erckel's Francolin (Francolinus erckelii), California Quail (Callipepla californica), Japanese Quail (Coturnix japonica), Barn owl (Tyto alba), Yellow-billed Cardinal (Paroaria capitata), Northern Mockingbird (Mimus polyglottos), Saffron Finch (Sicalis flaveola), Lavender Waxbill (Estrilda caerulescens), House Finch (Carpodacus mexicanus) and House Sparrow (Passer domesticus).

The feral mammals observed during the survey were the Small Indian Mongoose (Herpestes auropunctatus), dogs and goats. No rats, mice or cats were recorded but it would be highly unusual if these ubiquitous mammals did not occur on the property. Without a trapping program it is difficult to draw conclusions about the relative abundance of rats, mice, mongooses, dogs, cats and goats. However, it is likely that their numbers are typical of what one would find elsewhere in similar habitat on the island.

Records of the endemic and endangered Hawaiian Hoary Bat (Lasiurus cinerus semotus) are sketchy but the species has been reported from Hawaii (Tomich 1986). However, none were observed on this field survey. Bats were found at locations makai of the project site (Bruner 1984d).

Overall, results of the survey indicated that the study area provides a limited range of habitats which are utilized by the typical array of exotic bird species expected at this elevation and in this type of environment.

Some species typically found on the island in this habitat were not recorded during the survey. This may be due to the very dry conditions found at the study area. No endemic birds or seabirds were recorded nor were they expected. Also, no threatened or endangered species were encountered and there was no evidence suggesting such species being in the project area.

Impacts and Mitigation

The proposed development would create a more diversified habitat than presently exists and would likely result in the following changes in the avifauna and feral mammals on this site:

1. Some species might experience a decline in numbers of individuals. Species in this situation could be Gray Francolin, and perhaps Spotted Dove.

2. Populations of all exotic species, with the exception of Gray Francolin and Spotted Dove, will likely increase dramatically following the proposed development. Residential property to the east of the site clearly demonstrates this effect. A drive/walk through census of birds in the residential area revealed more total species and greater numbers of individuals of all species.

3.6 NOISE

3.6.1 Existing Conditions

The project site is undeveloped. The closest development to the project site are single-family homes mauka of Paniolo Avenue. The houses nearest to the project site are about 2,000 feet from the project boundary.

The site is not near any major highways and is not in the flight path of any airports.

Impacts and Mitigation

Construction-related (grading and infrastructure development) noise may impact on the neighboring homes located near the project site due to the general wind pattern during the day. Certain construction equipment may be required to be muffled to minimize the higher noise levels. These higher noise levels will, however, be short-term impacts. Also, since the nearest houses are about 2,000 feet from the project boundary, significant noise impacts are not expected.

Once the project has been developed, there will be some noise impact from vehicular traffic on Paniolo Drive and on project roadways. However, the relatively low volume of traffic, coupled with speed limits of 35 mph or lower, will be mitigating factors. Noise impacts from roadways are therefore not expected to be a significant problem.

3.7 AIR QUALITY

A report on the air quality was prepared in October 1990 and is included in this document as Appendix C. Present air quality in the project area is mostly affected by air pollutants from natural, agricultural and/or vehicular sources. Natural sources of air pollution emissions which may affect the project area but cannot be quantified very accurately include ocean, plants, wind-blown dust and volcanoes. Of these natural sources of air pollution, volcanoes are the most significant.

Volcanic emissions have chronically plagued the project area since the latest eruption phase of Kilauea Volcano began in 1983. Air pollution emissions from Kilauea consist primarily of sulfur dioxide. After entering the atmosphere, these sulfur dioxide emissions are carried away by the wind and either washed out as acid rain or gradually transformed into particulate sulfates. Although emissions from Kilauea are vented more than 60 miles southeast of the project site, the prevailing wind patterns eventually carry the emissions into the Kona and South Kohala areas. These emissions can be seen in the form of volcanic haze (vog) which persistently hangs over the area. The American Lung Association is currently studying the character and concentrations of volcanic air pollution in the Kona area, but to date no results of the study are available.

Although the project is located between two major regional arterial roadways, Queen Kaahumanu Highway and Mamalahoa Highway, it is several miles from either and unlikely to be significantly affected by the exhausts of motor vehicles traversing these roadways. Any air pollution from motor vehicles is likely confined to limited areas near intersections where and when traffic congestion occurs during poor dispersion conditions.

The State Department of Health operates a network of air quality monitoring stations at various locations around the state. Unfortunately, very little data are available for the Island of Hawaii, and none are available for the South Kohala area specifically. As is indicated in Table 3-1, the only existing monitoring data anywhere near the project site consist of sulfur dioxide and particulate measurements that were made about 30 miles to the south at Kealakekua during 1985 and 1986. During this two-year period,

measurements of 24-hour average sulfur dioxide concentration at this location were consistently low with daily mean values ranging from less than 5 to 12 milligrams per cubic meter (mg/m3). No exceedances of the state/national 24-hour AAQS for sulfur dioxide were recorded. Twenty-four hour average particulate concentrations ranged from 4 to 28 milligrams per cubic meter. Hence, no violations of the state AAQS were measured.

TABLE 3-1

ANNUAL SUMMARY OF AIR QUALITY MEASUREMENTS FOR
MONITORING STATIONS NEAREST
WAIKOLOA AFFORDABLE HOUSING PROJECT

Parameter/Location	1985	1986
Sulfur Dioxide/Kealakekua, Kona		
Period of Sampling (months)	7	8
No. of 24-Hr Samples	31	40
Range of 24-Hr Values (ug/m^3)	<5-8	<5-12
Average Daily Value (ug/m^3)	<5	<5
No. of State AAQS Exceedances	0	0
Particulate/Kealakekua, Kona		
Period of Sampling (months)	7	8
No. of 24-Hr Samples	34	40
Range of 24-Hr Values (ug/m^3)	6-22	4-28
Average Daily Value (ug/m^3)	12	16
No. of State AAQS Exceedances	0	0

SOURCE: State of Hawaii, Department of Health, "Hawaii Air Quality Data for the Period of January 1985 to December 1987"

At this time, there are no reported measurements of lead, ozone, nitrogen dioxide or carbon monoxide in the project vicinity. These are primarily motor vehicle related air pollutants. Lead, ozone, and nitrogen dioxide typically are regional scale problems; concentrations of these contaminants generally have not been found to exceed AAQS elsewhere in the state. Carbon monoxide air pollution, on the other hand, typically is a microscale problem caused by congested motor vehicular traffic. In traffic congested areas such as urban Honolulu, carbon monoxide concentrations have been found to

occasionally exceed the state AAQS. Present concentrations of carbon monoxide in the project area are estimated later in this study based on mathematical modeling of motor vehicle emissions.

Impacts and Mitigation

1. Short-Term Construction-Related Impacts and Mitigation

Short-term direct and indirect impacts on air quality could occur due to project construction. There are two potential types of air pollution emissions which could directly result during construction: (1) fugitive dust from vehicle movement and site excavation; and (2) exhaust emissions from on-site construction equipment.

State of Hawaii Air Pollution Control Regulations stipulate that emissions of fugitive dust from construction activities cannot be visible beyond the property line. Thus, an effective dust control plan for the construction phases will be necessary to mitigate these impacts. In dust-prone areas like South Kohala, limiting the area that can be disturbed at any given time, regular watering of exposed soil areas, applying chemical soil stabilizers, use of mulches and erosion control fabrics and/or using wind screens may be necessary. Control regulations also specify that open-bodied trucks be covered when in motion. Paving of parking areas and roads and establishing landscaping as early in the construction process as possible can also lower the potential for fugitive dust emissions.

On-site mobile and stationary construction equipment will also emit some air pollutants in the form of engine exhausts. The largest of this equipment is usually diesel-powered. Nitrogen oxides emissions from diesel engines can be relatively high compared to gasoline-powered equipment, but the standard for nitrogen dioxide is set on an annual basis and is not likely to be violated by short-term construction equipment emissions. Carbon monoxide emissions from diesel engines, however, are low and should be

insignificant compared to vehicular emissions on roadways.

Indirectly, slow-moving construction vehicles could obstruct normal traffic flow to the extent of increasing overall vehicular emissions. However, this can be mitigated by moving heavy construction equipment during periods of low traffic volume. Likewise, the schedules of commuting construction workers can be adjusted to avoid peak hours in the project vicinity.

2. Long-Term Roadway and Vehicular Movement Impacts and Mitigation

The primary long-term air pollution impact from the project will arise from the increased motor vehicle traffic associated with the project. Potential increased levels of carbon monoxide concentrations along roadways leading to and from the proposed development will be the primary concern. Based on mathematical modeling of projected vehicular traffic and on atmospheric dispersion estimates of vehicular emissions (CALINE4), the *proposed project carbon monoxide concentrations along roadways in the* project vicinity will unavoidably be higher at several locations compared to the without project case, but worst-case concentrations will remain within the national standards. The highest concentrations will occur in the vicinity of Queen Kaahumanu Highway at Waikoloa Road.

In 1997 with the project, the estimated maximum worst-case 8-hour concentration was 7.6 mg/m3 near Queen Kaahumanu Highway and Waikoloa Road; other locations studied ranged from 3.1 mg/m3 at Mamalahoa Highway and Waikoloa Road to 6.6 mg/m3 at the intersection of Paniolo Drive and Waikoloa Road. Either with or without the project, 1997 concentrations will be higher than existing concentrations at most locations. Comparing the projected values for the existing case to the AAQS, it appears that both the State and National 8-hour standards will be met during 1990. The same is true without the project in 1997 except at the intersection of Queen Kaahumanu Highway and Waikoloa Road. With the

project, worst-case 8-hour concentrations will meet the national standard but may occasionally exceed the more stringent state standard along Waikoloa Road at Queen Kaahumanu Highway and at Paniolo Drive.

Roadway improvements, reduction of traffic or reduction of individual vehicular emissions will help mitigate increased air pollution levels. Roadway improvements such as a grade-separated interchange at Queen Kaahumanu Highway and Waikoloa Road will help lower future air pollution concentrations. Also, air quality impacts near the intersection of Paniolo Drive and Waikoloa Road will be diminished if the north-south collector road west of and parallel to Paniolo Drive is built in 1995 as planned.

Air pollution impacts from vehicular emissions can also be mitigated by reducing traffic through the use of buses and car pooling, and/or by adjusting local school and business hours to begin and end during off-peak times. It is also possible that at some point in the future, the State may adopt either a motor vehicle inspection and maintenance program, which ensures that emission control devices are properly maintained and thereby reduces emissions, or more restrictive emission control standards.

3. Long-Term Project Electrical and Solid Waste Generated Impacts and Mitigation

The proposed project will generate indirect emissions from power generating facilities as a consequence of electrical power usage. Peak power demand at project completion is not expected to exceed 3 megawatts. Present generating capacity on the Big Island is 161 megawatts with most of this power provided by oil-burning generating units. Island-wide, peak power demand is currently 120 megawatts. Based on the ratio of peak project power demand to total present peak power demand on Hawaii, the project power demand will result in about a 3 percent increase in emissions from the electric utility if all project power is derived

from fuel oil.

Indirect emissions from project electrical demand could be reduced by the use of solar energy design features to the maximum extent possible. This would include installing solar water heaters, designing homes and building space so that window positions maximize indoor light without unduly increasing indoor heat, and using landscaping where feasible to provide afternoon shade to cut down on the use of air conditioning. Use of wind power generating unit, solar energy, geothermal energy, ocean thermal energy conversion and/or other alternative energy sources by the utility instead of fuel-burning facilities also would minimize indirect emissions from project electrical demand.

Solid waste generated by the project is expected to amount to about 10 tons of refuse (about one 12-ton truckload) per day. At present, the refuse district handles about 100 tons per day. Most, if not all project refuse will likely be hauled and either landfilled or burned at another location.

Most solid waste from the project will be buried at the West Hawaii Sanitary landfill, and any air pollution impacts will be minimal if the landfill is operated properly. If project refuse is burned instead at a municipal incinerator, air pollution impacts could be reduced substantially if the incinerator is fitted with pollution control equipment; i.e., electrostatic precipitators or fabric filters. Conservation and recycling programs will also reduce solid waste which would reduce any related air pollution emissions proportionately.

3.8 VIEWS

The project area is located at the 700-foot elevation of the Kohala region, approximately four miles from the coastline. The predominant views from the project area are the peaks of Mauna Kea to the east, the Kohala Mountains to the north, and the Kohala coastline to the west. Southeast of the project area are residential units nestled in the rolling hills

of Waikoloa Village. The south slope of Haleakala Crater on Maui is visible on a clear day. Views onto the project site are of an undisturbed environment, as it is currently undeveloped. Residents of neighboring mauka houses have clear views of the Kohala coast.

Impacts

The project will have no significant adverse impacts on existing views. Due to the relative low-density and mix of single-family and multi-family units planned for the project, views will be enhanced rather than impeded. The varying topography and elevations will allow the developer(s) to site buildings and homes in areas within the site to minimize significant alterations to the existing views and view planes.

The views of the project site from existing neighborhoods will be somewhat impacted due to the introduction of this residential development. To mitigate this potentially adverse impact, a 50-foot planting easement which will consist of trees is proposed to run along the length of Paniolo Drive.

3.9 HISTORIC AND ARCHAEOLOGICAL RESOURCES

An archaeological reconnaissance survey was conducted for the project area by William J. Bonk in August, 1988. The archaeological report, in its entirety, is included as Appendix D in this document.

Literature research, aerial photographs, and field reconnaissance survey methods were used to conduct the historic and archaeological resource study for the project site.

The prehistoric land use pattern in the Waimea-Waikoloa area was originally subsistence horticulture and subsistence marine exploitation. By the latter half of the 16th century, changes in this pattern occurred as the economy expanded. This trend reached its peak in the late prehistoric period of the second half of the 18th century (Bonk, 1985:6). As foreign ships increased in numbers at Kawaihae in the early historic period, further development of a "subsistence-trade" economy occurred. Through the 19th century, as

cattle became a more important part of the economic base, the transporting of products and a money-based economic system gradually evolved.

These cultural changes occurred simultaneously with the related environmental evolution in the form of botanical and zoological changes. Subsequently, this had an effect on the land surface. Exotic animals and plants began to replace endemic varieties, and these changes transformed the physical as well as cultural environment.

"At the Mahele of 1848, the land, Waikoloa, was awarded to George Huen Davis, son of Isaac Davis, the English companion and advisor to Kamehameha I (Soehren, 1980)." Waikoloa was regarded as "an 'ili'aina of Waimea" as Waimea developed as the "food basket" of South Kohala. In aboriginal times, before cattle, Soehren (1984) says, these lands (Waikoloa) were marginal to the Hawaiian economy, serving as a reservoir of material products such as pili grass and birds. Without an assured source of water, the midlands of Waikoloa were not able to support horticulture.

Marine exploitation was more readily available for the coastal inhabitants of Waikoloa and its neighboring ahupua'a. Starting with Reinecke in 1930 and extending to the present, there is an increasing number of reports covering the lowland regions. The summarization and analysis of these data show the use of these coastal, inland and offshore areas as of economic importance in the prehistoric period. If the midlands were marginal, the coastal regions were of importance. This produced an attraction for people and cultural development within the coastal region, but not in the midlands. Here, only off and on incursions were made for the gathering of pili grass for the thatching of homes and other structures, and the passage through these lands on travels elsewhere, hardly a reason for settlement, or even lingering long enough to leave their cultural marks on the surface of the ground.

Prior to the development of the village of Waikoloa in the early 1970's only the military left their mark on the project site. Evidence of the presence of the military (from World War II) were the remains of field communication wire as well as a number of examples of

shrapnel fragments.

Impacts and Mitigation

The study reported that no sites of prehistoric or historic significance were found on the project site. Thus, any land transformation would not be "archaeologically detrimental". In conclusion, Bonk indicated that no further archaeological work is recommended for the project site.

Notwithstanding the negative survey results, it is always possible that archaeological artifacts or human burials could be uncovered during construction. In the event of such discoveries, construction in the immediate vicinity should be halted, and the State Historic Preservation Division should be contacted as soon as possible. A staff person from the Division will then assess the situation and recommend appropriate mitigation measures.

SECTION 4

SOCIO-ECONOMIC ENVIRONMENT

4.1 OVERVIEW

Real Estate Services, Inc. prepared a Market Research and Analysis report for the Waikoloa Affordable Housing master plan in June, 1990. The findings of this report are summarized below. The report reviewed and addressed the anticipated housing demands created by the resort development at Waikoloa, outlined the affordable housing alternatives for the County's designated property for this purpose, and identifies the market for such housing. The report, in its entirety, is included as Appendix E in this FEIS.

The demographics of consumers for the affordable housing market at Waikoloa include:

- Construction workers for continued resort development along the North Kona/South Kohala coast;
- Permanent work force at completed hotels;
- General population growth resulting from continued economic growth.

While housing opportunities for employees of the developments in Waikoloa cannot be reserved for these consumers exclusively, primary emphasis should be placed on their needs.

4.2 POPULATION TRENDS

The County of Hawaii is the southernmost and largest island of the Hawaiian Archipelago. The land area of the County is approximately twice that of all the other islands of the State combined.

Within the past twenty-five years, tourism has emerged as the primary economic activity on the island. Much of the economic growth experienced during this period can be linked with the expansion of the visitor industry.

In 1970, just prior to the adoption of the County General Plan, the population in the County of Hawaii numbered 63,468. The 1970 census count was the first to show an increase since 1930. Population peaked at 73,325, largely as a result of the importation of labor for the sugar industry.

Since 1970, the county's population has continued to grow. The 1980 census registered an island-wide population of 92,053 people representing a growth of 28,585 residents for a 45% increase over the 1970 census. Estimates prepared in the 1989 Hawaii State Data Book suggest a population of 117,500 in 1988.

Three sets of population projections were developed for the County's comprehensive planning review program, series A, B, and C. The major variable in each of these projections is the rate of growth of the visitor industry.

Series A is the most conservative projection. It assumes the demise of the sugar industry and modest expansion in the visitor industry. The overall 1985-2005 rate of growth for series A of 2.0% per annum is less than the 2.9% rate of employment growth in the County during the last five years.

Series B projections were developed as a medium series. Sugar employment is maintained and the overall per annum employment growth rate is 3.7%.

Series C reflects an optimistic outlook of the County's future. It is assumed that 17,800 hotel rooms plus additional condominium units will be built in the County by 2005. The average annual growth rate of employment is 4.7%.

The above described population projections are summarized below:

TABLE 4-1
District Distribution
(Year 2005 Projections)

District	Series A	Series B	Series C
Puna	39,790	49,910	58,340
S. Hilo	44,115	55,335	65,790
N. Hilo	1,211	1,519	1,806
Hamakua	5,363	6,721	7,896
N. Kohala	5,363	6,721	7,896
S. Kohala	19,203	24,087	28,638
N. Kona	43,250	54,250	64,500
S. Kona	10,899	13,671	16,254
Kau	3,806	4,774	5,676
Total	170,000	216,988	256,796

The proportion of 1980 residential population in East Hawaii to West Hawaii was 67 percent to 33 percent, respectively. County projections for the year 2005 indicate a shift in population from East Hawaii to West Hawaii. The county projects that by the year 2005, 45.5% of the residential population will be living in West Hawaii.

Patterns and population settlement and growth are defined for the most part by an area's economic opportunities and its energy resources. The West Hawaii region has many opportunities to sustain a stable and diversified economy supported by energy resources, high technology research and development, aquaculture, diversified agriculture, commercial and sport fishing, seafood marketing and ocean research. Expansion in these areas will increase job choice and the availability of higher paying jobs.

4.3 AFFORDABLE HOUSING NEEDS/DEMAND

Unpublished population estimates from a Department of Transportation study show that, within Waikoloa Village, 334 single family units, 226 multi-family units and 69 resort condos existed in 1987. Projections for 2010 show an additional 2,430 single family and 1,000 multi-family units coming on line. Projected total dwelling units by 2010 are 3,921 with a population of 11,760.

The housing needs of the County of Hawaii's West Hawaii region have been documented in HUD's Housing Market Analysis report, the State's Regional Plan for West Hawaii, the County's Infrastructure Needs Assessment report, Queen's Medical study, Peat Marwick and Mitchell's preliminary Kealakehe plan for the Housing Finance and Development Corporation, and studies done for Puako Mauka, Signal Puako and Parker 2020.

Based on these studies, the projected housing demand in the West Hawaii area ranges between 1,000 units and over 2,000 units per year. Not only is there a significant pent-up demand in the area, the situation will be impacted by the thousands of construction and permanent full- and part-time hotel workers at the Ritz Carlton Mauna Lani, the soon to be completed Four Seasons at Kaupulehu, South Kohala Resort at Mauna Kea Resort, the Regent Beach-Kona at Kukio, Kohanaiki, and the Princess Hotel at Kaupulehu.

This demand will be complemented with the necessary support community that will come along with this hotel construction. This housing demand can be accommodated throughout the coast, in Kona, Waikoloa, and other parts of the coast.

It is reasonable to estimate that the housing demand (at prices in the 'affordable' range) at a level of 1,500 to 2,000 units per year exists in the West Hawaii area for the foreseeable future.

Definition of Affordable

It has been customary to separate affordable units into family income categories as follows*:

VERY LOW:	families earning less than 50% of median income (under $16,000).
LOW:	families earning between 50% and 80% of median income (between $16,000 and $25,600).

LOW/MODERATE: families earning between 80% and 120% of median income (between $25,600 and $38,400).

MODERATE: families earning between 120% and 140% of median income (between $38,400 and $44,800).

* According to the Office of Housing and Community Development (OHCD), the 1990 HUD median income estimate for Hawaii County is $32,000, assuming a household size of 4 persons.

These income limits can be converted to selling price ranges. A bank and savings and loan were contacted for current loan underwriting policies and they are as follows:

Loan underwriting for typical bank:

- gross monthly income/mortgage payment 3.6 to 1
- gross monthly income/mortgage and all debt 2.8 to 1
- Current 30 year loans (amortization and term) have rates at approximately 10.58% per annum.
- Loan to value ratios are typically 80% to 90%.

Loan underwriting for typical savings and loan:

- Housing debt = 28% of gross monthly income
- Total debt = 36% of gross monthly income

- Current 30 year fixed loans have rates at 10.50%

- Loan to value ratios are typically 80% to 90%.

Sales Price Ranges

The various selling prices for houses within the income groups (i.e., low, low/mod, and mod) can be computed based on the underwriting policies of the lenders and the current home mortgage terms.

Category	Sales Price Range
Very Low Income (up to 50%)	(Assume Rentals only)
Low Income (50% to 80%)	up to $77,800
Low/Moderate (80% to 120%)	$77,800 - $117,900
Moderate (120% to 140%)	$117,900 - $140,200

Rental Ranges

Based on HUD evaluation standards, a projected rent to income ratio of 30% is used. Based on this policy, the following are indicated rental ranges for each income group.

Assume: Rent is 30% of gross monthly income

	Annual Income	Monthly Income	Rent Range
Very Low	up to $16,000	up to $ 1,330	up to $ 400
Low	$16,000-$25,600	$1,330-$2,130	$ 400 - $640
Low/Mod	$25,600-$38,400	$2,130-$3,200	$ 645 - $960
Moderate	$38,400-$44,800	$3,200-$3,730	$ 960 - $1120

NOTE: The above projections are based strictly on a family of four people. For varying family sizes the estimated median income is adjusted; therefore the selling price and rental ranges must be adjusted.

4.4 PROJECT IMPACTS

The Waikoloa Affordable Housing Project is proposed to provide approximately 1,200 dwelling units which will all be targeted to West Hawaii households whose incomes fall within the below 50% of median to Hula Mae income ranges. Based on the analysis above, the project will provide the equivalent of about one year's demand for affordable housing in this region. While the recommended rental rates and sales prices of these units are not yet firm, the County's policy will be to provide the greatest possible opportunity to each of the groups defined and described in these categories.

A major concern in West Hawaii is the affordability of housing: the cost of housing is comparatively high, while wages in the visitor industry are regarded as low. The problem is expected to become worse, given the outlook for substantial growth driven by the visitor industry.

West Hawaii has experienced cycles of rapid and slow housing appreciation, and will experience similar cycles in the future. These cycles reflect both local conditions (such as rapid employment growth) and national economic conditions, such as dramatic changes in inflation and interest rates.

Population and housing impacts of economic development shift over time, in ways that are not always easy to predict. For example, four recently hired new resort workers might be young singles sharing one housing unit. A generation later, these four young people might each be supporting a family of five or six, living now in four different housing units. Alternatively, the original four young workers might have left, only to be replaced by four other people sharing the same unit.

Entry level employees can seldom afford to solve their housing needs in ways which are considered to be conventional; i.e., by purchase or rental of single-family homes or condominiums in an improved neighborhood for a nuclear family. Instead, most find less expensive solutions, including staying with their parents or other relatives until they can

afford their own place; finding a roommate to share the rent; commuting long distances from non-conforming subdivisions where housing is less expensive; and renting units (often illegal) from owners of single-family homes, and thereby supplementing the income of these house owners.

SECTION 5

INFRASTRUCTURE SYSTEMS AND SERVICES

SECTION 5 INFRASTRUCTURE SYSTEMS AND SERVICES

5.1 TRAFFIC/TRANSPORTATION

A traffic impact study for the project was conducted by Parsons Brinckerhoff Quade & Douglas, Inc. in August 1990. The report findings, analysis, and recommendations are summarized in this section. The traffic study in its entirety can be found in this Final Environmental Impact Statement as Appendix F.

5.1.1 Existing Roadways

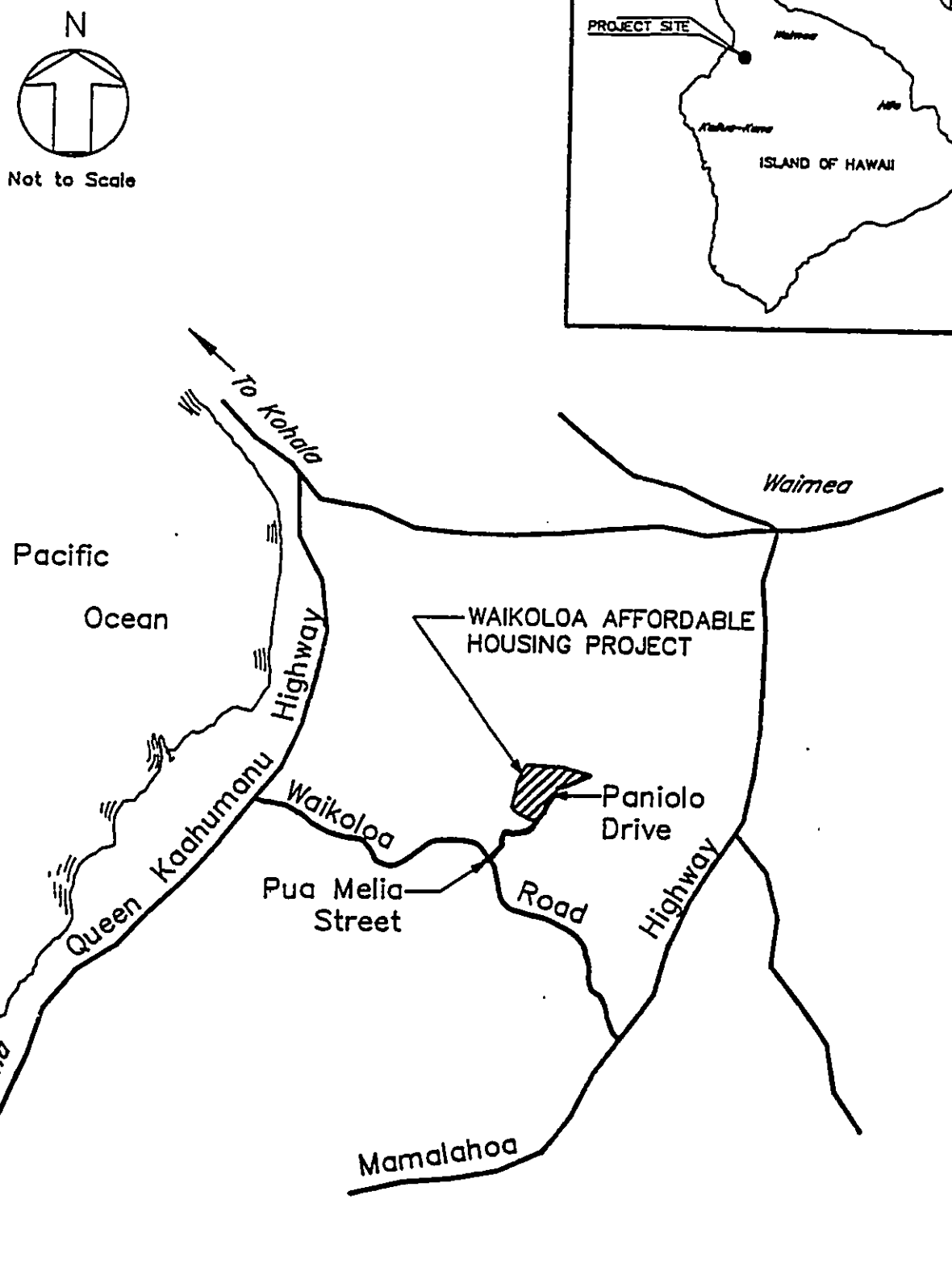
Located in the South Kohala district on the island of Hawaii, the site is located just north of the existing Waikoloa Village. Vehicular access to the site will be provided by the northerly extension of Paniolo Drive (see Figure 5-1).

A. Local Roadway System

Paniolo Drive serves as a collector road for Waikoloa Village. Paniolo Drive has an 80-foot right-of-way and its southern terminus intersects Waikoloa Road and Pua Melia Street forming a cross intersection. The posted speed limit of Paniolo Drive is 35 miles per hour.

B. Regional Roadway System

Queen Kaahumanu Highway is a two-lane arterial road with unpaved shoulders. The posted speed limit for Queen Kaahumanu Highway is 55 mph. Left turn bays for southbound traffic and right turn acceleration and deceleration lanes are provided for northbound traffic at the intersection with Waikoloa Road. Mamalahoa Highway is a narrow two-lane major collector road with sharp vertical and horizontal curves. The posted speed limit for Mamalahoa Highway is 55 miles per hour. Waikoloa Road is a two-lane east-west collector road that widens to four lanes in the vicinity of Waikoloa Village. The posted speed limit is 55 miles per hour, which decreases to 35 miles per hour near Waikoloa Village.



Source: Parsons Brinckerhoff Quade & Douglas, 1990

WAIKOLOA AFFORDABLE HOUSING PROJECT MASTER PLAN

Figure 5-1:
Existing Roadways

For: County of Hawaii Dept. of Housing & Community Development
Hilo, Hawaii

By: R. M. Towill Corporation
Honolulu, Hawaii

October 1990

C. Existing Traffic Conditions

Manual traffic counts were taken on August 7 and 8, 1990, at the intersections of Queen Kaahumanu Highway/Waikoloa Road, Waikoloa Road/Pua Melia Street/Paniolo Drive, and Mamalahoa Highway/Waikoloa Road. The morning peak hour occurs from 6:30 to 7:30 a.m., and the afternoon peak was from 3:30 to 4:30 p.m.

The unsignalized intersection methodology specified in the 1985 Highway Capacity Manual evaluates gaps in the major street traffic flow and calculates capacities available for left turns from the major street to cross oncoming traffic. It also calculates capacities available for left turns from the minor street onto the major street and for right turns from the minor street onto the major street. Operating conditions at unsignalized intersections are expressed in terms of levels of service (LOS), which are designated from A to F, with LOS A representing the best operating conditions and LOS F the worst. LOS of D or better is considered to be adequate operating conditions.

At present, all turning movements within the project vicinity's regional roadway system operate at LOS D or better.

5.1.2 Future Conditions Without Project

Future conditions refer to the year 1997 -- the projected completion period of the project. The Draft Report of Island of Hawaii Long-Range Highway Plan (Parsons Brinckerhoff, September, 1990) and a traffic study for Mauna Lani Cove (Belt Collins & Associates, October, 1989) project a 15 percent annual increase in traffic in the vicinity of Waikoloa.

A. Impacts

Overcapacity conditions on the regional roadway intersections as described below will occur even without the proposed affordable housing project:

The Queen Kaahumanu Highway/Waikoloa Road intersection would experience overcapacity, or LOS F, conditions for southbound left turns from Waikoloa Road because of the increase in traffic volumes. The Mamalahoa Highway/Waikoloa Road intersection would experience LOS E conditions for the northbound left turn movements from Waikoloa Road during the p.m. peak hour. At the Waikoloa Road/Paniolo Drive/Pua Melia Street intersection, near-capacity, or LOS E, conditions would result for the northbound approach during the a.m. and p.m. peak hours. The southbound left turn movements from Paniolo Drive will function at LOS E during the p.m. peak hour.

Two-lane highway analysis reveals that traffic conditions on Queen Kaahumanu Highway would increase to LOS E during the a.m. and p.m. peak hours. Traffic on Mamalahoa Highway north of Waikoloa Road would increase to LOS E conditions during both peak hours.

5.1.3 Future Conditions with Project Traffic

Trip generation for the proposed project is based on the following assumed land uses and square footages: 560 single-family and 840 multi-family dwelling units, a 9.2-acre park, a 5,000 square foot commercial building, and several churches with a total area of 75,000 square feet. (Note: The higher total of 1,400 units was used on the traffic study to ensure a conservative analysis of traffic impacts.)

A. Trip Generation

Table 5-1 summarizes the trips generated by the Waikoloa Affordable Housing project.

TABLE 5-1
Project Traffic

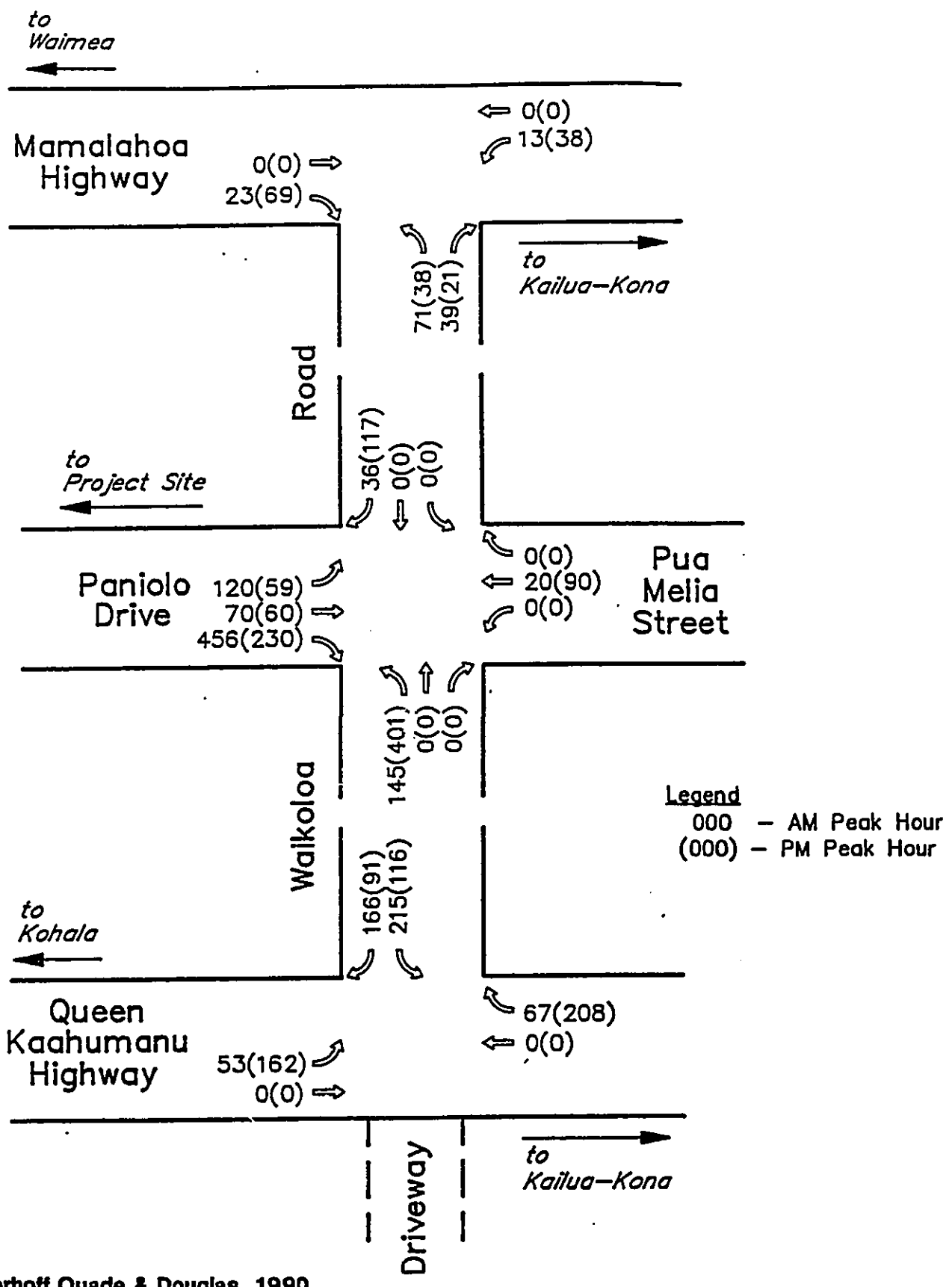
Land Use (Parameter)	Daily (vpd)	A.M. Peak Hour Enter (vph)	A.M. Peak Hour Exit (vph)	P.M. Peak Hour Enter (vph)	P.M. Peak Hour Exit (vph)
Single-family (560 d.u.)	3644	104	283	346	203
Multi-family (840 d.u.)	5024	76	348	263	124
Park (9.2 acres)	336	6	16	8	23
Commercial (5,000 s.f.)	4435	169	169	182	174
Church (75,000 s.f.)	577	4	1	21	18
Total:	14,016	359	817	820	542

NOTE: vpd = vehicles per day
vph = vehicles per hour

B. Trip Distribution/Traffic Assignment

Various land uses would encourage internal trips within Waikoloa Village. Internal trips include trips between residential areas and nonresidential areas such as industrial/shopping centers, parks, and churches. The internal trips ranged from 25 percent for residential generated trips to 90 percent for trips generated by the park, commercial and church land uses. These internal trips were deducted from the total project trips to determine the number of external trips that would take place on the regional roadway system. Table 5-2 shows the external trips generated by the affordable housing project.

The project traffic was distributed to and from two directions: north and south via Mamalahoa Highway and Queen Kaahumanu Highway. Table 5-2 shows the trip distribution of the generated trips for the affordable housing project. Figure 5-2 shows the traffic assignment for the generated trips for the affordable housing project.



Source:
Parsons Brinckerhoff Quade & Douglas, 1990

WAIKOLOA AFFORDABLE HOUSING PROJECT MASTER PLAN

For: County of Hawaii Dept. of Housing & Community Development
Hilo, Hawaii
By: R. M. Towill Corporation
Honolulu, Hawaii
October 1990

Figure 5-2: Project Generated Traffic

TABLE 5-2
Trip Distribution
(Location of Other Trip Ends)

	EXTERNAL	SOUTH	NORTH
A.M. IN	43% 156	51% 80	49% 76
A.M. OUT	60% 491	52% 254	48% 237
P.M. IN	58% 477	52% 246	48% 231
P.M. OUT	42% 266	52% 137	48% 129

C. Project Impacts

1. Local Roadway System

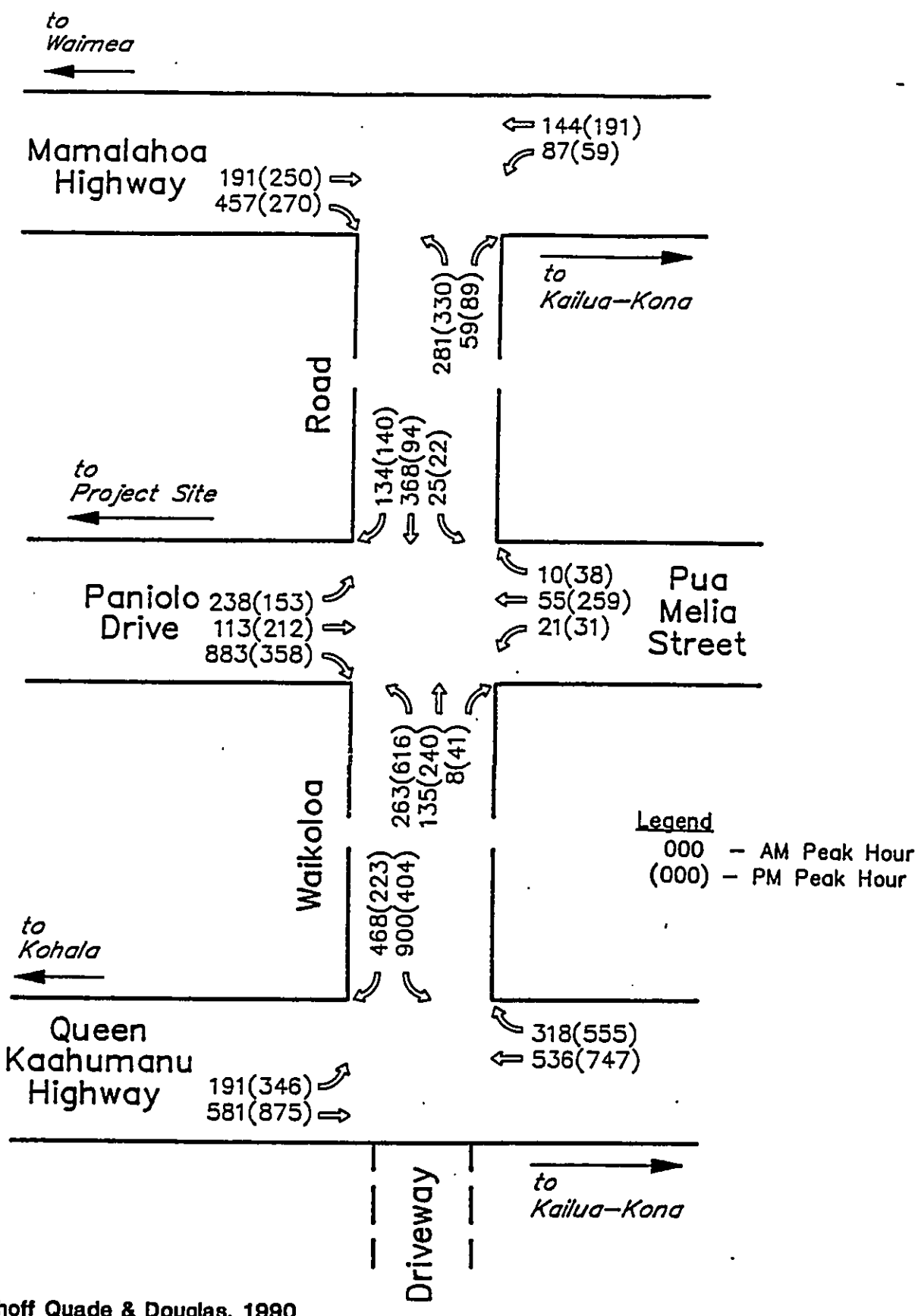
It is assumed that Paniolo Drive will be four lanes wide and will terminate south of the project. The proposed collector roads will form the stem of a T-intersection with Paniolo Drive. At these intersections, the proposed project collector roads will be striped to provide a dedicated left-turn and a dedicated right-turn lane. Dedicated left-turn lanes will also be provided on Paniolo Drive at these collector roads. Roadway cross sections and striping will conform to the County of Hawaii Standard Details R-32, T-9 and T-10 dated September 1984. Preliminary analysis indicates that signalization will not be warranted.

The total estimated project traffic volumes at full development will contribute to the existing regional transportation network, however, at or near overcapacity conditions will exist at peak periods even without the affordable housing project.

Project generated traffic volumes for the affordable housing project were added to the 1997 future traffic volumes (without project), and the assignment is shown in Figure 5-3. Tables 5-3 and 5-4 summarize the levels of service for future traffic conditions with and without the project.

TABLE 5-3
Levels of Service
(Unsignalized Intersection)

	Existing		Future Conditions (Year 1997) w/o Project		w/Project	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
Queen Kaahumanu/Waikoloa Road						
Westbound						
Left	D	D	F	F	F	F
Right	A	A	D	D	F	E
Southbound Left	A	A	A	C	B	E
Waikoloa Rd./Paniolo Dr./						
Pua Melia St.						
Eastbound Left	A	A	A	A	A	C
Westbound Left	A	A	A	A	A	A
Pua Melia St. Approach						
Left	B	B	E	E	F	F
Through	A	A	E	E	F	F
Right	A	A	E	E	F	F
Paniolo Dr. Approach						
Left	A	B	D	E	F	F
Through	A	A	B	D	E	F
Right	A	A	C	A	F	A
Mamalahoa Hwy./Waikoloa Rd.						
Eastbound						
Left	A	A	D	E	E	F
Right	A	A	A	A	A	A
Northbound Left	A	A	A	A	A	A



Source:
Parsons Brinckerhoff Quade & Douglas, 1990

WAIKOLOA AFFORDABLE HOUSING PROJECT MASTER PLAN

For: County of Hawaii Dept. of Housing & Community Development
Hilo, Hawaii

By: R. M. Towill Corporation
Honolulu, Hawaii

October 1990

Figure 5-3:
1997 Traffic Volumes
(w/Project)

TABLE 5-4
Levels of Service
(Two-Lane Highways)

	Existing		Future Conditions (Year 1997) w/o Project		w/Project	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
Queen Kaahumanu Highway						
North of Waikoloa Rd.	C	C	E	E	E	E
South of Waikoloa Rd.	C	C	E	E	E	E
Mamalahoa Highway						
North of Waikoloa Rd.	C	C	E	E	E	E
South of Waikoloa Rd.	B	B	C	D	C	D

D. Mitigation Measures for Regional Roadway System

For 1997 the capacity of the westbound left turn storage lane at the unsignalized intersection of Queen Kaahumanu Highway and Waikoloa Road would be exceeded even without the affordable housing project traffic. There are two alternatives that could improve operating conditions at this intersection:

- Alternative A: Signalization of this intersection would be warranted based on the Peak-Hour Volume criteria in the Federal Highway Administration's Manual on Uniform Traffic Control Devices (1988) even without the project traffic. Reconstruction of the Queen Kaahumanu Highway and Waikoloa Road intersection would be needed with project traffic to include double left turn bays and a single right turn lane for westbound traffic on Waikoloa Road. A two-phase traffic signal at the Queen Kaahumanu Highway/Waikoloa Road intersection, with these improvements is projected to operate at LOS D or better during the a.m. and p.m. peak hours for 1997 with the proposed project. Note that this alternative is not consistent with current State Department of Transportation Policy.

- Alternative B: Realignment of Waikoloa Road to intersect Queen Kaahumanu at the intersection of Queen Kaahumanu Highway with the Waikoloa Resort access road and construction of a grade-separated interchange at this new cross intersection. This alternative involves constructing Waikoloa Road over or under Queen Kaahumanu Highway with on-ramps and off-ramps. The State Department of Transportation prefers this alternative.

The intersection of Queen Kaahumanu with Waikoloa Road will experience LOS F conditions for southbound left turns from Waikoloa Road as early as 1991; however, completion of a grade-separated interchange is not anticipated before 1995. Interim improvements, such as signalization, would provide additional capacity until an interchange is constructed.

The Mamalahoa Highway/Waikoloa Road intersection may not need to be signalized with the project traffic if the grade-separated interchange is constructed. Construction of the grade separated interchange at Queen Kaahumanu Highway may divert traffic away from the Mamalahoa Highway/Waikoloa Road intersection and lower volumes by providing easier access to Queen Kaahumanu Highway.

The Waikoloa Road/Paniolo Drive/Pua Melia Street intersection will experience over capacity conditions in 1997 with the project traffic. Signalization would also be warranted under Peak-Hour Volume criteria. Reconstruction and signalization of this intersection will be needed to provide sufficient capacity at this intersection. The provision of a separate eastbound left turn lane and use of a westbound through lane for traffic on Waikoloa Road would be adequate to serve the projected volumes. A three-phase traffic signal, with improvements, at this intersection would operate at LOS D or better for both a.m. and p.m. peak hours. However, a north/south collector road mauka or west of and parallel to Paniolo Drive

is proposed. This road which will connect Paniolo Drive with Waikoloa Road west of Paniolo Drive should divert some traffic away from the Waikoloa Drive/Pua Melia Street intersection; completion of the intersection is estimated to be in 1995.

With the proposed improvements described above, the roadway system would have sufficient capacity to serve the project traffic. The County will need to coordinate with other developers who are active in the area so that a coordinated program for regional roadway improvements can be implemented.

5.2 WATER SYSTEM

The Waikoloa Water Company owns the wells, reservoirs and primary transmission mains that supply potable water to Waikoloa Village.

The Waikoloa Water Company's potable water wells draw from the Waikoloa aquifer. These wells, known as Parker wells No. 4 and No. 5, are located at the 1,200 foot level nearly five miles inland from Puako Bay. Both of these wells tap high quality water (25 ppm chloride content).

In addition, a new well, Waikoloa Well No. 1, with a capacity of 2 million gallons per day has recently been completed, and a fourth well, Waikoloa Well No. 2, is under construction. A new 1-million gallon storage tank will also be constructed together with the fourth well.

The combined pumping capacity of the three wells currently in use is 3,000 gallons per minute, or 4.3 million gallons per day and a sustained yield of 2.3 million gallons per day. The fourth well will increase the sustainable yield to 3.4 million gallons per day.

In addition to these potable water wells, the existing water system includes a one million gallon (mg) capacity reservoir near the wells, a transmission main connecting to a second reservoir of 1.0 mg capacity located at the 300 foot elevation above the Queen Kaahumanu Highway and the beach resort. The point of connection to the water system from the project area is an 8-inch main at Paniolo Avenue and Ho'oko Street.

Impacts

If as many as 1,400 units are developed, the project will have an average daily demand of approximately 560,000 gallons. The Waikoloa water system has sufficient capacity to satisfy these demands.

On-site system development costs are estimated to be about $988,000. Pursuant to Section 23-84 of the Hawaii County Code regulating subdivisions, the following minimum requirements will be complied with for subdivision design and approval:

- Provide a water system designed to deliver water at adequate pressure and volume under peak flow and fire-flow conditions in accordance with the Water System Standards, State of Hawaii, and the Rules and Regulations of the Department of Water Supply. The water system shall include, but not be limited to, the installation of the necessary distribution pipeline, fire hydrants, and service laterals.

- A fee requirement of four-tenths of one percent of the estimated cost for the construction of the water system, but not less than $25.00, to cover the costs for plan review, testing, and inspection, shall be applied to the overall development costs of the project.

All construction plans for on-site water system improvements are subject to review and approval by Waikoloa Water Company (the Water Company) pursuant to the Water Company's Rules and Regulations. The Water Company shall inspect and approve on-site water improvements as they

are completed.

5.3 WASTEWATER

At present, there is no sewer system in the immediate vicinity of the project area. The nearest sewer system is located approximately 7,000 feet southwest of the project site, and serves the commercial and multi-family areas of Waikoloa Village. The development of the subject project, as well as the development of other sites in the vicinity, will result in the need for a new sewage treatment and disposal system.

Impacts and Mitigation

The existing sewer system is not available for use by the proposed project. Preliminary analysis of the sewer system needs for the project indicates that the project will generate a total average flow of 0.5 million gallons per day (mgd). The proposed on-site improvements will consist primarily of 8-inch and 12-inch gravity lines. Sewage treatment facilities will be provided off-site by Waikoloa Sanitary Sewer Company.

As noted in the Project Description, the new sewage treatment plant is still in the early planning stages. One of the critical environmental issues that will require thorough analysis is the issue of effluent disposal methods and possible adverse impacts on area groundwater resources. This and other issues will be addressed during the detailed planning work for the new sewage treatment plant. This analysis, however is beyond the scope of the present EIS.

All materials and construction of on-site sewer system facilities and appurtenances shall be in accordance with the Department of Public Works of the County of Hawaii's "Standard Specifications for Public Works Construction," dated 1986, and the "Standard Details for Roads, Storm Drains and Sewers," dated 1984, and all subsequent amendments and additions.

All construction plans for wastewater system improvements are subject to review and approval by the Waikoloa Sanitary Sewer Co. (the Sewer Company) prior to construction in accordance with the Sewer Company's rules and regulations. The Sewer Company shall inspect and approve the complete on-site improvements.

5.4 POWER AND COMMUNICATIONS

An existing underground duct bank which contains a 750 MCM cable (14.47 KVY) originates from a substation located mauka of the Waikoloa Village's general store and runs along Paniolo Drive to the project site. Conduits to accommodate cable and telephone lines are also located within this same duct bank.

Impacts and Mitigation

A new electrical substation will be required to service the proposed and other future projects. The cost of a new electrical substation will be in the range of $1 million. Project power and communications development costs are estimated at approximately $1.46 million, assuming that these utility systems will be located underground. The increased demand for electrical power will probably be met by oil-fired generating facilities. Geothermal produced electricity may also be a source of energy for the project.

Energy conservation measures should be utilized to help reduce the project's energy requirements. These measures should include: (1) engineering and architectural designs that stress energy conservation, (2) the installation of energy-saving devices such as solar water heating systems, energy efficient refrigeration, and energy efficient lighting.

5.5 SOLID WASTE

The proposed project will generate in the range of 10 tons of solid waste per day at build-out, assuming 1,200 to 1,400 units and 3+ people per unit.

Currently, the solid waste disposal system for West Hawaii has some significant problems. At best, the existing landfill at Kealakehe can be utilized for another two years. The County is currently developing plans on an expedited basis for a new sanitary landfill project, to be located some miles south of the project site.

Existing solid waste transfer stations at Puako and at Kohala are currently operating near capacity. A new solid waste transfer station is being planned at Waikoloa.

Impacts and Mitigation

The proposed project at build-out will generate a significant volume of solid waste which will add to the volumes of refuse being produced by other residential and resort developments in West Hawaii. A new solid waste transfer station will probably be needed to service the project and other area developments. Families living in the County's "affordable housing" project at Waikoloa should be encouraged to participate in waste recycling and other waste volume reduction programs.

5.6 POLICE AND FIRE PROTECTION

5.6.1 Police Protection

The Waimea Police Station provides police protection to a 680 square mile area which includes South Kohala. There are, at present, 4 patrolmen assigned to each 8-hour shift. According to current staffing expansion plans at the Waimea Station, an additional 10 to 12 more people are expected to help meet the district's immediate needs.

Impacts and Mitigation

In order to meet the proposed project's police protection requirements as well as those of the growing regional population, by the year 2000, a new Waikoloa Substation has been recommended to be in service (Captain Lawrence Mahuna, October 31, 1990).

5.6.2 Fire Protection

The Mauna Lani Fire Substation, located 10 miles from Waikoloa, provides fire protection services to an area that stretches from Mahukona to Kona Village, including the project area. Currently, 5 firefighters are assigned to each of three weekly shifts.

Impacts and Mitigation

In order to respond to the proposed project's fire protection requirements as well as those of the growing regional population, the County of Hawaii is planning a new fire station in the Waikoloa area (telecon with Mauna Lani Fire Station representative, October 1990). The schedule for this new facility has not yet been set. In the interim, the project will be served by the Mauna Lani fire substation.

5.7 MEDICAL FACILITIES

The State's Kona Hospital located in Kealakekua, provides medical and health care services to the Waikoloa area. This hospital's service area covers Kohala to Hawaiian Oceanview Estates. It is a 75-bed acute care facility which provides a range of services including long-term care, skilled and interim nursing care, obstetrical, pediatrics, laboratory, cat scan, physio- and occupational therapy, chemotherapy, and a 24-hour emergency room. Kona Hospital in currently in the process of expanding its facilities and services to include a surgical suite and new recovery room.

Two other facilities, Kohala Hospital in Kapaau and Lucy Enriquez out-patient services in Kamuela, also provide medical services to the project area.

Impacts and Mitigation

The proposed development will result in an increased population in Waikoloa Village that will require the full range of medical and health care services. The expansion of the Kona Hospital will help meet some of the health care needs of this new residential community. A West Hawaii Regional Health Center is currently being planned in the Kailua-Kona area. North Hawaii Hospital in Kamuela which is a joint-venture between government and private enterprise, is in the process of

development as a full-service, primary care facility.

5.8 SCHOOLS

At present, Waimea Elementary, Waimea Intermediate, and Honokaa High Schools include Waikoloa Village in their educational services area. Both Waimea Elementary and Intermediate Schools, and Honokaa High School are operating beyond capacity and have severe shortages of classrooms, according to the State's Superintendent of Education (August, 1990).

Impacts and Mitigation

The DOE schools cannot accommodate the large additional enrollment growth which will result from the Waikoloa Affordable Housing project and other Waikoloa projects until additional classrooms are built.

Projected enrollment demand by the project is summarized as follows:

School	Projected Grades	Students
Waimea Elementary	K thru 5	425-475
Waimea Intermediate	6 thru 8	175-225
Honokaa High	9 thru 12	275-325

NOTE: Projections are based on a total of 1,400 dwelling units.

The Department of Education is evaluating the offer of approximately 36 acres of land from the Waikoloa Land Company for use as a school site and combined community recreation center. The enrollment projections for the Waikoloa area will be monitored to determine the DOE's timing for constructing new schools in the area.

5.9 RECREATION FACILITIES

The recreational facilities offered in Waikoloa Village are a private golf course and a 4.3-

acre park. The park, which is under construction, is scheduled to be open to the public in September 1991. It is planned to include a soccer field, softball diamond, and playground equipment.

Impacts and Mitigation

The proposed affordable housing development will provide a variety of recreational facilities on the project site: a community park of approximately 9 acres located at the entrance of the development, and a neighborhood park of 7 acres at the makai end of the development. The proposed 36-acre public school site adjacent to the southeast boundary of the proposed project may also offer additional community recreational facilities, such as ballfields.

SECTION 6

ALTERNATIVES TO THE PROPOSED ACTION

SECTION 6 ALTERNATIVES TO THE PROPOSED ACTION

6.0 OVERVIEW

The alternatives considered for this evaluation include the "no project" alternative, income mix alternatives and economic range of housing units, and alternative land use concepts. Because the original transfer of this property from Transcontinental Development Company to the County of Hawaii was intended specifically for the purpose of increasing the badly needed affordable housing supply in West Hawaii, there was no doubt that the focus of the County's use of this property was for the development of housing.

6.1 NO ACTION

The "no action" alternative would result in continuation of existing conditions for the Waikoloa project site. The site would most likely continue in its undeveloped condition. However, as surrounding development occurs as part of the overall Waikoloa Village expansion, other uses of this site could occur.

Advantages of the "no action" alternative are few. These advantages include: no further expenditures of resources by public and private agencies; continued non-use of the site; and no adverse impacts on the project site generated by development.

The primary disadvantage of this no-project alternative would be the absence of a planned residential community with a unique mix of affordable housing opportunities to suit lower and low-to-moderate income families. Additionally, losses resulting from this alternative would include lost housing and employment opportunities, as well as lost tax revenues for County and State governments.

6.2 SITE SELECTION

The initial site selection process conducted by Transcontinental Development Company (TDC, the original land owner of the site), involved initially identifying a general area of approximately 580 acres for evaluation and analysis to determine suitability for residential development. The purpose of this site study was to help Transcontinental locate a large enough land area to accommodate a planned affordable residential community.

To determine the best possible location for the affordable housing project site, the 580-acre study area's physical characteristics were assessed-- topography, soils, climate, flora, fauna, archaeological sites, natural hazards, and existing infrastructure. As part of the analysis, site constraints were generally identified, and developable areas were delineated. The result of the analysis provided for the selection of the northern portion or most developable area of the property for the County's housing project.

Even in this selected area, some development constraints exist. Thus, additional land was allocated for the recommended site. A total of 340 acres was set aside, of which 25 acres encompass potential flood plains, 10 acres are steep lands, and 5 acres are for a sewage treatment site. The total net area for the recommended site was thus 300 acres.

6.3 ECONOMIC MIX OF HOUSING UNITS

Maintaining the project's overall economic feasibility while truly providing all of the housing units at affordable rent and sales price levels has been one of the project's major objectives. To theoretically achieve this balance between the County's social objectives and economic viability, numerous cash flow analyses were conducted to reflect different scenarios of economic mixes of types of housing units. Each of the cash flow analyses contained different sets of assumptions regarding varying per square foot building construction costs, dwelling unit sizes, and numbers of units assigned to each intended target group of buyers.

One scenario indicated that total revenues from the sale of 1,000 units would be $129 million, while total development costs (including building construction, subdivision or on-site development, backbone infrastructure, sales/processing fees, indirect costs for design, management, loan points, contingencies at 15%, and developer's profit at 5% of revenues) are $132 million. At an annual deficit financing rate of 12%, the deficit after financing will be $17 million.

The conclusion to this series of analyses and evaluations was that, to a certain extent, modification of certain subdivision standards may result in significant cost savings, and

may further result in more affordable housing. These modifications need, however, to ensure that such cost-saving methods, (1) will not result in health and safety risks; (2) will not result in significant added post-construction maintenance costs for the County and/or for the residents; (3) will not have an adverse visual impact; and, (4) will clearly result in a greater number of affordable houses and/or lower prices for some or all of the homes.

6.4 LAND USES WITHIN THE AFFORDABLE HOUSING PROJECT

Various alternative development concepts were explored during the master plan preparation process. This process involved identification of the opportunities and constraints, which provided the basis for the environmental concept (Figure 6-1). Developable areas excluded steep slopes, primary ridgeline, and major drainageways. These constraints added a new dimension to the overall development concept. The analysis revealed opportunities to enhance the development pattern by incorporating unbuildable areas as buffer areas. Constraints were thus turned into amenities.

The developable areas were grouped into four different general types:

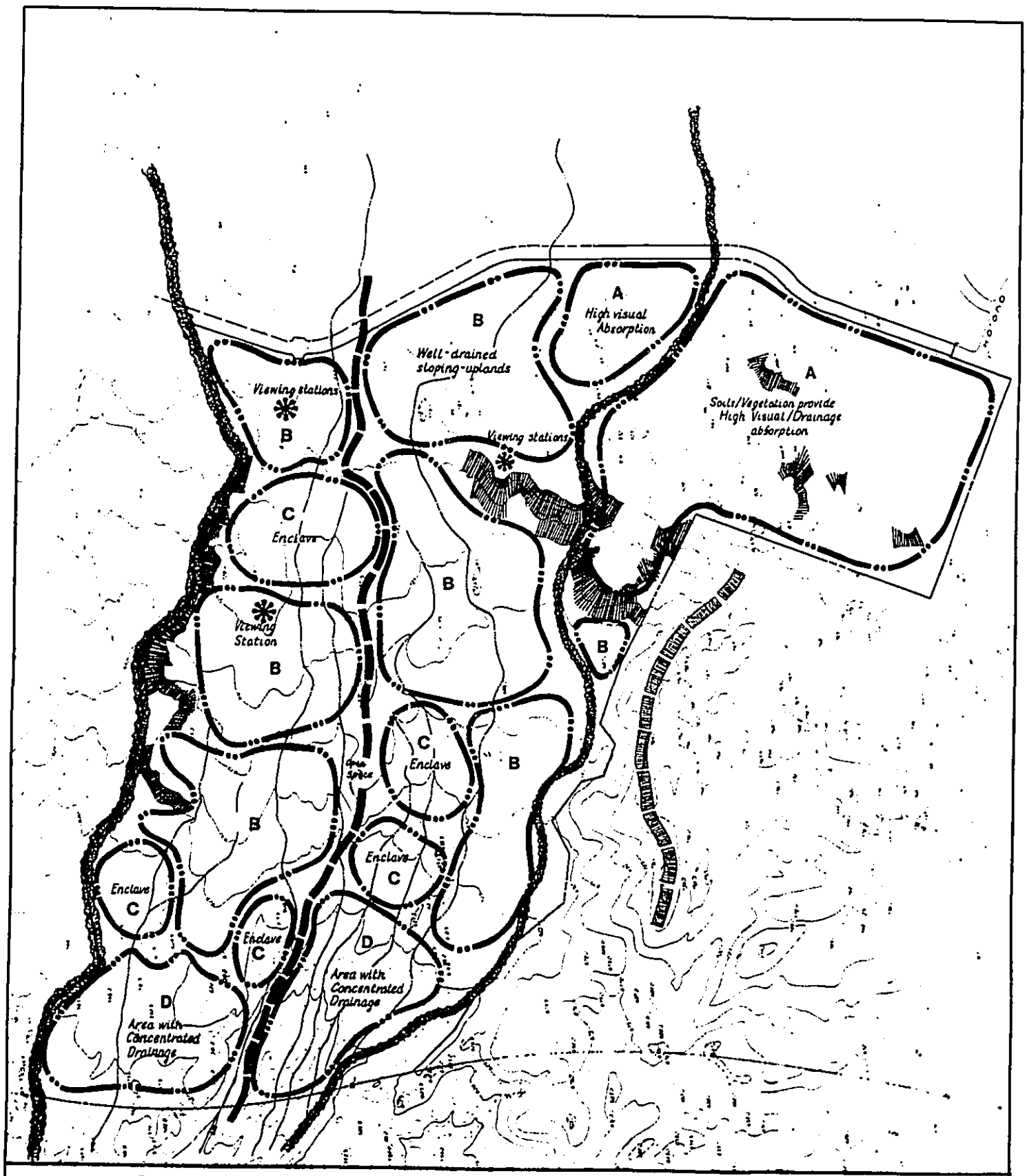
A) Land type characterized by having soils and vegetation which provide high visual and drainage absorption.

B) Lands that may be characterized as well-drained sloping uplands.

C) Enclaves, or valley-like topographic features.

D) Areas found in the western or makai end of the site -- these are areas of concentrated drainage.

The different site types presented land use planning and development opportunities in the general siting within the project site of the internal collector roadway system, housing sites, neighborhood and community parks, and church/commercial areas.



WAIKOLOA AFFORDABLE HOUSING PROJECT MASTER PLAN

ENVIRONMENTAL CONCEPT

For: County of Hawaii Dept. of Housing & Community Development
Hilo, Hawaii

By: R. M. Towill Corporation
Honolulu, Hawaii

NOVEMBER 1989

0 200 400 800 800
SCALE IN FEET

FIGURE 6-1

The general land use planning criteria used were:

- Provide approximately 1,200 multi- and single-family housing units in development clusters averaging 10-20 acres each.

- Provide at least one community park located near Paniolo Drive so that it would be utilized by not only the County project residents, but by adjacent neighborhoods as well.

- Provide an area for "church/convenience commercial" uses that will service the project as well as adjacent neighborhoods.

The Master Land Use Plan was developed based on these guidelines and criteria.

SECTION 7

RELATIONSHIP TO LAND USE PLANS AND POLICIES

7.1 THE HAWAII STATE PLAN

The Hawaii State Plan represents a guide for the future of Hawaii. The State Plan sets forth a broad range of goals, objectives, and policies to serve as guidelines for growth and development of the State and establishes a coordination system between the State and County agencies. Chapter 226, Hawaii Revised Statutes, as amended, 1986, states the following purpose of the State Plan:

> "(it) shall serve as a guide for the future long-range development of the State; identify the goals, objectives, policies, and priorities for the State of Hawaii; provide the basis for determining priorities and allocating limited resources, such as public funds, services, manpower, land, energy, water, and other resources; improve coordination of state and county plans, policies, programs, projects, and regulatory activities; and to establish a system for a plan formulation and program coordination to provide for an integration of all major state and county activities." (Chapter 226-1: Findings and Purpose, HRS)

The proposed project is generally consistent with objectives and policies of the Hawaii State Plan. The following sections analyze relevant goals, objectives, policies and guidelines of the State Plan relative to the proposed project.

A. Section 226-5 Objectives and Policies for Population

The Waikoloa Affordable Housing Project will contribute to the distribution of future growth expectations of the West Hawaii region by providing a well managed community offering a mix of housing types and community support facilities.

B. Section 226-6 Objectives and Policies for the Economy In General

Development of this project will directly benefit the economy in terms of construction, commercial/retail, public institutional, and real estate opportunities.

C. Section 226-12 Objectives and Policies for the Physical Environment - Scenic, Natural Beauty, and Historic Resources

The project will be designed to promote views of the surrounding peaks of Mauna Kea to the east, the Kohala Mountains to the north, and the Kohala coastline to the west. Southeast of the project site are the rolling hills of Waikoloa Village. The south slope of Haleakala Crater on Maui is visible on a clear day.

D. Section 226-13 Objectives and Policies for the Physical Environment - Land, Air and Water Quality

Air quality of the Waikoloa Village area will be impacted by traffic generated from the proposed project and surrounding neighborhoods. Water quality impacts will be minimal due to implementation of an effective potable water system and drainage system.

In some areas of the project site, grading of the land will be needed for roadways and subdivision development. This action will change some of the natural slopes of the site.

E. Section 226-15 Objectives and Policies for Facility Systems - Solid and Liquid Wastes

Wastewater generated from this project will utilize a new sewage treatment plant which will be provided off-site by the Waikoloa Sanitary Sewer Company. Solid waste will be disposed of at the proposed new West Hawaii Sanitary Landfill.

F. Section 226-16 Objectives and Policies for Facility Systems - Water

The proposed project is located within the service area of Waikoloa Water Company, and will utilize the potable water supplied by the wells tapped by this Company.

G. Section 226-17 Objectives and Policies for Facility Systems - Transportation

The proposed project will add to traffic volumes around the project site. Measures to mitigate the increased traffic include roadway improvements to off-site roadways and intersections.

H. Section 226-18 Objectives and Policies for Facility Systems - Energy/Telecommunications

Energy and telecommunication facilities necessary for the development of the Waikoloa Affordable Housing Project will be planned and coordinated with the appropriate agencies and public utilities. Energy conservation and the utilization of energy-saving devices will be encouraged through guidelines for designers and developers as well as through homeowner information and orientation programs provided by the County.

I. Section 226-19 Objectives and Policies for Socio-Cultural Advancement - Housing

The proposed project is designed to accommodate a variety of housing types suited to families with incomes ranging from below 50% of the median income to the Hula Mae qualifying levels. This income range is representative of the general worker population in West Hawaii. The Waikoloa Affordable Housing Project will be consistent with this section by offering a mix of housing types (including gap-group and assisted housing), and costs to suit the needs of a large portion of the housing market. Integral planning of the overall development will provide necessary support facilities for these housing areas.

J. Section 226-20 Objectives and Policies for Socio-Cultural Advancement - Health

Medical and health care facilities are currently located in Kapaau (North Kohala), Kealakekua (Kona), and Kamuela, with emergency services provided by the Kohala Hospital and the Kona Hospital. There are

anticipated increases of medical and health care services and facilities for West Hawaii as the development of the region continues. In the planning stages is a North Hawaii Hospital located in Kamuela. This new 50-60 bed hospital will be a joint venture project between government and private enterprise, and is planned as a full-service facility. Additionally, the abundance of recreational facilities anticipated within the project area will promote "wellness" through physical and mental health.

K. Section 226-21 Objectives and Policies for Socio-Cultural Advancement - Education

The Waikoloa Land Company is in the process of donating a parcel of land to the State Department of Education for the development of a school site to service the Waikoloa Affordable Housing project and the surrounding community. The site is adjacent to the southeastern boundary of the project site. Close cooperation with the Department of Education will be maintained to ensure adequate provision of educational services.

L. Section 226-23 Objectives and Policies for Socio-Cultural Advancement - Leisure

Recreational facilities will be provided within the development offering a variety of activities including a neighborhood park, ballfields, and recreation centers. These facilities, as well as the adjacent school site provide an abundant amount of open space within the project site.

M. Section 226-104 Population Growth and Land Resources Priority Guidelines

Development of the Waikoloa Affordable Housing project will result in the permanent loss of open space as it exists, however, the master plan of the project is designed with open space areas including parks. The proposed urban use of the land is consistent with the State and County land use policies for this site.

The project site was not determined to be environmentally critical in the areas of archaeology, flora, and fauna. Any environmental impacts resulting from development will be mitigated where possible.

N. Section 226-106 Affordable Housing, Priority Guidelines for the Provision of Affordable Housing

The proposed project will incorporate a mix of housing types to include gap group and assisted housing. While other residential development projects attempt to offer a mix of market rate and affordable housing units, the Waikoloa Affordable Housing project is intended to offer all of its units at rental and sales price levels that will be affordable to families in West Hawaii that would otherwise be priced out of the housing market.

7.2 STATE FUNCTIONAL PLAN

The Hawaii State Plan is used as the primary tool for directing the planning process for Hawaii's long-term and short-term goals. Functional plans, created as extensions of the State Plan, are prepared by the appropriate State agencies to specify objectives, policies, and implementation actions of their respective concerns. These plans were reviewed and evaluated with regard to the proposed project. The following are descriptions of functional plans applicable to the proposed project.

7.2.1 Education Plan

This functional plan relates to educational functions, school systems, goals and growth. Topics within the plan are organized under four categories: personal skills and knowledge; employability and economy; social and natural resources; and educational support services.

Development of the Waikoloa Affordable Housing project, as well as neighboring communities, will result in an increased demand for educational facilities for the West Hawaii region. The school site adjacent to the proposed project may include a facility that will accommodate grades K through 8.

7.2.2 Housing Plan

This functional plan, managed by the Housing Finance and Development Corporation, deals with orderly development of housing and expanded housing opportunities for Hawaii's people. Objectives of the functional plan are to:

> "develop greater opportunities for Hawaii's people to secure reasonably priced, safe, sanitary, liveable homes located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals";
>
> "assist the orderly development of residential areas sensitive to community needs and other land uses."

An innovative concept of the proposed project is to offer a wide range of housing types with varying costs. The Waikoloa Affordable Housing project will address the need for affordable housing by providing homeownership and rental opportunities to families and individuals with varied income levels. For-sale units will be available to families whose income levels are too low for conventional home buying methods. Housing within the development will include approximately 1,200 units.

7.2.3 Health Plan

The primary purpose of the State Health Plan is to serve as a guide for State and County agencies and the private sector in outlining environment related objectives and health care objectives for Hawaii. This plan, under the jurisdiction of the State Department of Health (DOH), focuses on: "preventing disease and promoting healthful life styles and environmental conditions; ensuring and promoting appropriate provisions and access to health care; protecting society from potential dangers; and enhancing the quality of air, land and water resources and preventing environmental degradation."

Currently, the State's Kona Hospital, located in Kealakekua, provides medical and health care services to the Waikoloa area. Two other facilities, Kohala Hospital in Kapaau and the Lucy Enriquez out-patient services in Kamuela, currently provide additional medical

services to the project area. The Kona Hospital, whose service area covers Kohala to Hawaiian Oceanview Estates, is constructing a new unit to respond to West Hawaii's growing population. The addition will include special care services, a new surgical suite and recovery room.

Environmental concerns expressed in the functional plan have also been addressed in their respective sections of this document. Minimal adverse impacts of utilities such as water supply and sewerage are expected to occur from the development. Air and noise quality impacts are also expected to be minimal. Mitigation measures of adverse impacts will be implemented as necessary.

7.2.4 Transportation Plan

General objectives of this functional plan are to ensure efficient multi-modal transportation servicing statewide needs of movement of people and goods, and to ensure a transportation system supportive of statewide growth. The functional plan is divided into five major topics addressing each mode of transportation, as well as statewide transportation planning and energy conservation.

The Waikoloa Affordable Housing Project will provide an efficient on-site transportation network of roadways to effectively meet demands. Additionally, off-site roadway improvements will be provided, adjacent to the project site. These transportation mitigating measures, discussed in greater detail in Appendix E, are presented in an effort to meet general objectives of the functional plan.

7.2.5 Recreation Plan

The Department of Land and Natural Resources is responsible for the State Recreation Plan. This functional plan reviews demands and actions needed to fulfill existing and future recreation demands. Other objectives of the plan include "guiding State and County agencies in acquiring and preserving lands of recreational value, and ensuring public access to recreational areas."

The Waikoloa Affordable Housing Project will be consistent with the functional plan by providing a variety of recreational facilities. A neighborhood park (at the makai end of the project site), and a recreation center are planned within the development.

7.3 STATE LAND USE LAW

The State Land Use Commission has classified all land in the State in one of four classifications: Urban, Rural, Agricultural, and Conservation. The entire proposed project site lies within the Urban district boundary. Hence, the proposed project is consistent with the intent and permitted uses of Urban lands as defined under State Land Use Law.

7.4 STATE'S WEST HAWAII REGIONAL PLAN

The State's West Hawaii Regional Plan was developed in 1989 in response to the anticipated increased job opportunities and corresponding rise in population with the expanded economic growth in this geographic area of the Island of Hawaii. The West Hawaii regional planning effort is coordinated by the Office of State Planning. The plan addresses issues which require State attention in order to most effectively meet the region's present and emerging needs.

The State's interest in formulating and implementing a plan for the West Hawaii region are fourfold:

- 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 West Hawaii Regional Plan is intended to complement the County of Hawaii's General Plan and Community Development Plans.

Among the numerous goals that provide the focus and direction of this planning effort is one which is aimed to, "ensure provision and adequacy of affordable housing." The strategy is to designate and develop appropriate primary and secondary support communities to house employees working at the Resort Destination nodes and other employment generators in the West Hawaii region.

The Plan identifies Waikoloa as one of the major new support communities that would house employees of the region and offer a range of support services, convenience stores, recreational activities, and other community facilities. Hence, the Waikoloa Affordable Housing Project is consistent with the goals, strategies, and actions of the West Hawaii Regional Plan.

7.5 COUNTY OF HAWAII REVISED GENERAL PLAN

7.5.1 General Plan Policy Document

The County's General Plan is the policy document for the long-range comprehensive development of the island of Hawaii. The General Plan provides the direction for balanced growth of the County in terms of economic activities, environmental quality, flood control and drainage, historic sites, housing, natural beauty, natural resources and shoreline, public facilities, public utilities, recreation, transportation, land use patterns, and energy.

The General Plan, adopted by County Ordinance (No. 439) in 1971, and revised and adopted by the County Council in November 1989, recognizes the South Kohala region's primary economic activities as cattle ranching, diversified crops and tourism. The policy directions therefore reflect the County's encouragement of growth of these activities along with support for attendant resources, such as employee housing, public services and recreational facilities.

The Waikoloa Affordable Housing Project is in concert with the General Plan in that the proposed development will facilitate the provision of housing affordable to workers in West Hawaii as well as related services needed by the residents of this new residential community.

7.5.2 Land Use Pattern Allocation Map (LUPAG)

The General Plan Land Use Pattern Allocation Map (LUPAG) designates the project site for Low Density Urban Development. "Low Density" is defined as Residential and ancillary community and public uses (single-family residential in character, as revised, per the Hawaii County Planning Department, Oct., 1990). Hence, the proposed project is consistent with the County's revised General Plan LUPAG designation.

7.6 COUNTY OF HAWAII ZONING CODE

The County Zoning Code provides a physical planning and regulatory guideline for the development or intended uses of lands within Hawaii County. The project site is designated RS-10, Residential Single-Family on the County of Hawaii zoning code. Residential lots proposed for this site may range in size from 3,750 square feet to 7,500 square feet. These lot sizes would not conform with the current RS-10 zoning of the project site. However, it is the County's intent to designate the entire project as an "experimental housing project", under Section 46-15 of the Hawaii Revised Statutes.

7.7 COASTAL ZONE MANAGEMENT/SMA RULES AND REGULATIONS

Objectives and policies of the Coastal Zone Management Program are described in Chapter 205A-2, Hawaii Revised Statutes (HRS), Part I. Special Management Area guidelines are found in Part II of the same chapter. The proposed project site is not located within a Special Management Area and therefore, a Special Management Area permit is not required.

7.8 ENVIRONMENTAL IMPACT STATEMENT (Chapter 343, HRS)

Chapter 343 outlines the necessary procedures and contents of environmental impact statements. The chapter states: "environmental review at the State and County levels

shall ensure that environmental concerns are given appropriate consideration in decision making along with economic and technical considerations." This environmental impact statement is prepared in accordance with the legislative mandates of Chapter 343, HRS. The requirement of an environmental impact statement was determined pursuant to Chapter 200 of Title 11, Administrative Rules, Subchapter 5(b).

SECTIONS 8 - 13

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES AND THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY (8)

UNRESOLVED ISSUES (9)

LIST OF ORGANIZATIONS & AGENCIES CONSULTED (10)

COMMENTS AND RESPONSES TO THE EIS PREPARATION NOTICE (11)

COMMENTS AND RESPONSES TO THE DEIS (12)

REFERENCE MATERIAL (13)

SECTION 8 IRREVERSIBLE & IRRETRIEVABLE COMMITMENTS OF RESOURCES

8.1 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Development of the Waikoloa Affordable Housing project will involve the irretrievable loss of certain environmental and fiscal resources. However, the costs associated with the use of these resources should be evaluated in light of recurring benefits to the residents of the region, County of Hawaii, and the State of Hawaii.

It is anticipated that the construction of the proposed project will commit the necessary construction materials and human resources (in the form of planning, designing, engineering, construction labor, landscaping, and personnel for the sales, management, services offices, and maintenance functions). Reuse of much of these materials and resources is not practicable. Although labor is compensated during the various stages of development, labor expended for project development is non-retrievable.

Air and noise quality will be adversely affected by the proposed development, but will remain in compliance with State standards. While ambient air and noise quality in the area is good, the proposed development will result in a greater number of vehicles traveling to and from the project site, creating vehicular emissions.

8.2 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF HUMANITY'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

No short-term exploitation of resources resulting from development of the project site will have long-term adverse consequences. The appearance of the project site will be altered from its present open, undeveloped environment to that of a completed planned residential community. The completed development will be visually integrated with the growing urban activities of Waikoloa Village.

Long-term community gains resulting from development of the project include residential and commercial uses which will likely benefit future homeowners, the landowners, private businesses, and the State and County governments. As the property develops, its

productivity in terms of generating tax revenues will increase. Income from property, personal, and excise taxes is expected to more than offset expenses associated with expanded public facilities and services to meet the requirements of the development and population growth.

SECTION 9 UNRESOLVED ISSUES

Drainage system improvements constitute the most significant cost identified for the project's backbone infrastructure requirements. Because the project site functions as an area through which significant mauka-generated surface drainage flows, drainage system improvements including directing surface flows into Kamakoa Gulch will be necessary. As part of the requirements for improving the drainage system, Kamakoa Gulch, which forms the northern boundary of the project site, will continue to function as the major natural drainageway in the area. The flood boundaries of Kamakoa Gulch need to be defined prior to the development of construction plans for the project site.

A drainage study has been commissioned by the County of Hawaii to define the Kamakoa Gulch floodplain boundaries and to confirm the preliminary engineering cost estimates and system recommendations for the project's drainage improvements. Discussions are now taking place involving the County, Waikoloa Land Company, and other developers in the area relative to major options for drainage improvements. The drainage study for the County's parcel will proceed after a consensus is reached on the overall strategy for these major drainage improvements.

SECTION 10 LIST OF ORGANIZATIONS AND AGENCIES CONSULTED

10.1 PARTICIPANTS IN THE EIS PREPARATION PROCESS

A. Federal Agencies

- Department of the Interior, Fish & Wildlife Service
- Department of the Interior, National Park Service
- Department of the Interior, Geological Survey
- Department of the Army, Army Engineer District Engineering Division
- Department of Housing & Urban Development
- Department of Agriculture, Soil Conservation Service

B. State Agencies

- Department of Land & Natural Resources
- Department of Health
- Office of Environmental Quality Control
- Department of Agriculture
- Department of Business, Economic Development and Tourism
- Department of Transportation
- Office of State Planning
- University of Hawaii Environmental Center
- Department of Education
- Housing Finance & Development Corporation
- State Land Use Commission
- Hawaii Housing Authority
- University of Hawaii Water Resources Research Center
- Department of Hawaiian Home Lands

C. County Agencies

- Department of Parks & Recreation
- Planning Department
- Department of Water Supply
- Department of Public Works
- Department of Research & Development

- Police Department
- Fire Department
- Department of Finance
- Civil Defense Agency

D. Others

- Waikoloa Land Company/Waikoloa Development Company
- Waikoloa Sanitary Sewer Company
- Waikoloa Water Company
- Waikoloa Village Association

10.2 LIST OF EIS PREPARERS

R. M. Towill Corporation	Bruce T. Tsuchida, Project Manager Colette Sakoda, EIS Coordinator James Yamamoto, Project Engineer
Parsons, Brinckerhoff, Quade and Douglas, Inc.	Robert Miyasaki, Project Manager Keith Niiya, Traffic Engineer
Char & Associates	Winona Char, Principal
William J. Bonk	William J. Bonk
B. D. Neal & Associates	Barry D. Neal, Principal
Phillip L. Bruner	Phillip L. Bruner
Real Estate Services, Inc.	Peter T. Young, Principal

SECTION 11 COMMENTS AND RESPONSES TO THE EIS PREPARATION NOTICE

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII
25 AUPUNI STREET • HILO, HAWAII 96720
TELEPHONE (808) 969-1421 • FAX (808) 969-6996

September 10, 1990

RMT		WES	
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REC'D SEP 14 1990 RMTC			
GST			
DKH			

Ms. Collette M. Sakoda, Senior Planner
R.M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, HI 96817

WAIKOLOA AFFORDABLE HOUSING MASTER PLAN
ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE
TAX MAP KEY 6-8-2:31 AND POR. 26

We have reviewed the subject preparation notice for the proposed subdivision. The water system in the area is privately owned and operated.

Pursuant to Section 23-84 of the Hawaii County Code regulating subdivisions, the following minimum requirements must be complied with for subdivision approval:

1. Provide a water system designed to deliver water at adequate pressure and volume under peak-flow and fire-flow conditions in accordance with the Water System Standards, State of Hawaii, and the Rules and Regulations of the Department of Water Supply. The water system shall include, but not be limited to, the installation of the necessary distribution pipeline, fire hydrants, and service laterals.

2. Submit construction plans for our review and approval.

3. Pay a fee of four-tenths of one percent of the estimated cost for the construction of the water system, but not less than $25.00, to cover the costs for plan review, testing, and inspection.

Should you have any questions, please contact our Water Resources and Planning Section.

H. William Sewake
Manager

WA

Office of Housing and Community Development
50 Wailuku Drive • Hilo, Hawaii 96720 • (808) 961-8379 • Fax (808) 935-4725

Larry S. Tanimoto
Mayor
A. Scott Leithead
Housing Administrator

November 7, 1990

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RYK			
REC'D 11/12 1990 RMTC			
GST			
DKH			

MEMORANDUM

TO: William Sewake, Manager
Department of Water Supply

FROM: A. Scott Leithead
Administrator

SUBJECT: Waikoloa Affordable Housing Project Environmental Impact Statement Preparation Notice (EISPN)

We have received your letter of September 10, 1990 regarding the Environmental Impact Statement Preparation Notice for the Waikoloa Affordable Housing Project. The following has been prepared in response to your comments.

1. The project's water system will be designed in accordance with the Water System Standards, State of Hawaii, and the Rules and Regulations of the Department of Water Supply.

2. Construction plans will be submitted to the Water Department for your review and approval.

3. The fees required to cover the Water Department's costs for plan review, testing, and inspection will be honored.

Because we are aware of the fact that the water system in the area is owned by the Waikoloa Land company, we are coordinating the planning and development of the project with the owner.

Thank you for your interest and participation in the planning process for this important project.

cc: Dr. Bruce Anderson, OEQC Acting Director
Duane Kanuha, Planning
C. Sakoda, R. M. Towill Corp.

EQUAL HOUSING OPPORTUNITY

Larry S. Tanimoto
Mayor
George Yoshida
Director
Juliette M. Tulang
Deputy Director

Department of Parks and Recreation

25 Aupuni Street, Rm. 210 • Hilo, Hawaii 96720 • (808) 961-8311

RMT			
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August 23, 1990

Colette M. Sakoda, Senior Planner
R.M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817

CS

Subject: Waikoloa Affordable Housing Master Plan
EIS Preparation Notice

Dear Ms. Sakoda:

Consideration should be given to locating the community park adjacent to or within close proximity to the proposed school site.

Additional comments may be submitted upon review of "recreational facilities alternatives", which will be discussed in the EIS.

Thank you for the opportunity to review and submit comments during this phase of the project.

Sincerely,

George Yoshida
Director

Larry S. Tanimoto
Mayor
A. Scott Leithead
Housing Administrator

Office of Housing and Community Development

50 Waiuku Drive • Hilo, Hawaii 96720 • (808) 961-8379 • Fax (808) 935-4725

November 7, 1990

MEMORANDUM

TO: George Yoshida
Parks and Recreation Director

FROM: A. Scott Leithead
Administrator

SUBJECT: Waikoloa Affordable Housing Project Environmental Impact Statement Preparation Notice (EISPN)

We have received your letter of August 23, 1990 regarding the EISPN for the Waikoloa Affordable Housing Project. The following has been prepared in response to your comments.

1. We intend to propose a joint use recreational facility with the DOE similar to the Manoa Park facility in Honolulu. This facility would serve the needs of the broader Waikoloa community.

2. The proposed park within the Waikoloa Affordable Housing Project was primarily intended to serve the needs of its residents.

3. Your input into the discussion on "recreational facilities alternatives" will be appreciated.

Thank you for your participation in the planning process of this important County project.

cc: Dr. Bruce Anderson, OEQC Acting Director
Duane Kanuha, Planning
C. Sakoda, R. M. Towill Corp.

EQUAL HOUSING OPPORTUNITY

LARRY S. TANIMOTO
Mayor
Duane Kanuha
Director
William L. Moore
Deputy Director

Planning Department
25 Aupuni Street, Rm. 109 • Hilo, Hawaii 96720 • (808) 961-8288

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DKM			

August 30, 1990

Ms. Colette M. Sakoda
Senior Planner
R. M. Towill Corporation
420 Waiakamilo Rd., #411
Honolulu, HI 96817-4941

CS

Dear Ms. Sakoda:

EIS Preparation Notice
Waikoloa Affordable Housing

We have reviewed the EIS Preparation Notice for the proposed Waikoloa Affordable Housing and provide the following comments:

1. The Accepting Authority is the Mayor and the Approving Agency is the Planning Department.
2. The drainage study should be included in the EIS.
3. The discussion on the relationship of the proposed project to State and County land use plans and policies needs further discussion.
4. The County Civil Defense Agency should be included as a consulted party for the preparation of the Draft EIS.

Thank you for the opportunity to review and comment on the EIS Preparation Notice.

Sincerely,

DUANE KANUHA
Planning Director

AK:mra

Office of Housing and Community Development
50 Wailuku Drive • Hilo, Hawaii 96720 • (808) 961-8379 • Fax (808) 935-4725

Larry S. Tanimoto
Mayor
A. Scott Leithead
Housing Administrator

November 7, 1990

MEMORANDUM

TO: Duane Kanuha,
Planning Director

FROM: A. Scott Leithead
Administrator

SUBJECT: Waikoloa Affordable Housing Project Environmental Impact Statement Preparation Notice (EISPN)

We have received your letter of August 30, 1990 regarding the EISPN for the Waikoloa Affordable Housing Project. The following has been prepared in response to your comments.

1. The designated approving and accepting authorities for the Final Environmental Impact Statement have been noted. These parties will be identified in the Draft and Final EIS documents.

2. Preliminary findings of the drainage study, which is currently underway, will be included in the EIS.

3. A comprehensive discussion on the relationship of the proposed project to State and County land use plans and policies will be included in the Draft EIS.

4. As a follow up to your recommendation, the County Civil Defense Agency will be included as a consulted party during the preparation of the Draft EIS.

Thank you for your participation in the planning process of this important project.

cc: Dr. Bruce Anderson, OEQC Acting Director
C. Sakoda, R. M. Towill Corp.

EQUAL HOUSING OPPORTUNITY

Larry S. Tanimoto
Mayor
Victor V. Vierra
Chief of Police
Francis C. DeMorales
Deputy Chief of Police

Police Department

349 Kapiolani Street • Hilo, Hawaii 96720-3998 • (808) 961-2244 • FAX (808) 961-2702

August 29, 1990

Ms. Colette M. Sakoda
Senior Planner
R.M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817

Dear Ms. Sakoda:

Re: Waikoloa Affordable Housing
Master Plan, Environmental Impact
Statement Preparation Notice

We reviewed the draft environmental impact statement of the above master plan. An increase in calls for assistance from the public is anticipated when the project is completed.

VICTOR V. VIERRA
CHIEF OF POLICE

JD:sk

cc: South Kohala Police

Office of Housing and Community Development

Larry S. Tanimoto
Mayor
A. Scott Leithead
Housing Administrator

50 Wailuku Drive • Hilo, Hawaii 96720 • (808) 961-8379 • Fax (808) 935-4725

November 7, 1990

MEMORANDUM

TO: Victor V. Vierra
Chief of Police

FROM: A. Scott Leithead
Administrator

SUBJECT: Waikoloa Affordable Housing Project Environmental Impact Statement Preparation Notice (EISPN)

Thank you for your letter of August 29, 1990 regarding the Environmental Impact Statement Preparation Notice for the Waikoloa Affordable Housing Project. Our consultants will be contacting your office during the draft EIS preparation process to discuss possible measures which the Police Department may consider taking to respond to the increased number of calls anticipated upon the completion and occupancy of this project.

We appreciate your participation in the planning process for this important project.

cc: Dr. Bruce Anderson, OEQC Acting Director
Duane Kanuha, Planning
C. Sakoda, R. M. Towill Corp.

EQUAL HOUSING OPPORTUNITY

JOHN WAIHEE
GOVERNOR

ESTHER UEDA
EXECUTIVE OFFICER

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT, AND TOURISM
LAND USE COMMISSION
Room 104, Old Federal Building
335 Merchant Street
Honolulu, Hawaii 96813
Telephone: 548-4611

RMT DK NYK | WES BTT ABE | REC'D SEP 11 1990 RMTC | GSY DXM

September 7, 1990

Ms. Colette M. Sakoda
Senior Planner
R. M. Towill Corporation
420 Waiakamilo Road #411
Honolulu, Hawaii 96817-4941

Dear Ms. Sakoda:

Subject: EISPN For the Waikoloa Affordable Housing Master Plan, TMK No. 6-8-02: 31 and portion 26, Waikoloa Village, South Kohala, Hawaii

We have reviewed the subject EISPN and based on the maps provided, the project site appears to be designated within the State Land Use Urban District.

Thank you for the opportunity to comment.

Sincerely,

ESTHER UEDA
Executive Officer

EU:to

Office of Housing
and Community Development

Larry S. Tanimoto
Mayor

A. Scott Leithead
Housing Administrator

50 Wailuku Drive • Hilo, Hawaii 96720 • (808) 961-8379 • Fax (808) 935-4725

November 7, 1990

Ms. Esther Ueda
Executive Officer
State Land Use Commission
Department of Business, Economic Development
and Tourism
Room 104, Old Federal Building
335 Merchant Street
Honolulu, Hawaii 96813

SUBJECT: Waikoloa Affordable Housing Project Environmental Impact Statement Preparation Notice (EISPN)

Thank you for your letter of September 7, 1990 regarding the Environmental Impact Statement Preparation Notice for the Waikoloa Affordable Housing Project.

The projects site's location within the State Land Use Urban District has been so noted in the Draft Environmental Impact Statement.

We appreciate your participation in the planning process of this important County project.

A. Scott Leithead
Administrator

cc: Dr. Bruce Anderson, OEQC Acting Director
Duane Kanuha, County Planning Director
C. Sakoda, R. M. Towill Corp.

EQUAL HOUSING OPPORTUNITY

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
HOUSING FINANCE AND DEVELOPMENT CORPORATION
SEVEN WATERFRONT PLAZA, SUITE 300
500 ALA MOANA BOULEVARD
HONOLULU, HAWAII 96813
FAX (808) 543-2641

JOSEPH K. CONANT
EXECUTIVE DIRECTOR

IN REPLY REFER TO:

RECD AUG 29 1990

90:PLNG/4051jt

August 28, 1990

Ms. Colette M. Sakoda
Senior Planner
R.M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817

Dear Ms. Sakoda:

Re: Waikoloa Affordable Housing Master Plan, Environmental Impact Statement Preparation Notice (EISPN)

We have reviewed the subject EISPN and offer the following comments.

Conceptually, the proposed project will offer affordable housing opportunities to families with a range of incomes. Of the 1,400 housing units proposed for development, approximately how many are planned to be offered for sale or rent to families earning (1) less than 50% of the median income; (2) between 50% and 80% of the median; (3) between 80% and 120% of the median; and (4) between 120% and 140% of the median? Further, what is the development timetable and the estimated absorption rate of housing units in the proposed Waikoloa housing project?

Thank you for the opportunity to comment.

Sincerely,

Joseph K. Conant
Executive Director

JT:eks

Office of Housing and Community Development
50 Wailuku Drive • Hilo, Hawaii 96720 • (808) 961-8379 • Fax (808) 935-4725

Larry S. Tanimoto
Mayor
A. Scott Leithead
Housing Administrator

November 7, 1990

Mr. Joseph K. Conant, Executive Director
Housing Finance and Development Corporation
State of Hawaii
Department of Budget and Finance
Seven Waterfront Plaza, Suite 300
500 Ala Moana Boulevard
Honolulu, Hawaii 96813

SUBJECT: Waikoloa Affordable Housing Project Environmental Impact Statement Preparation Notice (EISPN)

Thank you for your letter of August 28, 1990 regarding the Environmental Impact Statement Preparation Notice for the Waikoloa Affordable Housing Project. The following has been prepared in response to your comments and questions.

1. First of all, the originally discussed 1,400 housing unit count in the EISPN has been adjusted downward to approximately 1,200. With this revised unit count, the overall distribution of rental and for sale units will be:

- 200 Multi-Family rental units;
- 1,000 Multi-Family and Single Family For Sale units in the following mix:

# of Units	Income Group	Sale Price/Unit	Type of Unit
400	100% of Median	$ 95,952	Duplex/Fourplex
200	120% of Median	$117,876	Single Family
200	140% of Median	$140,160	Single Family
200	Hula Mae Limit*	$167,000	Single Family

* Numbers are currently being updated in the Hula Mae Program.

The rental units are targeted to the 50% to 100% of Median group. However, these proportions -- i.e., by income groups for both the rental and for sale units -- are being used as guidelines for a developer or developers of the project.

EQUAL HOUSING OPPORTUNITY

2. Assuming a construction start date of early 1992, and a development period of 6 years, infrastructure (sewer, drainage, water) systems will be developed during the first year. The first housing units (77 units) will be constructed in Year Two; 311 units will be built in Year Three; 272 units constructed in Year Four; 119 units built in Year Five; and 221 units built in Year Six.

We appreciate your interest and participation in this important project.

A. Scott Leithead
Administrator

cc: Dr. Bruce Anderson, OEQC Acting Director
C. Sakoda, R. M. Towill Corp.

JOHN WAIHEE
GOVERNOR

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

EDWARD Y. HIRATA
DIRECTOR

DEPUTY DIRECTORS
DAN T. KOCHI (PRIMARY)
RONALD N. HIRANO
JEANNE K. SCHULTZ
CALVIN M. TSUDA

SEP 2 ? 1990

RECD SEP 2 4 1990 RMTC

IN REPLY REFER TO
HWY-PS
2.3604

cs

Ms. Colette M. Sakoda
Senior Planner
R.M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817

Dear Ms. Sakoda:

Subject: Environmental Impact Statement Preparation Notice
Waikoloa Affordable Housing Master Plan
Waikoloa Village, Hawaii, TMK: 6-8-02:31, Por. 36

Thank you for your letter of August 17, 1990 informing us of the subject EISPN.

We have the following comments:

1. The Traffic Impact Assessment Report should include intersection analyses of Waikoloa Road and any proposed connectors, with Mamalahoa Highway and/or Queen Kaahumanu Highway. Cost of improvements required to mitigate the traffic shall be borne by the developer.

2. Any construction that takes place within the State highway right-of-way will require the submission of construction plans for our review and approval.

Very truly yours,

Edward Y. Hirata
Director of Transportation

Office of Housing
and Community Development
50 Wailuku Drive • Hilo, Hawaii 96720 • (808) 961-8379 • Fax (808) 935-4725

Larry S. Tanimoto
Mayor

A. Scott Leithead
Housing Administrator

November 7, 1990

Mr. Edward Y. Hirata
Director
State Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

SUBJECT: Waikoloa Affordable Housing Project Environmental Impact Statement Preparation Notice (EISPN)

We are in receipt of your letter regarding the Environmental Impact Statement Preparation Notice for the Waikoloa Affordable Housing Project. The following responses to your comments have been prepared:

1. Intersection analyses of Waikoloa Road and the proposed connectors, Mamalahoa and Queen Kaahumanu Highways, have been conducted as part of the traffic study underway for this project. The study's findings with respect to impacts and mitigation measures will be discussed in the Draft Environmental Impact Statement.

2. Construction plans for any proposed work within the State highway right-of-way will be submitted to DOT for departmental review and approval.

We appreciate your participation in the planning process of this important County project.

A. Scott Leithead
Administrator

cc: Dr. Bruce Anderson, OEQC Acting Director
Duane Kanuha, County Planning Director
C. Sakoda, R. M. Towill Corp.

EQUAL HOUSING OPPORTUNITY

JOHN WAIHEE
GOVERNOR OF HAWAII

JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:
EPHSD
2-189

October 5, 1990

Ms. Colette M. Sakoda, Senior Planner
R.M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817

Dear Ms. Sakoda:

Subject: Waikoloa Affordable Housing Master Plan
Environmental Impact Statement Preparation Notice (EISPN)
6-8-02:31 & 26 Third Division (Hawaii)

Thank you for allowing us to review and comment on the subject EISPN. We provide the following comments:

Wastewater Disposal

At this time, the details of wastewater treatment and disposal plans from the site are incomplete.

The use of a centralized collection and treatment system meets the current requirements of Chapter 11-62, Wastewater System. However, please be informed that proposed revisions to Chapter 11-62 will require centralized wastewater treatment facilities to be constructed to meet county standards. Also, the subject area is above the Underground Injection Control (UIC) line, therefore the use of injection wells are prohibited.

Vector Control

The South Kohala district of West Hawaii including the proposed project site is subject to periodic field mice invasions. The population builds up to tremendous levels in the surrounding pasturelands during certain years when climatic conditions are right. As the grasses dry out and natural food sources are depleted, the mice migrate out of these areas enmass and invade urban areas.

Chemical applications by both ground and aerial equipment is then necessary. Future home owners should be made aware of the above described situation.

BRUCE S. ANDERSON, Ph.D.

Office of Housing and Community Development

Larry S. Tanimoto
Mayor
A. Scott Leithead
Housing Administrator

50 Wailuku Drive • Hilo, Hawaii 96720 • (808) 961-8379 • Fax (808) 935-4725

November 7, 1990

Bruce Anderson, Ph.D.
Deputy Director
State Department of Health
P. O. Box 3378
Honolulu, Hawaii 96801

SUBJECT: Waikoloa Affordable Housing Project Environmental Impact Statement Preparation Notice (EISPN)

We are in receipt of your letter regarding the Environmental Impact Statement Preparation Notice for the Waikoloa Affordable Housing Project. The following has been prepared in response to your comments.

Wastewater Disposal:
1. A new wastewater treatment plant will be developed by the Waikoloa Sanitary Sewer Company off of the project site to meet the wastewater disposal requirements of this as well as other adjacent developments. This facility will be constructed in accordance with county standards.

2. The use of injection wells will not be considered as we are aware that the project site is located mauka of the Underground Injection Control (UIC) line.

Vector Control:
The County will monitor the population of field mice in this area. If a vector control program becomes necessary appropriate measures will be taken to address the problem.

Thank you for participating in the planning process of this important project.

A. Scott Leithead
Administrator

cc: Duane Kanuha, County Planning Director
C. Sakoda, R. M. Towill Corp.

EQUAL HOUSING OPPORTUNITY

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES
KEITH W. AHUE
MANABU TAGOMORI
RUSSELL M. FUKUMOTO

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION PROGRAM
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF:OCEA:JN

File No.: 91-95
Doc. No.: 0197E

OCT 26 1990

Ms. Colette M. Sakoda
Senior Planner
R. M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817-4941

Dear Ms. Sakoda:

Subject: Waikoloa Affordable Housing, Environmental Impact Statement (EIS) Preparation Notice, Waikoloa, South Kohala, Hawaii; TMK 6-8-02: 31 and por. 26

Thank you for giving our Department the opportunity to comment on this matter. We have reviewed the materials you submitted and have the following comments.

Please note that the EIS should address the water demand and source(s) for this project.

Thank you again for your cooperation in this matter. Please feel free to call Jay Lembeck in our Office of Conservation and Environmental Affairs, at 548-7837, if you have any questions.

Very truly yours,

William W. Paty

Office of Housing and Community Development

50 Wailuku Drive • Hilo, Hawaii 96720 • (808) 961-8379 • Fax (808) 935-4725

Larry S. Tanimoto
Mayor
A. Scott Leithead
Housing Administrator

November 7, 1990

Mr. William W. Paty
Chairperson
State Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Waikoloa Affordable Housing Project Environmental Impact Statement Preparation Notice (EISPN)

We are in receipt of your letter regarding the Environmental Impact Statement Preparation Notice for the Waikoloa Affordable Housing Project.

Section 5, Infrastructure Systems, Impacts and Mitigation, of the Draft EIS will address the project's water demand, sources and preliminary system design parameters.

We appreciate your participation in the planning process of this important County project.

A. Scott Leithead
Administrator

cc: Dr. Bruce Anderson, OEQC Acting Director
Duane Kanuha, County Planning Director
C. Sakoda, R. M. Towill Corp.

EQUAL HOUSING OPPORTUNITY

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

CHARLES T. TOGUCHI
SUPERINTENDENT

OFFICE OF THE SUPERINTENDENT

HMT | | VIES
DK | | BTT
RYK | | RNE

REC'D SEP 12 1990 RMTC

August 30, 1990

Ms. Colette M. Sakoda
Senior Planner
R. M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817

Dear Ms. Sakoda:

Subject: Waikoloa Affordable Housing Master Plan
Draft Environmental Impact Statement
Waikoloa, Hawaii

Our review of the subject draft EIS indicates it may have the following enrollment impact on the following schools:

School	Grades	Projected Students
Waimea Elementary	K-5	425-475
Waimea Intermediate	6-8	175-225
Honokaa High	9-12	275-325

The projections are based on a total of 1,400 dwelling units.

Both Waimea Elementary and Intermediate School and Honokaa High School are operating beyond capacity and have severe shortages of classrooms.

The schools cannot accommodate the large additional enrollment growth until additional classrooms are built. The Department of Education has accepted the dedication of land by the Waikoloa Land Company of a school site which

may be used to construct a new school. The enrollment projections and projected design enrollment for the Waikoloa area will be monitored to determine the Department's direction in constructing new facilities in the area.

If there are any questions, please call the Facilities Branch at 737-4743.

Sincerely,

Charles T. Toguchi
Superintendent

CTT:jl

cc: E. Imai
A. Garson

Office of Housing and Community Development
50 Wailuku Drive • Hilo, Hawaii 96720 • (808) 961-8379 • Fax (808) 935-4725

Larry S. Tanimoto
Mayor
A. Scott Leithead
Housing Administrator

November 7, 1990

Mr. Charles T. Toguchi
Superintendent
State Department of Education
P. O. Box 2360
Honolulu, Hawaii 96804

SUBJECT: Waikoloa Affordable Housing Project Environmental Impact Statement Preparation Notice (EISPN)

We have received your letter of August 30, 1990 regarding the Environmental Impact Statement Preparation Notice for the Waikoloa Affordable Housing Project. The potential impacts this residential project will have on the existing institutions have been noted for the Draft Environmental Impact Statement.

A market assessment conducted by Real Estate Services, Inc. for this project indicated that the housing demand in the West Hawaii area ranges between 1,000 units and over 2,000 units per year. Not only is there a significant pent-up demand in the area, the situation will be impacted, "...by the thousands of construction and permanent full- and part-time hotel workers in the soon to be completed Ritz Carlton Mauna Lani, the Four Seasons at Kaupulehu, South Kohala Resort at Mauna Kea Resort, the Regent Beach-Kona at Kukio, Kohanaiki (Resort) and the Princess Hotel at Kaupulehu." This demand will be complemented with the necessary support community that will come along with the construction of these resorts.

With the projected population increase in the West Hawaii region (by the year 2005, DBED's M-F projection predicts that the residential population in West Hawaii will be 79,000), we are hopeful that planning for the school site dedicated by Waikoloa to the Department of Education will be closely coordinated between the County of Hawaii and the DOE.

We appreciate your participation in the planning and development phases of this important project.

A. Scott Leithead
Administrator

cc: Dr. Bruce Anderson, OEQC Acting Director
C. Sakoda, R. M. Towill Corp.

U.S. Department of Housing and Urban Development
Honolulu Office, Region IX
300 Ala Moana Blvd., Room 3318, Box 50007
Honolulu, Hawaii 96850-4991

REC'D SEP 10 1990 RMTC

90-306

September 6, 1990

Ms. Collette M. Sakoda
Senior Planner
R. M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 967817-4941

Dear Ms. Sakoda:

SUBJECT: Waikoloa Affordable Housing Master Plan,
Environmental Impact Statement Preparation Notice (EISPN)

This responds to your request for comments on the EISPN for the proposed Waikoloa Affordable Housing Master Plan. The EISPN identifies the environmental issues that will be addressed in the draft EIS. We understand that the Master Plan will provide for 1400 dwelling units in a mixture of single family detached, duplex, fourplex and apartment units. Other land uses will provide 8.5 acres for churches, a 9 acre park, a 36 acre school site for grades K-8, and commercial uses on a 340 acre site.

We submit the following comments that would apply if FHA mortgage insurance is to be made available to potential homeowners.

1. WATER AND SEWERAGE FACILITIES

If water and sewerage systems are not publicly owned and maintained, the ownership and maintenance of the systems must comply with HUD Handbook 4075.12 REV. Central Water and Sewerage Systems (Ownership and Organization).

2. GRADING AND FOUNDATION DESIGN

Cut or fill in excess of two feet should be controlled by a qualified soils engineer and in compliance with HUD Data Sheet 79g, Handbook 4140.3 CHG.

3. OTHER

Properties that will be FHA insured may be subject to further environmental review by HUD.

If you have any questions, please call Frank Johnson at 541-1327 or Roger Leremy at 541-1350.

Very sincerely yours,

Calvin Lew
Director
Community Planning and
Development Division

Office of Housing and Community Development
50 Wailuku Drive • Hilo, Hawaii 96720 • (808) 961-8379 • Fax (808) 935-4725

Larry S. Tanimoto
Mayor
A. Scott Leithead
Housing Administrator

November 7, 1990

Mr. Calvin Lew, Director
Community Planning and Development Division
U. S. Department of Housing and Urban Development
Honolulu Office, Region IX
300 Ala Moana Blvd., Room 3318, Box 50007
Honolulu, Hawaii 96850-4991

SUBJECT: Waikoloa Affordable Housing Project Environmental Impact Statement Preparation Notice (EISPN)

We have received your letter regarding the Environmental Impact Statement Preparation Notice for the Waikoloa Affordable Housing Project. The following has been prepared in response to your comments.

1. Regarding the other proposed land uses within the project site, the 36-acre school site for grades K-8 will be located outside the project boundary. This parcel has been dedicated by Waikoloa Land Company to the State of Hawaii Department of Education for use as a school site, and is located adjacent to the southeast boundary of our proposed Affordable Housing Project.

If FHA mortgage insurance is to be made available to potential homeowners, we will assure HUD that:

a. The water and sewerage systems, once constructed, will be conveyed to and be maintained by Waikoloa's private utility companies. Maintenance of the systems will comply with HUD standards as specified in section 4075.12 REV. of the Handbook regarding Central Water and Sewerage Systems.

b. Grading and foundation design will be prepared by a qualified soils engineer and in accordance with HUD Data Sheet 79g, Handbook 4140.3 CHG.

c. We understand that properties that will be FHA insured may be subject to further environmental review by HUD.

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Thank you for your interest and participation in the planning process for this important County project. We look forward to working with you and your staff as we proceed with the next stages of development.

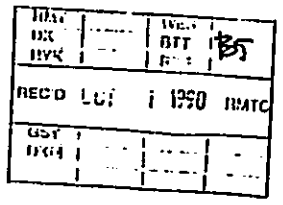
A. Scott Leithead
Administrator

cc: Dr. Bruce Anderson, OEQC Acting Director
Duane Kanuha, County Planning Director
C. Sakoda, R. M. Towill Corp.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
P. O. BOX 50004
HONOLULU, HAWAII 96850

September 27, 1990

Ms. Colette M. Sakoda
Senior Planner
R. M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, HI 96817



Dear Ms. Sakoda:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
Waikoloa Affordable Housing Master Plan, Waikoloa, Hawaii

We have reviewed the above-mentioned document as requested and offer the following comments:

A major area of concern will be dust control during construction. It will be important to ensure that adequate control measures are in place and operational prior to ground breaking. These measures may include water trucks, temporary irrigation systems, mulches, and erosion control fabrics. This area is highly susceptable to wind erosion.

The overall project appears to be well researched with most concerns addressed. The proposed project will undoubtedly reduce the infiltration of rain water and increase runoff toward Kamakoa Gulch (This problem was discussed on pages 5 and 6). There is no mention of maintenance for the dry wells and channels. It will be necessary to maintain proper operations and maintenance on the drainage structures to ensure proper operation.

We would appreciate the opportunity to review the draft EIS.

Sincerely,

WARREN M. LEE
State Conservationist

Office of Housing and Community Development
50 Wailuku Drive • Hilo, Hawaii 96720 • (808) 961-8379 • Fax (808) 935-4725

Larry S. Tanimoto
Mayor
A. Scott Leithead
Housing Administrator

November 7, 1990

Mr. Warren M. Lee
State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
P. O. Box 50004
Honolulu, Hawaii 96850

SUBJECT: Waikoloa Affordable Housing Project Environmental Impact Statement Preparation Notice (EISPN)

We have received your letter regarding the Environmental Impact Statement Preparation Notice for the Waikoloa Affordable Housing Project. The following has been prepared in response to your comments.

1. Your recommendations regarding dust control during construction have been taken under advisement. The section on Air Quality Impacts and Mitigation in the Draft EIS will address the issue of construction-related impacts. The mitigation measures you listed to minimize impacts on air quality will be further considered as part of the development process.

2. Maintenance of the proposed project's drainage channels and dry wells will be done by the County of Hawaii public works department.

We look forward to your review and comments on the Draft Environmental Impact Statement.

Thank you for your interest and participation in the planning process for this important County project.

A. Scott Leithead
Administrator

cc: Dr. Bruce Anderson, OEQC Acting Director
Duane Kanuha, County Planning Director
C. Sakoda, R. M. Towill Corp.

EQUAL HOUSING OPPORTUNITY

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:
Planning Division

September 4, 1990

RMT		WES	
DK		BTT	
RYK		RDE	
REC'D SEP 7 1990 RMTC			
GSY			
DKM			

Ms. Colette M. Sakoda
Senior Planner
R. M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817

Dear Ms. Sakoda:

Thank you for the opportunity to review the Environmental Impact Statement (EIS) Preparation Notice for the proposed Waikoloa Affordable Housing Master Plan, Waikoloa, Hawaii. The following comments are offered:

a. A Department of the Army (DA) permit would be required for any fill placed in Kanakoa Gulch or other waters of the United States. File No. P090-186 has been assigned to the project. Please refer to this file number in any future correspondence concerning the required permit. Further information about DA permits may be obtained by calling Operations Division at 438-9258.

b. According to the Map Index and Street Index of the Federal Emergency Management Agency's latest Flood Insurance Rate Map (FIRM), dated July 16, 1990, the project area lies within the borders of Panel 283C, which has not yet been printed. However, all areas covered by this panel have been designated Zone X, areas determined to be outside the 500-year flood plain.

c. The Preliminary Land Use Plan (Figure 2 of the Preparation Notice) indicates the presence of a floodplain boundary along the northern portion of the proposed project site. Details concerning this floodplain boundary should be provided in the EIS.

Sincerely,

C Fujiyama

Kisuk Cheung
Director of Engineering

Office of Housing and Community Development
50 Wailuku Drive • Hilo, Hawaii 96720 • (808) 961-8379 • Fax (808) 935-6725

Larry S. Tanimoto
Mayor
A. Scott Leithead
Housing Administrator

November 7, 1990

Mr. Kisuk Cheung
Director of Engineering
Department of the Army
U. S. Army Engineer District, Honolulu
Building 230, Planning Division
Honolulu, Hawaii 96858-5440

SUBJECT: Waikoloa Affordable Housing Project Environmental Impact Statement Preparation Notice (EISPN)

Thank you for your letter regarding the EISPN for the Waikoloa Affordable Housing Project. The following has been prepared in response to your comments.

1. As we proceed with the design as it would impact Kamakoa Gulch, my staff and consultants will closely coordinate the work necessary to comply with any Department of the Army requirements regarding filling of gulches or other waters of the United States.

2. We appreciate your confirmation that the project area has been determined to be outside the 500-year flood plain. Upon publication, please forward a copy of Federal Emergency Management Agency's July 16, 1990 FIRM map (Panel 283C) to my office.

3. A special drainage study that is intended to define the floodplain boundary along Kamakoa Gulch and to analyze preliminary engineering cost estimates regarding drainage system improvements, has been commissioned by the County of Hawaii. It is currently underway, and preliminary findings should be ready prior to the publication of the Final EIS.

We would like to thank you for your participation in the planning process for this important project.

A. Scott Leithead
Administrator

cc: Dr. Bruce Anderson, OEQC Acting Director
Duane Kanuha, County Planning Director
C. Sakoda, R. M. Towill Corp.

EQUAL HOUSING OPPORTUNITY

COMMENT LETTERS
(NO RESPONSES REQUIRED)

WAIKOLOA

August 17, 1990

Mr. A. Scott Leithead
Housing Administrator
Office of Housing and Community Development
County of Hawaii
50 Wailuku Drive
Hilo, Hawaii 96720

RE: ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE
WAIKOLOA AFFORDABLE HOUSING MASTER PLAN

Dear Mr. Leithead,

As the Waikoloa Affordable Housing Master Plan is located within the service area of Waikoloa Water Company, we would like to be a consulted party in the preparation of the draft and final environmental impact statement for this project.

Thank you and we look forward to receiving a copy of the draft EIS when it is available.

Sincerely,

WAIKOLOA WATER COMPANY

Stephen D. Hicks
Vice President

:hl

WAIKOLOA

RMI | DK | HYK | WES | BTT BT | RCE
REC'D AUG 22 1990 RMIC
GSY | DXM

C8

August 17, 1990

Mr. A. Scott Leithead
Housing Administrator
Office of Housing and County Development
County of Hawaii
50 Wailuku Drive
Hilo, Hawaii 96720

RE: ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE
WAIKOLOA AFFORDABLE HOUSING MASTER PLAN

Dear Mr. Leithead,

Further to the Waikoloa Affordable Housing Master Plan . . . we would like to be a consulted party in the preparation of the draft and the final environmental impact statement of this project. As you know, it will be within the service area of the Waikoloa Sanitary Sewer Company.

We look forward to receiving a copy of the draft EIS when it is available. If I can assist in any way, please call me at 885-1000.

Mahalo and . . .

Aloha,

WAIKOLOA SANITARY SEWER COMPANY

Stephen D. Hicks
Vice President

:hl

WAIKOLOA

REC'D AUG 21 1990 RMTC

August 15, 1990

Mr. A. Scott Leithead
Housing Administrator
Office of Housing and Community Development
County of Hawaii
50 Wailuku Drive
Hilo, Hawaii 96720

RE: ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE
WAIKOLOA AFFORDABLE HOUSING MASTER PLAN

Dear Mr. Leithead:

At this time we have no comments to offer, however, we would like to be a consulted party in the preparation of the Draft and Final Environmental Impact Statements.

We look forward to receiving a copy of the Draft EIS when it is available.

Thank you.

Sincerely,

WAIKOLOA DEVELOPMENT CO.

Ken Melrose
Director of Planning

ac

cc: Office of Environmental Quality Control

Department of Public Works
25 Aupuni Street, Rm. 202 • Hilo, Hawaii 96720 • (808) 961-8321 • Fax (808) 969-7138

Larry S. Tanimoto
Mayor

Bruce C. McClure
Chief Engineer

Richard H. Nishimura
Deputy Chief Engineer

REC'D SEP 17 1990 RMTC

September 10, 1990

MS COLETTE M SAKODA
SENIOR PLANNER
R M TOWILL CORPORATION
420 WAIAKAMILO RD SUITE 411
HONOLULU HI 96817

SUBJECT: WAIKOLOA AFFORDABLE HOUSING MASTER PLAN
Environmental Impact Statement Preparation Notice

We have reviewed the subject report and have no comments to offer.

ROBERT K. YANABU, Division Chief
Engineering Division

GO:lb

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF HUMAN SERVICES
HAWAII HOUSING AUTHORITY
P. O. BOX 17907
HONOLULU, HAWAII 96817

MITSUO SHITO
EXECUTIVE DIRECTOR

FAX NO. (808) 848-2313

IN REPLY REFER TO:
90:PLNG/1291

RECD 1990

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DKM			

October 26, 1990

Mrs. Colette H. Sakoda
Senior Planner
R.H. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817

Dear Mrs. Sakoda:

RE: Waikoloa Affordable Housing Master Plan
EIS Preparation Notice

We have no comment on the proposed project at this time.

Please contact either myself (848-3230) or Liana Tamura (848-3255) should you have any questions or need further assistance.

Sincerely,

MITSUO SHITO
Executive Director

United States Department of the Interior
FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE
P.O. BOX 50167
HONOLULU, HAWAII 96850

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AUG 23 1990

Ms. Colette H. Sakoda
Senior Planner
R. M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817

Dear Ms. Sakoda:

Re: Waikoloa Affordable Housing Master Plan

Due to current staff limitations, the Pacific Islands Office, Fish and Wildlife Enhancement cannot devote the time to adequately evaluate potential impacts to important fish and wildlife resources from the proposed project. Please understand that this notification does not represent the Fish and Wildlife Service's approval of the proposed activity. We may review future actions related to this project should workload constraints be alleviated, or if significant adverse impacts to trustee fish and wildlife resources are identified.

Sincerely yours,

Ernest Kosaka
Field Supervisor
Fish and Wildlife Enhancement

Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department

25 Aupuni Street, Rm. 109 • Hilo, Hawaii 96720 • (808) 961-8288

January 7, 1991

TO: Mr. Brian Nishimura
Housing Administrator

FROM: Norman K. Hayashi
Planning Director

SUBJECT: DEIS - Waikoloa Affordable Housing Project

We have reviewed the Draft EIS for the Waikoloa Affordable Housing Project and have the following comments:

1. Page 1-2 Paragraph 3 and Page 1-11: Paragraph 3 states that the EIS is intended to support actions which will require amendments to the General Plan and Change of Zone. However, page 1-11 does not include these amendments on the list of Necessary Permits and Approvals.

2. Page 1-3: A locational map showing the relationship of the project site to the general area is needed.

3. Page 1-3: The last sentence on this page does not relate to the context of the paragraph.

4. Page 1-8: The conclusion statement that there will be no significant impact on the flora should be based on the botanical survey.

5. Page 1-9, Paragraphs 2 to 4 and Section 5.3: Detailed discussion on the sewer system (proposed off-site by Waikoloa Sanitary Sewer Company) should be included in the EIS as it would be considered part of the project. More specifically, the location of the sewer system, the capacity of the system, and construction timetable needs to be addressed. In addition, how will the effluent will be handled and how and where will it be disposed of?

6. Page 1-10 and Page 5-14: Discussion on power and communication does not indicate whether HELCO will be able to provide the required electricity to meet this additional demand. Cost of a new substation should be noted.

7. Page 1-10 and Section 5: Detailed discussion on solid waste should be included in the EIS. How will the solid waste be collected? How will the projected two to three 6-ton truckloads per day be transported to the landfill? How will construction generated solid waste be disposed of? The location of the nearest transfer station should be noted.

8. Page 1-11: The list of Necessary Permits and Approvals should also include Housing Agency Exemption (359G, HRS).

9. Page 2-2: Figure 2-1 indicates an 8.5 acre parcel for the proposed commercial/church site, however, the discussion on pages 2-3 and 2-4 notes an 8.6 acreage.

10. Page 2-4: What effect would there be should the ranch lands be developed first? Will a diversion ditch be required? Are there other alternative flood control measures that could be handled at a lower cost? What effects would there be should the drainage retention area be located off of the site onto the Puuanahulu lands?

11. Page 3-5: The discussion on seismology and volcanic zones impacts and mitigation noted the possibility of lava flow from Kaupulehu crossing Queen Kaahumanu Highway. Should this be noted as Mamalahoa Highway?

12. Page 3-10: Discussion in the climate section should note that the area is subject to strong winds.

13. Page 5-2: Figure 5-1 very clearly shows the project site to have only one way ingress and one way egress. Such limited access may be a concern for ambulance, police and fire protection services.

14. Page 5-4: The traffic generation assumptions, 1400 total units, is inconsistent with the development program outlined on Page 2-5. Further, the development rate of 200 or more units per year seems optimistic. More realistic outlook to expect the project build out over the next 10 years at full occupancy, including the commercial and church site. A revised analysis should be considered based on the foregoing.

15. Page 5-6: The headings of Table 5-3 are mis-aligned.

16. Page 5-10: Alternative A is inconsistent with current State Department of Transportation policy.

17. Page 5-11: The requirement for an interchange has been placed on Waikoloa for the Makai development and, therefore, it can be assumed to be installed in the future.

18. Page 5-16: Section 5.7 states that the existing schools in Waimea and Honokaa cannot take the additional projected enrollment. The EIS needs to address this concern.

Mr. Brian Nishimura
Page 3
January 7, 1991

15. Pages 7-5 and 7-10: The revised General Plan was accepted by the County Council in November 1989. The General Plan Low Density Urban designation also allows for convenience type commercial uses. The EIS should note the proposed zoned district designation.

Thank you for the opportunity to review and comment on the Draft EIS for the subject development.

Sincerely,

NORMAN K. HAYASHI
Planning Director

AK

cc: OEQC
R.M. TOWILL

Office of Housing and Community Development
50 Wailuku Drive • Hilo, Hawaii 96720 • (808) 961-8379 • Fax (808) 935-4725

Lorraine R. Inouye
Mayor
Brian T. Nishimura
Housing Administrator

February 28, 1991

Mr. Norman K. Hayashi
Planning Director
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Hayashi:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your memorandum of January 7, 1991 concerning the DEIS for the subject project. In view of the detailed nature of your memorandum, we will respond point by point.

1. Page 1-2, Paragraph 3 and Page 1-11: The Final EIS will briefly discuss the County's intention to utilize a pre-emption process for the subject project.

2. Page 1-3: An "Area Map" will be provided in the Final EIS.

3. Page 1-3: The last sentence will be deleted.

4. Page 1-8: Reference will be made to the botanical survey.

5. Page 1-9: The proposed wastewater treatment system will be discussed in the Final EIS. However, as you know, this system is still in the early planning stages.

6. Page 1-10 and Page 5-14: Future power generation facilities will be discussed in the Final EIS, and the approximate cost of the new electrical substation will be noted.

7. Page 1-10 and Section 5: Solid waste collection and disposal will be discussed in the Final EIS.

8. Page 1-11: The list of Necessary Permits and Approvals will be expanded to include "Housing Agency Exemption" (359G, HRS) as well as other permits noted in several other comment letters.

EQUAL HOUSING OPPORTUNITY

9. Page 2-2: The commercial/church site acreage will be consistently shown as 8.6 acres.

10. Page 2-6: The Final EIS will include a more detailed discussion of drainage system options.

11. Page 3-5: The text should read: "Mamalahoa Highway."

12. Page 3-10: The occurrence of strong winds will be noted.

13. Page 5-2: A second access road will be available if and when the proposed new "North-South" collector road is constructed. This possibility will be mentioned in the Final EIS.

14. Page 5-4: The traffic study used the higher number of "1,400 units" in order to be on the conservative side. With respect to your comments on the absorption rate of 200 or more units per year, we believe that this rate can be achieved, given the fact that all of the units to be constructed here will be affordable.

15. Page 5-8: The headings for Table 5-3 will be properly aligned.

16. Page 5-10: The fact that signalization of Queen Kaahumanu Highway at Waikoloa Road is inconsistent with current State DOT policy will be noted in the Final EIS.

17. Page 5-11: The requirement for an interchange to be constructed by the Waikoloa Land Co. will be noted in the Final EIS.

18. Pages 5-16: The need for new schools will be addressed in the Final EIS.

19. Pages 7-9 and 7-10: New zoning district designations will not be required, as the project will be implemented as an "Experimental and Demonstration Housing Project."

We appreciate the thoroughness of your review and thank you for your participation in the planning stages of this project.

Very truly yours,

Brian Nishimura
Housing Administrator

DEPARTMENT OF PUBLIC WORKS
COUNTY OF HAWAII
HILO, HAWAII

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Memorandum

DATE January 4, 1991

TO : Planning Department

FROM : Robert K. Yanabu, Division Chief, Engineering Division

SUBJECT: WAIKOLOA AFFORDABLE HOUSING PROJECT DRAFT EIS
Location: Waikoloa, South Kohala, Hawaii
TMK: 6-8-02:31

We have reviewed the subject draft EIS and our comments are as follows:

SOLID WASTE

1. Impacts of solid waste generation need to be addressed.
   a. The nearest transfer station is at Puako and is presently operating near capacity.
   b. The two other transfer stations in Kohala are also operating near capacity.
   c. The stated 15 tons/day refuse volume would more than double the refuse loads presently being handled at Puako. This would require the hauling of at least two refuse trailers per day. The typical County refuse trailer has a capacity of about 16 tons but normally carries about 12 tons due to the varying density of refuse.
2. The cost of hauling and landfilling of all construction wastes must be included in the cost of development.

TRAFFIC

3. Intersections affected by this project are Waikoloa/Paniolo, Waikoloa/Mamalahoa, and Waikoloa/Queen Kaahumanu Highway. From the report, these intersections will be over capacity in the near future without the project. The Waikoloa/Paniolo intersection is proposed to be improved and signalized by Waikoloa Development Company in conjunction with the Highlands Golf Estates project. The Queen Kaahumanu and Mamalahoa intersections with Waikoloa Road are under the jurisdiction of the State Dept. of Transportation and required improvements to these intersections should be addressed by them. The EIS should address definite commitments for necessary improvements at all these intersections to resolve the over-capacity conditions.

DRAINAGE

4. Drainage impact analysis and proposed drainage systems meets with our approval.

   We also recommend as an alternative to the proposed channel along the lower or west side of Paniolo Avenue, a channel be considered along the mauka boundary of future developments mauka of the Waikoloa Affordable Housing property.

WASTEWATER

5. No comments to offer.

ELECTRICAL/TELEPHONE

6. In general all underground electrical and telephone lines within dedicable roadways shall be concrete jacketed with the exception of telephone service laterals.

GO:st

cc: OHCD
R.M. Towill
State, Office of Environmental Quality Control

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department

25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

February 26, 1991

Mr. Robert K. Yanabu
Chief, Engineering Division
Dept. of Public Works
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Yanabu:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your memorandum of January 4, 1991 on the DEIS for the subject project.

Impacts relating to solid waste generation will be addressed in the Final EIS. The Final EIS will also address intersection improvements in more detail. However, definite commitments for intersection improvements will have to be coordinated with other development entities who are or will be active in the Waikoloa Village area.

Your suggestions on drainage and electrical/telephone lines will be incorporated into the Final EIS.

Thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

January 22, 1991

County of Hawaii
Planning Department
Attn: Mr. Norman Hayashi
25 Aupuni Street
Hilo, Hawaii 96720

RE: Environmental Impact Statement
Waikoloa Affordable Housing Project

Gentlemen:

The proposed project falls within the designated service zones approved by the Public Utilities Commission for the private utility companies Waikoloa Water Company (WWC) and Waikoloa Sanitary Sewer Co. (WSSC). As such, development within this project will be subject to the approved Rules and Regulations of these two companies.

Certain amendments to the tariff structures of the Rules and Regulations were made by separate agreement between Waikoloa Development Co. and the County. However, WWC and WSSC continue to have approval obligations for all utility plans within this project. As such, we request that the following addition be made to Section 1.7, page 1-11:

C. Other

Waikoloa Water Company:	Water Master Plan Approval; Subdivision Improvement Drawing Approval
Waikoloa Sanitary Sewer Co.:	Sewer Master Plan Approval; Subdivision Improvement Drawing Approval

HC02 Box 5050 Waikoloa, Hawaii 96743 Phone (808) 885-1000 Fax (808) 885-8896

and in Section 5.2, page 5-13, that a third paragraph under Impacts be added, as follows:

- All construction plans for on-site water system improvements are subject to review and approval by Waikoloa Water Company (the Water Company) pursuant to the Water Company's Rules and Regulations. The Water Company shall inspect and approve on-site water improvements as they are complete.

and in Section 5.3, WASTEWATER, on page 5-14, add a second and third paragraph under Impacts and Mitigation:

- All materials and construction of on-site sewer system facilities and appurtenances shall be in accordance with the Department of Public Works of the County of Hawaii's "Standard Specifications for Public Works Construction," dated 1986, and the "Standard Details for Roads, Storm Drains and Sewers," dated 1984, and all subsequent amendments and additions.

- All construction plans for wastewater system improvements are subject to review and approval by the Waikoloa Sanitary Sewer Co. (the Sewer Company) prior to construction in accordance with the Sewer Company's Rules and Regulations. The Sewer Company shall inspect and approve the complete on-site improvements.

Further, you should be aware of water system expansions that have been completed and which are presently not reflected in the DEIS. Waikoloa Well No. 1, with a capacity of 2 million gallons per day, has been completed and is in service. This should be included in Section 2.3.2, Water System, on page 5-12. The combined pumping capacity of the three wells is 3,000 gallons per minute, or 4.3 million gallons per day, resulting in a sustained yield of 2.3 million gallons per day. A fourth well, known as Waikoloa Well No. 2, is under construction and, when complete, will increase the sustainable yield to 3.4 million gallons per day. An additional 1 million gallon storage tank will also be completed coincident with the fourth well. Both will be in service in the first quarter of 1991.

Thank you for your consideration of our comments.

Sincerely,

Stephen D. Hicks
General Manager / Vice President
Waikoloa Water Company and
Waikoloa Sanitary Sewer Co.

SH:ac

cc: Mr. Ken Melrose
Director of Planning
Waikoloa Development Co.
P. O. Box 3028
Waikoloa, Hawaii 96743

Mr. Brian Nishimura, Administrator
Office of Housing and Community Development
County of Hawaii
50 Wailuku Drive
Hilo, Hawaii 96740

Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Ms. Colette H. Sakoda
Senior Planning
R. M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817-4941

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department

25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

February 26, 1991

Mr. Stephen D. Hicks
General Manager/Vice President
Waikoloa Water Company and
Waikoloa Sanitary Sewer Co.
HCOZ Box 5050
Waikoloa, Hawaii 96743

Dear Mr. Hicks:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your letter of January 22, 1991 on the DEIS for the subject project.

The Final EIS will include a listing of approvals needed from the Waikoloa Water Company and from the Waikoloa Sanitary Sewer Company. Your suggested additions to the sections on water system and wastewater system impacts will also be incorporated in the Final EIS, as well as the updated information on your recent water system expansions.

Thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

University of Hawaii at Manoa

Environmental Center
A Unit of Water Resources Research Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 956-7361

January 7, 1991
RE:0569

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Mr. Duane Kanuha
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Kanuha:

Draft Environmental Impact Statement
Waikoloa Affordable Housing Project
South Kohala, Hawaii

The above mentioned project includes a Master Plan Development of approximately 1200 single family housing units, church/commercial areas, and recreational facilities on 279 acres.

The Environmental Center has reviewed this EIS with the assistance of Michael Graves, Anthropology; Joseph Halbig, UH Hilo/Geology; and Lee Lyttle, Environmental Center.

General Comments

Our reviewers were concerned about the general low quality of this EIS. The impact analysis in many sections were speculative and incomplete. While we appreciate the need for cost containment in the development of affordable housing projects, the quality of environmental analysis should not be compromised as a cost saving measure. It is hoped that the Final EIS will show an improvement in the level of analysis.

Noise (page 3-16)

The analysis is vague and unspecific. What are the anticipated construction related noise levels? Will neighboring homes be affected during early morning or evening hours?

Historic and Archaeological Resource (page 3-24)

Our reviewers felt that the archaeological survey is insufficient. Too little time was spent in the field for an adequate search. No field map was prepared for the report. The discussion of the survey methodology is also inadequate. The finding of no archaeological sites is highly suspect, since other sites along the Waimea-Kawaihae road corridor exist at the same elevation (see "Archaeological Investigations of the Mudlane-Waimea-Kawaihae Road Corridor, Island of Hawaii" edited by J.T. Clark amd P.V. Kirch, 1983, Departmental Report Series, 83-1. Bishop Museum).

Water System (page 5-13)

There is no discussion on the impact of this proposal on the capacity of the water system. How much water will the proposal require, and how will this affect the system's capacity?

Wastewater (page 5-14)

Where 'off-site' will the waste water be carried? What are the characteristics and capacity of that facility? How will this proposal's wastewater discharge requirements impact it and other area users?

Fire Protection (page 5-15)

What is the timing of the construction of the new fire station mentioned in this section vis-a-vis the construction of this project? Is adequate fire protection dependant upon this new facility?

Unresolved Issues (page 9-1)

The Kamakoa Gulch floodplain drainage study should have been a part of this Draft EIS. The Final EIS should include not merely the 'preliminary findings' of this study, but the final boundary demarkations, particularly if some elements of the project are to be constructed in or near the floodplain.

Thank you for the opportunity to comment on this document.

Yours truly,

John T. Harrison, Ph.D.
Environmental Coordinator

cc: OEQC
Office of Housing and Community Development
R.M. Towill Corp.
Roger Fujioka
Joseph Halbig
Michael Graves
Lee Lyttle

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

February 26, 1991

Mr. John T. Harrison, Ph.D.
Environmental Coordinator
University of Hawaii at Manoa
Environmental Center
Crawford 317 - 2550 Campus Road
Honolulu, Hawaii 96822

Dear Dr. Harrison:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your letter of January 7, 1991 on the DEIS for the subject project.

The Final EIS will provide more details on proposed facilities and probable impacts, including a more detailed description of subjects mentioned in your letter: Noise, Water System, Wastewater, Fire Protection, and Flooding.

Your comments on the archaeological survey have been noted. However, please refer to the comment letter from the Department of Land and Natural Resources (DLNR), dated January 10, 1991. DLNR states that "we agree that construction of this planned housing development is likely to have "no effect" on historic sites."

On the subject of the "Kamakoa Gulch floodplain drainage study," we agree that such a study is an important element in the planning process. However, the detailed drainage study that is needed for Kamakoa Gulch cannot be undertaken until detailed topographic data are available, and until an overall strategy for drainage management has been resolved for the several developments that are being planned in this area of Waikoloa. At this time, both the topographic data and the drainage management discussion are in process. Thus, conclusions cannot yet be documented in the Final EIS. Please be assured, however, that the Final Master Plan and subsequent design plans for the subject project will incorporate the findings and recommendations of the detailed drainage study.

Thank you for your participation in the planning stages of the project.

Very truly yours,

Norman K. Hayashi
Planning Director

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816-4495

ALEXIS T. LUM
MAJOR GENERAL
ADJUTANT GENERAL

MYLES M. NAKAISO
COLONEL
DEPUTY ADJUTANT GENERAL

November 28, 1990

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Engineering Office

County of Hawaii Planning Dept.
25 Aupuni Street
Hilo, Hawaii 96720

Attn: Mr. Duane Kanuha

Gentlemen:

Waikoloa Affordable Housing Project DEIS

Thank you for providing us the opportunity to review the above subject project.

We have no comments to offer at this time regarding this project.

Sincerely,

Jerry M. Matsuda
Lieutenant Colonel
Hawaii Air National Guard
Contracting & Engineering Officer

cc: Mr. A. Scott Leithead,
County of Hawaii
Office of Housing & Community Development
Ms. Colette Sakoda,
R.M. Towill Corporation

NATIONAL GUARD
Hawaii Air Guard

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department

25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

February 26, 1991

Mr. Jerry Matsuda
Lieutenant Colonel
Hawaii Air National Gurad
Contracting and Engineering Officer
Office of the Adjutant General
Dept. of Defense
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

Dear Mr. Matsuda:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your letter of November 28, 1990 indicating that you have no comments on the DEIS for the subject project. Thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

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County of Hawaii
Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Attention: Mr. Duane Kanuha

Gentlemen:

Subject: Waikoloa Affordable Housing Project
Draft EIS

Thank you for the opportunity to review the subject document. We have no comments to offer.

Should there be any questions, please contact Mr. Ralph Yukumoto of the Planning Branch at 548-7192.

Very truly yours,

TEUANE TOMINAGA
State Public Works Engineer

RY:jk
cc: County of Hawaii, Office of Housing and
Community Development
✓R. M. Towill Corporation
Office of Environmental Quality Control

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

(P)1986.0

February 26, 1991

Mr. Teuane Tominaga
State Public Works Engineer
Dept. of Accounting and
General Services
State of Hawaii
P.O. Box 119
Honolulu, Hawaii 96819

Dear Mr. Tominaga:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your letter of November 29, 1990 indicating that you have no comments on the DEIS for the subject project. Thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

JOHN WAIHEE
GOVERNOR

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: 548-4611

January 7, 1991

Mr. Brian T. Nishimura
Administrator
Office of Housing and Community
Development
50 Wailuku Drive
Hilo, Hawaii 96720

Dear Mr. Nishimura:

Subject: Waikoloa Affordable Housing Project DEIS

We have reviewed the draft EIS on the proposed Waikoloa Affordable Housing Project. We have no comments to offer at this time except to confirm that the subject property is in the State Land Use Urban District

Thank you for the opportunity to comment on this matter.

Sincerely,

ESTHER UEDA
Executive Officer

EU:to

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

March 13, 1991

Ms. Esther Ueda
Executive Officer
Land Use Commission
335 Merchant Street
Room 104
Honolulu, Hawaii 96813

Dear Ms. Ueda:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your letter of January 4, 1991 indicating that you have no comments on the DEIS for the subject project except to confirm that the subject property is in the State Land Use Urban District. Thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

Planning Department

25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

February 26, 1991

Mr. Harold S. Masumoto
Director
Office of State Planning
Office of the Governor
State Capitol
Honolulu, Hawaii 96813

Dear Mr. Masumoto:

SUBJECT: Waikoloa Affordable Housing Project
<u>Draft Environmental Impact Statement (EIS)</u>

We have received your letter of December 24, 1990 indicating that you have no comments on the DEIS for the subject project. Thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

OFFICE OF STATE PLANNING

Office of the Governor
STATE CAPITOL, HONOLULU, HAWAII 96813 TELEPHONE (808) 548-3493

December 24, 1990

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County of Hawaii
Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Attention: The Honorable Norman Hayashi
Planning Director

Gentlemen:

SUBJECT: Draft Environmental Impact Statement
Waikoloa Affordable Housing Project
Waikoloa, South Kohala, Hawaii
November 1990

It is our understanding that the Office of Housing and Community Development (OHCD) of the County of Hawaii is proposing to develop an affordable residential development on 340 acres in Waikoloa Village. Approximately 1,200 single- and multi-family housing units are proposed either for rent or sale.

According to page 7-8 of the DEIS, the entire proposed project site lies within the State Urban District. Therefore we do not have any comments to offer at this time.

Thank you for the opportunity to comment.

Sincerely,

Harold S. Masumoto
Director

cc: HFDC
County of Hawaii, OHCD
✓ R.M. Towill Corporation

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
465 SOUTH KING STREET, ROOM 104
HONOLULU, HAWAII 96813

Bruce S. Anderson, Ph.D.
Acting DIRECTOR

TELEPHONE NO.
548-6915

January 4, 1991

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The Honorable Duane Kanuha
Director
County of Hawaii
Department of Planning
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Kanuha:

SUBJECT: WAIKOLOA AFFORDABLE HOUSING PROJECT:
DRAFT ENVIRONMENTAL IMPACT STATEMENT

We have reviewed the document listed above and have no comments to offer at this time.

Thank you for the opportunity to submit comments on this project.

Sincerely,

for Bruce S. Anderson, Ph.D.
Acting Director

cc: A. Scott Leithead
Colette Sakoda

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department

25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

February 26, 1991

Bruce S. Anderson, Ph.D.
Acting Director
Office of Environmental Quality Control
State of Hawaii
465 South King Street, Rm. 104
Honolulu, Hawaii 96813

Dear Dr. Anderson:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your letter of January 4, 1991 indicating that you have no comments on the DEIS for the subject project. Thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

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CHARLES T. TOGUCHI
SUPERINTENDENT

December 12, 1990

Mr. Duane Kanuha
Planning Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Kanuha:

SUBJECT: Draft Environmental Impact Statement
Waikoloa Affordable Housing Project
Waikoloa, South Kohala, Hawaii
TMK: 6-8-02:31 and por 26

Our review of the subject report indicates that the proposed project of 1,200 single and multiple family units may have the following enrollment impact on the two schools listed below:

School	Grades	Projected Enrollment
Waimea Elementary/	K-5	425 - 475
Waimea Intermediate	6-8	175 - 225
Honokaa High	9-12	275 - 325

We agree with section 5.7 (Schools) which states that both schools are operating beyond capacity and have severe shortages of classrooms. We must emphasize that the schools cannot accommodate the additional enrollment until additional classrooms are built.

Honokaa High already has limited space for expansion and also requires the replacement of old wooden buildings. A new elementary school serving grades K-5 will need to be considered in the Waikoloa area if this project is developed. Additional Legislative funds will be required to address the need for more classrooms.

We request that no conditions be imposed for off-site infrastructure requirements by the County as conditions for building permits. We are having critical funding problems for classroom building projects because of added County requirements.

The Department of Education needs to be kept informed of plans for the development to allow for the timely addition of classrooms.

Please contact the Facilities Branch at 737-4743 if there are any questions.

Sincerely,

Charles T. Toguchi
Superintendent

CTT:jy

cc: E. Imai
A. Garson
Ofc. of Housing & Community Development
County of Hawaii
K. M. Towill Corporation

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

February 26, 1991

Mr. Charles T. Toguchi
Superintendent
State of Hawaii
Department of Education
P.O. Box 2360
Honolulu, Hawaii 96804

Dear Mr. Toguchi:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your letter of December 12, 1990 on the DEIS for the subject project.

We agree that a new elementary school serving grades K-5 will be needed in the Waikoloa area. This new school would serve the subject project and other existing and planned residential neighborhoods in the Waikoloa area.

Your concern relating to conditions for off-site infrastructure requirements has been noted. However, the County cannot respond to this request within the context of this EIS process.

We will certainly keep you informed as the subject project moves ahead, and we thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

JOHN WAIHEE
GOVERNOR
ROGER A. ULVELING
DIRECTOR
BARBARA KIM STANTON
DEPUTY DIRECTOR
LESLIE S. MATSUBARA
DEPUTY DIRECTOR

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

ENERGY DIVISION, 335 MERCHANT ST., RM. 110, HONOLULU, HAWAII 96813 PHONE: (808) 548-4160 FAX: (808) 531-5243

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January 7, 1991

County of Hawaii Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Attention: Mr. Norman Hayashi

Dear Mr. Hayashi:

Subject: Draft Environmental Impact Statement (DEIS)
for Waikoloa Affordable Housing Project

The Energy Division has received the above DEIS and has the following comments.

We note that the proposed project will result in a significant increase in electrical energy demand: a peak demand of about 3 megawatts and an average annual demand of about 15 million kilowatt-hours (Appendix F, pages 20-21). The DEIS suggests that the increased demand will probably be met by oil-fired generating facilities and does not mention the possibility of geothermal-produced electricity as a source of energy for the project. Given the fact that considerable activity is underway to develop geothermal power on the island of Hawaii, it should be mentioned as a likely source of electricity for the project.

Absent in this DEIS is any mention of energy conservation issues that should be addressed. The Energy Division would like to see language in the Final Environmental Impact Statement (FEIS) that commits the County of Hawaii to the use of energy conservation measures to help meet the project's energy requirements. In particular, we would like to see the FEIS indicate that the County will (1) require the project's design architects and engineers to include energy conservation measures in their designs, and (2) require the installation of solar water heating systems, heat pumps or the most efficient conventional water heating technology, and energy efficient refrigeration and lighting to the maximum extent possible.

Also, we recommend that the County adopt "energy efficiency design guidelines" for this project. We are enclosing the following for the County's consideration: (1) energy efficiency design guidelines which the Energy Division prepared for the Housing Finance and Development Corporation (HFDC) and which were included in HFDC's request for proposals for villages two and three of the Villages of Kapolei, and (2) calculations by our consultant, Peter Flachsbart, showing the positive impacts that installation of solar water heaters and heat pumps would have on home buyers at Kapolei.

In addition, we note that in Section 7, neither the State's goals, objectives, and policies for energy as set out in the Hawaii State Plan, nor the State Energy Functional Plan is mentioned. We recommend that the FEIS examine the proposed project for consistency with the energy provisions of both of the above plans. The requirement for such an examination is spelled out in the enclosed excerpt from the OEQC Bulletin. We are also enclosing the relevant portion of Act 319 of the 1990 Legislature which amends Section 226-18(c), Hawaii Revised Statutes.

Thank you for the opportunity to provide comments.

Sincerely,

Maurice H. Kaya
Energy Program Administrator

MHK/PE:do
Enclosures

cc: A. Scott Leithead
Collette Sakoda
OEQC

JOHN WAIHEE
GOVERNOR
ROGER A. ULVELING
DIRECTOR
BARBARA KIM STANTON
DEPUTY DIRECTOR
LESLIE S. MATSUBARA
DEPUTY DIRECTOR

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

ENERGY DIVISION, 335 MERCHANT ST., RM. 110, HONOLULU, HAWAII 96813 PHONE: (808) 548-4160 FAX: (808) 531-8743

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January 7, 1991

County of Hawaii Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Attention: Mr. Norman Hayashi

Dear Mr. Hayashi:

Subject: Draft Environmental Impact Statement (DEIS)
for Waikoloa Affordable Housing Project

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We note that the proposed project will result in a significant increase in electrical energy demand: a peak demand of about 3 megawatts and an average annual demand of about 15 million kilowatt-hours (Appendix F, pages 20-21). The DEIS suggests that the increased demand will probably be met by oil-fired generating facilities and does not mention the possibility of geothermal-produced electricity as a source of energy for the project. Given the fact that considerable activity is underway to develop geothermal power on the island of Hawaii, it should be mentioned as a likely source of electricity for the project.

Absent in this DEIS is any mention of energy conservation issues that should be addressed. The Energy Division would like to see language in the Final Environmental Impact Statement (FEIS) that commits the County of Hawaii to the use of energy conservation measures to help meet the project's energy requirements. In particular, we would like to see the FEIS indicate that the County will (1) require the project's design architects and engineers to include energy conservation measures in their designs, and (2) require the installation of solar water heating systems, heat pumps or the most efficient conventional water heating technology, and energy efficient refrigeration and lighting to the maximum extent possible.

Also, we recommend that the County adopt "energy efficiency design guidelines" for this project. We are enclosing the following for the County's consideration: (1) energy efficiency design guidelines which the Energy Division prepared for the Housing Finance and Development Corporation (HFDC) and which were included in HFDC's request for proposals for villages two and three of the Villages of Kapolei, and (2) calculations by our consultant, Peter Flachsbart, showing the positive impacts that installation of solar water heaters and heat pumps would have on home buyers at Kapolei.

In addition, we note that in Section 7, neither the State's goals, objectives, and policies for energy as set out in the Hawaii State Plan, nor the State Energy Functional Plan is mentioned. We recommend that the FEIS examine the proposed project for consistency with the energy provisions of both of the above plans. The requirement for such an examination is spelled out in the enclosed excerpt from the OEQC Bulletin. We are also enclosing the relevant portion of Act 319 of the 1990 Legislature which amends Section 226-18(c), Hawaii Revised Statutes.

Thank you for the opportunity to provide comments.

Sincerely,

Maurice H. Kaya
Energy Program Administrator

MHK/PE:do
Enclosures

cc: A. Scott Leithead
Collette Sakoda
OEQC

DESIGN GUIDELINES - ADDENDUM NO. 1

ENERGY EFFICIENCY DESIGN GUIDELINES

To minimize the life cycle energy use and life cycle cost of the project while maintaining the project development objectives of cost effectiveness, health, safety, security and aesthetics, the following guidelines should be considered and, where applicable, incorporated into the project plans.

1.0 Site Planning and Landscaping

1.1 Orient streets to provide an east/west orientation for the long dimension of the houses to minimize heat gains in the morning and afternoon.

1.2 Incorporate pedestrian walkways and bikeways to encourage walking and bicycling between home, school, parks and commercial areas.

1.3 Select and place landscape materials on the site to provide shading to minimize heat gains in the morning and afternoon.

1.4 Minimize exterior paved surfaces that are not shaded by trees, awnings, trellises, roofing or house.

1.5 Provide for enclosed yard areas where clotheslines could be utilized.

1.6 Incorporate drip irrigation where appropriate, and automatic irrigation system to conserve water.

1.7 Select drought-tolerant landscape materials where appropriate to reduce the need for water and energy consumption associated with landscape maintenance.

2.0 Building Design

2.1 Use operable windows to allow cross ventilation in every room, and orient openings toward prevailing winds.

2.2 Utilize eaves (minimum 30"), louvers, trellises, or shade screen to shade windows, especially on west, south and east sides.

2.3 Ventilate attic with devices such as louvers at or near the roof ridge to reduce attic heat buildup and resultant heat transfer to living areas.

2.4 Install a radiant barrier (reflective foil-faced kraft paper material or similar product) in the attic to reduce heat gain into the house attic. Typically installed at the underside of the roof rafters or the top side of the ceiling joists per manufacturer's recommendations.

2.5 Use light colored finishes on roof and wall to reflect sunlight.

3.0 Mechanical Equipment and Systems

3.1 Consider use of heat pump waterheaters.

3.2 Consider use of solar waterheater or provide for future installation by pre-plumbing and running power and control wiring.

3.3 Utilize the most efficient refrigerators, clothes dryers, and dishwashers.

3.4 Install ceiling fans or provide for future installation.

3.5 Use time switches to cut off electricity when not needed to high-usage applications or equipment such as electric waterheater.

3.6 Install fluorescent lights with high efficiency ballasts.

3.7 Use low water consumption waterclosets.

3.8 Install flow restrictors on showers and other water uses which can have high flow rates.

IMPACTS OF H. B. 3299 ON HOME BUYERS
by
Peter G. Flachsbart, Ph.D.

June 23, 1990

HB 3299 allows homeowners to take a 35% (up to $1,750) tax credit for installation of a solar hot water system and a 20% (up to $400) tax credit for installation of a heat pump. This report summarizes the financial impacts that this legislation could have on home buyers. Impacts are shown for a family of four that buys a home at Kumu Iki Village in Kapolei. These homes, which will have gas water heaters and ranges, are used as the baseline case for home prices, qualifying incomes and energy consumption (i.e., 445 kwh/mo. and 25.6 therms/mo.). Table I shows the financial impacts if Kumu Iki buyers install energy-saving equipment. Table II shows the impacts if all-electric appliances are provided in a future Kapolei increment.

Methodology

At Kumu Iki Village, a family of four would consume 585 kwh/mo. if their home had a heat pump and 485 kwh/mo. if it had a solar system. To accommodate the energy improvements, electric water heaters would replace the gas units. The range would consume 3.4 therms/mo. if it was gas and 55 kwh/mo. if electric. The family would pay 8.34¢/kwh and $1.20/therm plus the $6/mo. service charges. Utility rates would increase an average 4%/year. The family would need an 80 gal. tank for either the heat pump or solar system, and the combined solar panels would be 48 square feet. Installed cost would be $2,000 for the heat pump and $4,000 for the solar system.

Affordable housing ($89,000-$120,000) would require FHA/Hula Mae financing; mid-level market homes ($179,000-$217,000) would use FHA financing, and upper-level market homes (≥ $226,000) would use conventional financing. All home buyers would use a 30-year, fixed rate mortgage. However, buyers who invest in solar hot water systems and who use FHA financing are eligible for more favorable qualifying ratios. Conventional mortgage underwriters may credit borrowers for their reduced utility bills when calculating the borrower's qualifying income. The underwriter treats the reduced utility bill as a compensating factor that enhances borrowing ability. Since most of the higher mortgage payment is interest, it can be claimed as an itemized deduction on the home owner's income tax returns. Assuming a fixed interest rate on the mortgage, the increase in the mortgage payment for energy equipment will remain level over time, while the utility bill savings may increase if utility rates increase.

The attached tables show the net total savings for the buyer's pocketbook if the home is held either two or five years. The net total savings for the pocketbook equal:

(the tax credit with interest + cumulative savings on utility bills)
- (increase in down payment + sum of increased mortgage payments).

Findings

Home buyers who install energy equipment would face a change in qualifying annual incomes, from a decrease of $983 to an increase of $1,307, and all would make higher down payments ($119-$896) to finance the energy improvements. Further, the amortized cost of the energy improvement would result in higher monthly mortgage payments ($15.02-$33.53), which would be offset by the savings on monthly utility bills ($14.96-$30.02).

Net total savings for the pocketbook vary from $95-$1,404 for property held two years and from $455-$1,973 for property held five years. Variation is due to the type of mortgage financing, the buyer's income tax bracket, how long the property is held, and whether a home has gas appliances or is all-electric. Net savings were found to be greater for: solar systems over heat pumps, all-electric home those with gas appliances, and homes owned five instead of two Affordable homes have the greatest net savings for the pocketbo

TABLE I. FINANCIAL IMPACTS OF OPTIONAL ENERGY EQUIPMENT ON KAPOLEI HOME BUYERS

(Assumes home will be equipped with electric water heater and gas range.)

Heat Pump

Average home price (1,000)[a]	Qualifying gross annual income w/o equipment	Change in qualifying income w/ equipment	Percentage change in qualifying income
$96	$32,038	$678	2.1%
$102	$33,073	$678	2.0%
$109	$36,447	$678	1.9%
$118	$39,499	$678	1.7%
$120	$40,198	$679	1.7%
$189	$65,565	$694	1.1%
$208	$65,543	$621	0.9%
$235	$76,010	$653	0.9%
$248	$80,295	$653	0.8%
$265	$85,724	$653	0.8%
$279	$90,528	$653	0.7%

	Property Held Two Years					Property Held Five Years				
Average home price (1,000)[a]	Value of tax credit with interest[b]	Cumulative savings on utility bills[c]	Increase in down payment	Sum of increased mortgage payments[d]	Net total savings for pocketbook[e]	Value of tax credit with interest[b]	Cumulative savings on utility bills[c]	Increase in down payment	Sum of increased mortgage payments[d]	Net total savings for pocketbook[e]
$96	$424	$373	$119	$295	$383	$465	$992	$119	$738	$620
$102	$424	$373	$119	$295	$383	$465	$992	$119	$738	$620
$109	$424	$373	$119	$295	$383	$465	$992	$119	$738	$620
$118	$424	$373	$119	$295	$383	$465	$992	$119	$738	$620
$120	$424	$373	$119	$295	$383	$465	$992	$119	$738	$620
$189	$420	$373	$254	$244	$383	$470	$992	$254	$624	$584
$208	$420	$373	$448	$250	$295	$470	$992	$448	$559	$455
$235	$420	$373	$432	$227	$95	$470	$992	$432	$567	$463
$248	$420	$373	$432	$227	$134	$470	$992	$432	$567	$463
$265	$420	$373	$432	$227	$134	$470	$992	$432	$567	$463
$279	$420	$373	$432	$227	$134	$470	$992	$432	$567	$463

Solar System

Average home price (1,000)[a]	Qualifying gross annual income w/o equipment	Change in qualifying income w/ equipment	Percentage change in qualifying income
$96	$32,038	$243	0.8%
$102	$34,073	$175	0.5%
$109	$36,477	$96	0.3%
$118	$39,499	($5)	0.0%
$120	$40,190	($28)	-0.1%
$189	$65,565	($894)	-1.3%
$208	$65,543	($963)	-1.5%
$235	$76,010	$1,307	1.7%
$248	$80,295	$1,307	1.6%
$265	$85,724	$1,307	1.5%
$279	$90,528	$1,307	1.4%

	Property Held Two Years					Property Held Five Years				
Average home price (1,000)[a]	Value of tax credit with interest[b]	Cumulative savings on utility bills[c]	Increase in down payment	Sum of increased mortgage payments[d]	Net total savings for pocketbook[e]	Value of tax credit with interest[b]	Cumulative savings on utility bills[c]	Increase in down payment	Sum of increased mortgage payments[d]	Net total savings for pocketbook[e]
$96	$1,483	$581	$238	$590	$1,236	$1,696	$1,545	$238	$1,475	$1,528
$102	$1,483	$581	$238	$590	$1,236	$1,696	$1,545	$238	$1,475	$1,528
$109	$1,483	$581	$238	$590	$1,236	$1,696	$1,545	$238	$1,475	$1,528
$118	$1,483	$581	$238	$590	$1,236	$1,696	$1,545	$238	$1,475	$1,528
$120	$1,483	$581	$238	$590	$1,236	$1,696	$1,545	$238	$1,475	$1,528
$189	$1,469	$581	$508	$499	$1,043	$1,645	$1,545	$508	$1,247	$1,434
$208	$1,469	$581	$896	$447	$707	$1,645	$1,545	$896	$1,117	$1,176
$235	$1,469	$581	$864	$454	$732	$1,645	$1,545	$864	$1,134	$1,191
$248	$1,469	$581	$864	$454	$732	$1,645	$1,545	$864	$1,134	$1,191
$265	$1,469	$581	$864	$454	$732	$1,645	$1,545	$864	$1,134	$1,191
$279	$1,469	$581	$864	$454	$732	$1,645	$1,545	$864	$1,134	$1,191

Note: a. Prices represent Kumu Iki at Villages of Kapolei.

b. Assumes: tax credit is received 8 months after purchase of home; tax credit earns interest at 5.75 percent per year compounded monthly; and income taxes are paid on interest.

c. Assumes energy equipment is sized for family of four and utility rates will increase an average 4 percent per year.

d. Increased mortgage payments for energy improvement have been offset for the mortgage interest deduction on income tax returns.

e. [illegible] on utility bills) – (increase in down payment + sum of increased mortgage payments).

TABLE II. FINANCIAL IMPACTS OF OPTIONAL ENERGY EQUIPMENT ON KAPOLEI HOME BUYERS

(Assumes home will be equipped with all-electric appliances.)

Heat Pump

Average home price (1,000)[a]	Qualifying gross annual income w/o equipment	Change in qualifying income w/ equipment	Percentage change in qualifying income	Property Held Two Years: Value of tax credit with interest[b]	Cumulative savings on utility bills[c]	Increase in down payment	Sum of increased mortgage payments[d]	Net total savings for pocketbook[e]	Property Held Five Years: Value of tax credit with interest[b]	Cumulative savings on utility bills[c]	Increase in down payment	Sum of increased mortgage payments[d]	Net total savings for pocketbook[e]
$96	$32,036	$678	2.1%	$424	$541	$119	$295	$551	$485	$1,437	$119	$738	$1,065
$102	$34,073	$678	2.0%	$424	$541	$119	$295	$551	$485	$1,437	$119	$738	$1,065
$109	$36,447	$678	1.9%	$424	$541	$119	$295	$551	$485	$1,437	$119	$738	$1,065
$118	$39,499	$678	1.7%	$424	$541	$119	$295	$551	$485	$1,437	$119	$738	$1,065
$120	$40,198	$679	1.7%	$424	$541	$119	$295	$551	$485	$1,437	$119	$738	$1,065
$189	$65,565	$694	1.1%	$420	$541	$254	$244	$462	$470	$1,437	$254	$624	$1,030
$208	$65,543	$621	0.9%	$420	$541	$448	$250	$263	$470	$1,437	$448	$559	$901
$235	$76,010	$653	0.9%	$420	$541	$432	$227	$302	$470	$1,437	$432	$567	$908
$248	$80,295	$653	0.8%	$420	$541	$432	$227	$302	$470	$1,437	$432	$567	$908
$265	$85,724	$653	0.8%	$420	$541	$432	$227	$302	$470	$1,437	$432	$567	$908
$279	$90,528	$653	0.7%	$420	$541	$432	$227	$302	$470	$1,437	$432	$567	$908

Solar System

Average home price (1,000)[a]	Qualifying gross annual income w/o equipment	Change in qualifying income w/ equipment	Percentage change in qualifying income	Property Held Two Years: Value of tax credit with interest[b]	Cumulative savings on utility bills[c]	Increase in down payment	Sum of increased mortgage payments[d]	Net total savings for pocketbook[e]	Property Held Five Years: Value of tax credit with interest[b]	Cumulative savings on utility bills[c]	Increase in down payment	Sum of increased mortgage payments[d]	Net total savings for pocketbook[e]
$96	$32,038	$243	0.8%	$1,483	$749	$238	$590	$1,404	$1,696	$1,990	$238	$1,475	$1,973
$102	$34,073	$175	0.5%	$1,483	$749	$238	$590	$1,404	$1,696	$1,990	$238	$1,475	$1,973
$109	$36,447	$96	0.3%	$1,483	$749	$238	$590	$1,404	$1,696	$1,990	$238	$1,475	$1,973
$118	$39,499	($5)	0.0%	$1,483	$749	$238	$590	$1,404	$1,696	$1,990	$238	$1,475	$1,973
$120	$40,198	($28)	-0.1%	$1,483	$749	$238	$590	$1,404	$1,696	$1,990	$238	$1,475	$1,973
$189	$65,565	($894)	-1.3%	$1,469	$749	$508	$499	$1,211	$1,645	$1,990	$508	$1,247	$1,880
$208	$65,543	($983)	-1.5%	$1,469	$749	$896	$447	$875	$1,645	$1,990	$896	$1,117	$1,622
$235	$76,010	$1,307	1.7%	$1,469	$749	$864	$454	$900	$1,645	$1,990	$864	$1,134	$1,637
$248	$80,295	$1,307	1.6%	$1,469	$749	$864	$454	$900	$1,645	$1,990	$864	$1,134	$1,637
$265	$85,724	$1,307	1.5%	$1,469	$749	$864	$454	$900	$1,645	$1,990	$864	$1,134	$1,637
$279	$90,528	$1,307	1.4%	$1,469	$749	$864	$454	$900	$1,645	$1,990	$864	$1,134	$1,637

Note: a. Prices represent Kumu Iki at Villages of Kapolei.

b. Assumes: tax credit is received 6 months after purchase of home; tax credit earns interest at 5.75 percent per year compounded monthly; and income taxes are paid on interest.

c. Assumes energy equipment is sized for family of four and utility rates will increase an average 4 percent per year.

d. Increased mortgage payments for the energy improvement have been offset for the mortgage interest deduction on income tax returns.

e. Net total savings = (value of tax credit with interest + cumulative savings on utility bills) - (increase in down payment + sum of increased mortgage payments).

465 SOUTH KING STREET · KEKUANAOA BUILDING, #104 · HONOLULU, HAWAII 96813 TELEPHONE (808) 548-6915

OEQC BULLETIN

OFFICE OF ENVIRONMENTAL QUALITY CONTROL

JOHN WAIHEE
GOVERNOR

MARVIN T. MIURA, Ph D
DIRECTOR

Volume 5 | September 23, 1988 | Number 18

REGISTER OF CHAPTER 343, HRS DOCUMENTS

All Chapter 343, HRS documents submitted for publication in the OEQC Bulletin must be addressed to the Office of Environmental Quality Control, 465 South King Street, Room 104, Honolulu, Hawaii 96813. Documents addressed otherwise will not be considered for publication.

NEGATIVE DECLARATIONS

The following are Negative Declarations or determinations made by proposing or approving agencies that certain proposed actions will not have significant effects on the environment and therefore do not require EISs (EIS Rules 11-200-11). Publication in the Bulletin of a Negative Declaration initiates a 60-day period during which litigation measures may be instituted. Copies are available at 25 cents per page upon request to the Office. Parties wishing to comment may submit written comments to the agency responsible for the determination (indicated in project title). The Office would appreciate a copy of your comments.

KAUAI

GOLF COURSE AT HYATT REGENCY, POIPU, Ainako Resort Associates-Grove Farm Properties, Inc./County of Kauai Planning Commission

The applicant proposes to develop an 18-hole championship-calibre golf course and operate it in association with the planned 605-room Hyatt Regency Kauai at Keoneloa Bay. The proposed development will be maintained as a resort-oriented facility but will be opened to the public. It will be developed also to accommodate an increasing demand for golf play in Poipu and to make South Kauai more competitive with other visitor destination areas on the island.

The golf course will consist of 18 holes, a driving range, putting green, and clubhouse. The clubhouse will be located near the planned Hyatt Regency Kauai and will include parking and access from Poipu Road extension. The clubhouse will include a golf pro shop, restaurant, golf club storage room and golf cart maintenance area. Also proposed are a golf course maintenance building and temporary field nursery that will be located within the golf fairways away from the golf clubhouse.

NOTEWORTHY

NEWS FROM THE EPA

Rule finalized for Premanufacture Notification Fees

The EPA Administrator signed a final rule requiring fees from manufacturers, importers, and processors who are seeking Agency review of premanufacture notices (PMNs) for new chemicals, exemption applications and significant new-use notices submitted under Section 5 of the Toxic Substances Control Act (TSCA). The rule will be published in the Federal Register within two weeks. Contact: TSCA Assistance Information Service (202) 554-1404.

Chemical Fact Sheets

EPA has distributed about 180 fact sheets prepared by the State of New Jersey on chemicals which must be reported under Section 313 of Title III (annual toxic chemcial release reports). EPA and New Jersey have committed to developing fact sheets on the remaining Section 313 chemicals by December 31, 1988. Each fact sheet contains a 2- to 5-page summary of relevant information on each chemical and was developed primarily for individuals working with chemicals, and also offers relevant and important information for general use. To obtain copies of the fact sheets, call the TSCA Information Assistance Service (202)554-1404.

Lead in Drinking Water

Safe Drinking Water Hotline's correct number: 1-800-426-4791 or (202)382-5533 in the Washington metropolitan area.

ENERGY IMPACTS

Draft Environmental Impact Statements should comply with the requirements found in State laws for evaluating any energy impacts that the project will have. The mandate for such an evaluation is found in Chapter 344, HRS ("State Environmental Policy") and Chapter 226, HRS ("Hawaii State Planning Act"). In particular, Chapter 226-18(a)(2) and (c)(3); 226-52(a)(2) and (b)(2)(D); and 226-103(f)(1) and (2) should be noted.

ENVIRONMENTAL COUCNIL MEETINGS

The Environmental Council is currently updating its list of individuals, organizations, and agencies that receive notices of its meetings. All those wishing to be kept on or added to the list are asked to submit their names and addresses to: Environmental Council, 465 S. King Street, Room 104, Honolulu, HI 96813.

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

February 26, 1991

Mr. Maurice H. Kaya
Energy Program Administrator
State of Hawaii
Dept. of Business, Economic
Development and Tourism
335 Merchant St., Room 110
Honolulu, Hawaii 96813

Dear Mr. Kaya:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your letter of January 7, 1991 on the DEIS for the subject project.

In accordance with your suggestion, we will mention geothermal power as a possible future source of electricity for the project.

Your suggestions concerning energy conservation measures and design guidelines are appreciated and, where practical, will be implemented in the design and construction of the project. We will also discuss the State's goals, objectives and policies for energy in the Final EIS.

Thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

SECTION 2. This Act shall take effect upon its approval.
(Approved July 3, 1990.)

ACT 319

H.B. NO. 3299

A Bill for an Act Relating to Energy Conservation.

Be It Enacted by the Legislature of the State of Hawaii:

SECTION 1. The legislature recognizes the need to promote and support energy conservation and renewable energy resources in the State of Hawaii. The legislature finds, however, that the State's dependency on imported fossil fuel remains unabated, even in the face of the emergence of cost-effective and energy-saving technologies. Accordingly, the use of commercially available energy conservation systems, the adoption of energy-saving measures, and the development of demand-side management programs should be promoted to encourage the consumer's efficient use of energy resources.

Solar water heating systems and heat pumps are off-the-shelf, commercially available energy conservation systems that give every resident the opportunity to use an abundant renewable energy resource—the sun. Additionally, ice storage systems are designed to shift the consumption of energy to off-peak periods.

Although solar energy systems and heat pumps for water heating can play a major role in energy conservation, the current low price of imported oil has adversely affected the competitive viability of such devices. Further, the continued prudent use of energy by devices, such as ice storage systems, should be encouraged. As such, the legislature finds that incentives in the form of higher state tax credits are needed to ensure that progress will continue toward the State's goals of reducing its dependence on imported oil and using energy prudently. One of the purposes of this Act then, is to provide for a tax credit increase for the installation of ice storage systems and of solar water heating systems and to clarify the tax credit for heat pumps in new and existing buildings.

Recognizing our dependency on imported oil and our fragile and vulnerable economic foundation, the Hawaii state plan promotes the prudent use of power and fuel supplies through conservation measures. Consumer demand for energy must be considered an important variable that can be influenced by public utility actions. Demand-side management is the planning and implementation of utility actions to influence consumer use of energy to affect the utility system's demand characteristics. Acknowledging the importance of demand-side management, this Act also amends the state policy relating to the use of energy to include demand-side management programs as a conservation measure.

SECTION 2. Section 226-18(c), Hawaii Revised Statutes, is amended by amending subsection (c) to read as follows:

"(c) To further achieve the energy objectives, it shall be the policy of this State to:

(1) Support research and development as well as promote the use of renewable energy sources[.];
(2) Ensure a sufficient supply of energy to enable power systems to support the demands of growth[.];
(3) Promote prudent use of power and fuel supplies through conservation measures including [education and energy-efficient practices and technologies.];
   (A) Development of cost-effective demand-side management programs;
   (B) Education; and
   (C) Adoption of energy-efficient practices and technologies; and
(4) Ensure that the development or expansion of power systems and sources adequately consider environmental, public health, and safety concerns, and resource limitations."

SECTION 3. Section 235-12, Hawaii Revised Statutes, is amended to read as follows:

"§235-12 [Solar or wind energy devices, heat pumps or ice storage systems;] Energy conservation; income tax credit. (a) [Each] For taxable years ending before January 1, 1990, except in the case of ice storage systems for taxable years ending before January 1, 1991, each individual and corporate resident taxpayer who files an individual or corporate net income tax return for a taxable year, may claim a tax credit under this section against the Hawaii state individual or corporate net income tax. The tax credit may be claimed for any solar or wind energy device, heat pump, or ice storage system in an amount not to exceed ten per cent of the total cost of the device, heat pump, or ice storage system; provided that the tax credit shall apply only to the actual cost of the solar or wind energy device, the heat pump, or ice storage system, their accessories, and installation and shall not include the cost of consumer incentive premiums unrelated to the operation of the solar or wind energy device, the heat pump, or ice storage system offered with the sale of the solar or wind energy device, the heat pump, or ice storage system. The credit shall be claimed against net income tax liability for the year in which the solar or wind energy device, the heat pump, or ice storage system was purchased and placed in use; provided:

(1) The tax credit shall be applicable only with respect to solar devices, which are erected and placed in service after December 31, 1974, but before [December 31, 1992;] January 1, 1990;
(2) In the case of wind energy devices and heat pumps, the tax credit shall be applicable only with respect to wind energy devices and heat pumps which are installed and placed in service after December 31, 1980, but before [December 31, 1992; and] January 1, 1990; and
(3) In the case of ice storage systems, the tax credit shall be applicable only with respect to ice storage systems which are installed and placed in service after December 31, 1985, but before [December 31, 1992.] January 1, 1990.

Tax credits which exceed the taxpayer's income tax liability may be used as a credit against the taxpayer's income tax liability in subsequent years until exhausted. If federal energy tax credits are not extended beyond December 31, 1985, are not retroactively extended or reenacted, or federal energy tax credits the same as or less in amount than the credits in effect during the 1985 taxable year are not enacted during the taxable year 1986, then the state tax credit shall be increased to [twenty] fifteen per cent of the total cost after [December 31, 1989, to December 31, 1992.

(b)] The director of taxation shall prepare such forms as may be necessary to claim a credit under this section. The director may also require the taxpayer to furnish reasonable information in order to ascertain the validity of the claim for credit made under this section and may adopt rules necessary to

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
HOUSING FINANCE AND DEVELOPMENT CORPORATION
SEVEN WATERFRONT PLAZA, SUITE 300
500 ALA MOANA BOULEVARD
HONOLULU, HAWAII 96813
FAX (808) 543-0000

JOSEPH K. CONANT
EXECUTIVE DIRECTOR

IN REPLY REFER TO:

RMT | DK | RYK | WES | BTT | RDF
REC'D JAN 4 1991 RMTC
GSY | DKM

91:PLNG/9jt

January 2, 1991

TO: Norman K. Hayashi
County of Hawaii Planning Department

FROM: Joseph K. Conant
Executive Director

SUBJECT: DRAFT EIS FOR THE WAIKOLOA AFFORDABLE HOUSING PROJECT

Thank you for the opportunity to review the subject EIS. Our comments are as follows.

With respect to the proposed multi-family rental units, it is possible that the units could be developed under the State's Rental Housing System (RHS). Under this program, rental projects are financed from the proceeds of tax-exempt revenue bonds issued by the Housing Finance and Development Corporation. The HFDC would retain ownership of the rental projects and bonds would be payable from and secured by a lien on, and pledge of, the net revenues of the entire system. The RHS could be used in conjunction with the HFDC's Rental Assistance Program which provides rent subsidies to lower the rent to eligible tenants.

As for the single family, for sale units targeted for the Hula Mae income group, please note that the maximum sales price for a newly constructed unit in the County of Hawaii is presently $134,100 (not $167,000).

Consideration should also be given to Policy C(7) of the State Housing Functional Plan which strives to integrate special needs housing in new and existing neighborhoods. As defined in the housing plan, "special needs housing" means housing for persons for whom social problems, age, or physical or mental handicaps impair their ability to live independently and for whom such ability can be improved by more suitable housing conditions.

JT:eks

c: Brian Nishimura, Office of Housing and Community Development
Colette Sakoda, R.M Towill Corporation
Office of Environmental Quality Control

Planning Department
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

February 26, 1991

Mr. Joseph K. Conant
Executive Director
State of Hawaii
Housing Finance and Development
Corporation
500 Ala Moana Blvd.
Honolulu, Hawaii 96813

Dear Mr. Conant

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your memorandum of January 2, 1991 on the DEIS for the subject project.

We appreciate your comments concerning the possible applicability to this project of the State's Rental Housing System and Rental Assistance Program. The County and the selected Master Developer will, I believe, wish to explore these possibilities in greater depth.

Your comments on for sale units for the Hula Mae income group and on special needs housing have been noted, and will be incorporated in the Final EIS.

Thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

JOHN WAIHEE
GOVERNOR OF HAWAII

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

JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

RMT		WES	
DK		BTT	
RYK		RMF	
REC'D FEB	1	1991	RMTC
GSY			

In reply, please refer to:
EPHSD

January 31, 1991

91-1-006

MEMORANDUM

TO: Norman K. Hayashi, Director
Planning Department County of Hawaii

FROM: Director of Health

SUBJECT: Draft Environmental Impact Statement
Waikoloa Affordable Housing Project
Waikoloa, South Kohala, Hawaii
TMK: 6-8-02: 31 and por. 26

Thank you for the opportunity to review and comment on the subject document. We have examined the Draft Environmental Impact Statement (DEIS) and have the following comments to offer:

Drinking Water

1. According to the DEIS, the proposed project will be served by the Waikoloa Water Company (Public Water System No. 135). The development will require the installation of a new 12-inch waterline, fire hydrant, and service laterals. Section 11-20-30 of Chapter 20 requires that new or substantially modified distribution systems for public water systems be approved by the Director.

2. The proposed development is situated above the Department's Underground Injection Control (UIC) line. Land areas located above the UIC line are generally considered to contain underground sources of drinking water. These areas should therefore be protected against all sources of groundwater contamination.

3. According to the DEIS, drywells will be used for the disposal of surface water runoff. Since these drywells would be classified as injection wells, they must comply with the Department's Administrative Rules, Title 11, Chapter 23, "Underground Injection Control." Chapter 23 requires UIC permits for the construction and operation of all injection wells.

If you should have any questions, please contact the Safe Drinking Water Branch at 543-8258.

Wastewater Disposal

At this time, the details of wastewater treatment and disposal plans from the site are incomplete.

In our previous comments to the Master Plan, Environmental Impact Statement Preparation Notice date September 1990, we recommended the use of a centralized collection and treatment system meeting the current requirements of Chapter 11-62. However, please be informed that proposed revisions to Chapter 11-62, "Wastewater Systems" will require that such a centralized wastewater treatment facility be constructed to meet county standards. Also, the subject area is above the UIC line, therefore the use of injection wells as a means of effluent disposal are prohibited.

If you should have any questions, please contact Harold Yee of the Wastewater Branch at 543-8295.

Very truly yours,

for JOHN C. LEWIN, M.D.
Director of Health

cc: Wastewater Branch
Safe Drinking Water Branch
Office of Housing Community Development (Hawaii County)
✓R.M. Towill Corp

Planning Department
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

February 26, 1991

John C. Lewin, M.D., Director
State of Hawaii
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Lewin:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your letter of January 31, 1991 on the DEIS for the subject project.

Your comments concerning the need for the Director's approval of the proposed public water system and the need for UIC permits for injection wells have been noted and will be mentioned in the Final EIS. The need to protect groundwater resources in this area will also be discussed. The Final EIS will include a description of the proposed wastewater treatment and disposal systems.

Thank you for your participation in the planning stages of the project.

Very truly yours,

Norman K. Hayashi
Planning Director

JOHN WAIHEE
GOVERNOR

HWT			K-8
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REC'D			RMTC
GSY			
DXM			

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

January 18, 1991

EDWARD Y. HIRATA
DIRECTOR

DEPUTY DIRECTORS
DAN T. KOCHI (PRIMARY)
RONALD N. HIRANO
JEANNE K. SCHULTZ
CALVIN M. TSUDA

IN REPLY REFER TO
HWY-PS
2.5251

MEMORANDUM

TO: Dr. Bruce Anderson, Acting Director
Office of Environmental Quality Control

FROM: Edward Y. Hirata, Director

SUBJECT: DRAFT EIS, WAIKOLOA AFFORDABLE HOUSING PROJECT
TMK: 6-8-02: 31 AND PORTION 26

We have the following comments:

1. (a) A grade-separated, full diamond interchange should be constructed at the intersection of Waikoloa Road and Queen Kaahumanu Highway, and (b) Mitigation measures for the intersection of Waikoloa Road and Mamalahoa Highway should be proposed and submitted for our review. Plans for these improvements should be coordinated with our Highways Division.

2. The developer should be aware of our plans to have Queen Kaahumanu Highway serve as a high speed, limited access, divided freeway. Access to the freeway will be allowed only at designated locations.

3. Any work within the State highway right-of-way will require a permit and construction plans must be submitted for our review and approval.

4. Additional regional traffic mitigation measures required as a cumulative result of this and other projects in the area should also be provided by the developer. The developer should participate in the funding and construction of such regional traffic improvements on a prorata basis, as determined by the State Department of Transportation.

5. Utilities should be placed underground to mitigate any impact on scenic vistas.

6. Bikepaths and highway landscaping should be considered and addressed.

7. This project should be coordinated with other developments in the adjacent areas.

8. Costs for required roadway improvements shall be borne by the developer.

✓bc: R.M. Towill Corporation

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

February 26, 1991

Mr. Edward Y. Hirata
Director
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Hirata:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received a copy of January 18, 1991 memorandum addressed to Mr. Bruce Anderson, Acting Director, Office of Environmental Quality Control, concerning the DEIS for the subject project.

We agree that intersection improvements will be needed at Waikoloa Road/Queen Kaahumanu Highway, and at Waikoloa Road/Mamalahoa Highway. However, a resolution of these improvements is beyond the scope of this EIS process. The County will work with other development entities that are active in the Waikoloa area to develop intersection improvement plans that will be acceptable to your department.

Your other comments and suggestions have been taken under advertisement and will be incorporated into the Final EIS as appropriate.

Thank you for your participation in the planning stages of the project.

Very truly yours,

Norman K. Hayashi
Planning Director

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

REP:OCEA:JN

File No.: 91-223
Doc. No.: 9545E

JAN 10 1991

The Honorable Norman Hayashi, Director
Planning Department
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Hayashi:

Subject: Environmental Impact Statement (EIS) Waikoloa Affordable Housing Project South Kohala, Hawaii, TMK: 6-8-02: 31 and portion 26

Thank you for giving our Department the opportunity to comment on this matter. We have reviewed the materials submitted by the State of Hawaii-Office of Environmental Quality Control and have the following comments.

We concur that the archaeological survey adequately demonstrates the probable absence of historic sites in the 279 acre planned housing development and that the historic literature review depicts the area as having been marginal for major subsistence and residential activities. These results are also adequately addressed within the main text of the EIS. We agree that construction of this planned housing development is likely to have "no effect" on historic sites.

We would, however, ask that one addition be made to the main text of the EIS where Historic and Archaeological Resources are discussed. Despite negative survey results and an overall low probability of finding historic remains, it is always possible that some, including human burials, could be uncovered during construction. Please ask the Applicant to add a statement which acknowledges this possibility and commits them to halting construction in the immediate vicinity of an inadvertent discovery.

Our State Historic Preservation Division should then be contacted as soon as possible so that one of our staff can assess the situation and recommend appropriate mitigation measures if necessary.

Our Divisions' of Water Resource Management and Forestry and Wildlife will comment directly to you if they have comments.

Thank you for you cooperation in this matter. Please feel free to call me or Bob Johnson at our Office of Conservation and Environmental Affairs, at 548-7837, if you have questions.

Very truly yours,

William W. Paty

cc: Office of Housing & Community Development, County of Hawaii
R.W. Towill Corp.
Environmental Quality Control

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

February 26, 1991

Mr. William W. Paty, Chairman
State of Hawaii
Department of Land and
Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Paty:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your letter of January 10, 1991 on the DEIS for the subject project.

Thank you for your concurrence with the DEIS finding that the subject project is likely to have "no effect" on historic sites. In accordance with your request, we will add a paragraph to the Final EIS that addresses procedures to be followed in the event that historic remains are discovered during construction.

Thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

HAI
DK
RYK

P. O. BOX 50004
HONOLULU, HAWAII
96850

REC'D JAN 1 . 1991 RMTC

GSV
DKM

January 8, 1991

County of Hawaii Planning Department
(On behalf of the Mayor, County of Hawaii)
25 Aupuni Street
Hilo, Hawaii 96720

Attention: Mr. Duane Kanuha

Dear Mr. Kanuha:

Subject: Draft Environmental Impact Statement (DEIS) - Waikoloa Affordable Housing Project, South Kohala, Hawaii

The above-mentioned document has been reviewed as requested. We offer the following comments your consideration:

Blowing dust and dirt can be expected to be a problem during construction, hence the developer will need to ensure that proper dust control measures are in place and operational prior to ground breaking. These measures could include water trucks, temporary irrigation systems, mulches, and erosion control fabrics. The soils in the Waikoloa area are highly susceptible to wind erosion from the periodic winds that occur.

This development can be expected to reduce infiltration of rain water and increase runoff to Kamakoa Gulch. This problem was discussed in Section 2.3.3, page 2-6. Mention should be made of operation and maintenance for the dry wells and channels to ensure their proper operation.

Thank you for the opportunity to review this document. We would appreciate the opportunity to review the final EIS.

Sincerely,

Acting

WARREN M. LEE
State Conservationist

cc:
County of Hawaii Office of Housing & Community Development, 50 Wailuku Drive, Hilo, Hawaii 96720, Attention: A. Scott Leithead
R. M. Towill Corporation, 420 Waiakamilo Road, Room 411, Honolulu, Hawaii 96817, Attention: Colette Sakoda
Office of Environmental Quality Control, 465 South King Street, Room 104, Honolulu, Hawaii 96813

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department

25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

February 26, 1991

Mr. Warren M. Lee
Acting State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
P.O. Box 50004
Honolulu, Hawaii 96850

Dear Mr. Lee:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your letter of January 8, 1991 on the DEIS for the subject project.

We agree that proper dust control measures will be needed during construction, and we will discuss this issue in the Final EIS. The need for proper maintenance of dry wells and drainage channels will also be discussed.

Thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

United States Department of the Interior

GEOLOGICAL SURVEY

WATER RESOURCES DIVISION
677 Ala Moana Blvd., Suite 415
Honolulu, Hawaii 96813

January 02, 1991

RMT		WES	
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GSY			
DKM			

County of Hawaii Planning Dept.
(on behalf of the Mayor, County of Hawaii)
25 Aupuni Street
Hilo, Hawaii 96720
Attn: Duane Kanuha

Dear Mr. Duane Kanuha:

The Honolulu District Office of the Water Resources Division, U.S. Geological Survey has reviewed the subject DEIS, and offers the following comments. The principal reviewer was Mark Underwood. Please contact him at (808) 541-2653 if you have any questions.

Section 2.3.1. A description of the wastewater treatment was not given, nor is a reference given where this can be looked up within the report. Where is the treatment and sewerage discharge? What will the addition of this new development be on the wastewater treatment? Will the addition of this proposed increase in sewerage affect the treatment facility? Does this comply to EPA standards, both currently and with the additional development?

Section 2.3.2. Several unsubstantiated facts were given. It was stated that 100,000 million gallons of ground water lies stored in the aquifer that supplies the water for Waikoloa Village. Is this water stagnant? Is this all freshwater or brackish water? What is its source? The other troublesome statement is that 3.0 to 5.0 Mgal/d is flowing through the aquifer in the vicinity of the well. Do these figures refer to flow per unit width (i.e. per mile) of aquifer?

Section 2.3.3, 3.3 and 3.9. It is stated that 58,000 acres produces about 12,000 cfs of runoff which drains through Kamakoa Gulch. When does this occur? During a typical day, or during a small shower, a large rainstorm? Is it only the 58,000 acres that produces 12,000 cfs of runoff, or is this the amount that the whole watershed produces? A flow of 12,000 cfs is very substantial.

Section 9. The basic fundamentals of streamflow, as relevant to this specific area, appear to be poorly understood. Perhaps with better understanding, you could better address the unresolved issue of drainage.

Thank you for the opportunity to review this document.

Sincerely,

William Meyer
District Chief

cc: A. Scott Leithead, Hawaii County
Colette Sakoda, R.M. Towill Corp.
Office of Environmental Quality Control

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department

25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

February 26, 1991

Mr. William Meyer
District Chief
U.S. Department of the Interior
Geological Survey
Water Resources Division
677 Ala Moana Blvd.
Suite 415
Honolulu, Hawaii 96813

Dear Mr. Meyer:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your letter of January 2, 1991 on the DEIS for the subject project.

The Final EIS will describe the proposed wastewater treatment system. Your questions and comments on groundwater and drainage have been noted, and these sections will be expanded and clarified in the Final EIS.

Thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

DEPARTMENT OF THE NAVY
COMMANDER
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860-5020

IN REPLY REFER TO:
5090
Ser 00F2/3937
27 NOV 1990

RMT		WES	
DK		DTP	
RYK		RYE	
REC'D NOV 29 1990 RMTC			
GSY			
DKM			

Mr. Duane Kanuha
County of Hawaii, Planning Department
24 Aupuni Street
Hilo, HI 96720

Dear Mr. Kanuha:

WAIKOLOA AFFORDABLE HOUSING PROJECT

The Draft Environmental Impact Statement (DEIS) for Waikoloa Affordable Housing Project, South Kohala, Hawaii, has been reviewed, and we have no comments to offer. Since we have no further use for the DEIS, it is being returned to your office.

Thank you for the opportunity to review the draft.

Sincerely,

W. K. Liu
Assistant Base Civil Engineer
By direction of
the Commander

Copy to:
Ofc of Hsg & Comm Dev
R.M. Towill Corp
OEQC (w/DEIS)

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

February 26, 1991

Mr. W. K. Liu
Assistant Base Civil Engineer
Dept. of the Navy
Commander
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860-5020

Dear Mr. Liu:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your letter of November 27, 1990 indicating that you have no comments on the DEIS for the subject project. Thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:
Planning Division

January 2, 1991

RMT		IVES	
DK		BTT	
RYK		RDE	
REC'D JAN / 1991 RMTC			
GSY			
DKM			

Mr. Duane Kanuha
County of Hawaii Planning Department
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Kanuha:

We have reviewed the Draft Environmental Impact Statement (DEIS) for the Waikoloa Affordable Housing Project, Waikoloa, South Kohala, Hawaii. Our comments in response to the Preparation Notice (letter dated September 4, 1990) have been incorporated into the DEIS. We have no additional comments.

Sincerely,

Kisuk Cheung
Director of Engineering

Copies Furnished:
County of Hawaii
Office of Housing and Community Development
50 Wailuku Drive
Attn: A. Scott Leithead
Hilo, Hawaii 96720

✓ R.M. Towill Corporation
420 Waiakamilo Road, Room 411
Attn: Colette Sakoda
Honolulu, Hawaii 96817

Office of Environmental Quality Control
State of Hawaii
465 South King Street, Room 104
Honolulu, Hawaii 96813

Lorraine R. Inouye
Mayor
Norman K. Hayashi
Director
Tad Nagasako
Deputy Director

Planning Department
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720 • (808) 961-8288

February 26, 1991

Mr. Kisuk Cheung
Director of Engineering
Dept. of the Army
U.S. Army Engineer District, Honolulu
Building 230
Ft. Shafter, Hawaii 96858-5440

Dear Mr. Cheung:

SUBJECT: Waikoloa Affordable Housing Project
Draft Environmental Impact Statement (EIS)

We have received your letter of January 2, 1991 indicating that you have no comments on the DEIS for the subject project. Thank you for your participation in the planning stages of this project.

Very truly yours,

Norman K. Hayashi
Planning Director

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10. Data Book 1989: A Statistical Abstract, Department of Business and Economic Development, State of Hawaii, 1989.

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12. Waikoloa Affordable Housing Project Master Plan Report, September 1990, R. M. Towill Corporation.

13. Soil Survey of the Island of Hawaii, State of Hawaii, Washington, D.C., August 1972.

APPENDICES

Botanical Survey - APPENDIX A

Survey of Avifauna & Feral Animals - APPENDIX B

Air Quality Impact Analysis - APPENDIX C

Archaeological Reconnaissance Survey - APPENDIX D

Market Analysis - APPENDIX E

Traffic Impact Analysis - APPENDIX F

APPENDIX A

Botanical Survey by Char & Associates

APPENDIX A

Botanical Survey
580-Acre Residential Development, Waikoloa Village
District of South Kohala
Hawaii

Prepared By:
Char & Associates
Botanical/Environmental Consultants

BOTANICAL SURVEY

580-ACRE RESIDENTIAL DEVELOPMENT, WAIKOLOA VILLAGE

DISTRICT OF SOUTH KOHALA

HAWAI'I

by

George K. Linney
Winona P. Char

CHAR & ASSOCIATES
Botanical/Environmental Consultants
Honolulu, Hawaii

Prepared for: BELT COLLINS & ASSOCIATES

August 1988

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SUMMARY

A botanical survey was carried out on a parcel of approximately 580 acres proposed for future residential development adjacent to, and just north of Waikoloa Village. The site is divided into two almost equal halves by soil type. In the northeast, the soil is a deep, yellow ash with occasional rock outcroppings. In the southwest, this substrate is overlain by a thick, weathered 'a'a. The soil is thinner and rock outcroppings predominate. Vegetation in the northeast consists of rolling grasslands with widely scattered trees. In the southwest, vegetation is a savannah-scrubland. Differences in vegetation represent little more than shifts in relative abundance of the constituent plants. For the most part, the species composition is the same throughout the site. Only 46 species of vascular plants were found growing on the site, an extremely low number for an area of this size. Of these, 40 (87%) were exotic weeds or deliberately introduced plants, and 6 (13%) native, or presumed-native plants. None of the species found on the site are officially listed as endangered or threatened; nor are any species proposed or candidate for such status.

SURVEY METHODS

A walk-through method was used for this survey, with plants identified on sight. Plants that could not be positively identified were collected for later determination by comparison with known specimens in the herbarium and reference to standard taxonomic literature. Taxonomy of ferns is based on Wagner and Wagner (1987). Taxonomy and nomenclature of the flowering plants follows Wagner et al. (in press). Species composition recorded for the site is subject to the problem of identifying small annuals and perennials that were sterile, dormant, or dead at the time of the survey. Access to the site was from a dirt road, representing an extension of Paniolo (or Paniola, according to maps) Avenue. An abandoned ranch road running through the site also facilitated access for short portions of the transects.

DESCRIPTION OF THE SITE

The study site consisted of approximately 580 acres contiguous with Waikoloa Village and located just to the north of the presently developed land. The upper boundary of the site corresponded to a dirt road extending beyond the paved Paniolo (or Paniola) Avenue, at an elevation of approximately 880-780 feet. The lower boundary was at an elevation of approximately 580-600 feet. The northern boundary was Kamakoa Gulch, while the southern boundary was an apparently unnamed gulch that serves as the drainage for central Waikoloa Village. Throughout the site, metal fragments were common, decreasingly so to the south. These were tentatively identified as ordnance. At least some of the site disturbance (change of species composition, serious erosion) may be attributable to this former bombing, as well as to browsing by animals, and range fires.

The entire site is prehistoric lava field, though the substrate was of two distinct types. In the northeast portion of the site, the soil was a fine yellowish ash, with occasional rock outcroppings. Erosional features revealed that the ash was, at least in some places, more than three feet thick and divided into two soil zones marked by a change in color. The upper layer was approximately one foot deep. A herd of approximately 50 goats was found in a large cave in the south bank of Kamakoa Gulch. Browsed plants, tracks, and droppings indicated that they travel widely through the site, and may contribute to the composition of the vegetation. They certainly appeared to have an impact on soil erosion. This portion of the site was covered by grassland, with very widely scattered trees. Along the road and in the bottom of Kamakoa Gulch, fountain grass (Pennisetum setaceum) predominated, with many patches of 'aheahea (Chenopodium oahuense) and wild zinnia occurring along the road. Away from the road, the predominant grass was native hard-stemmed love-grass (Eragrostis atropioides). Where erosion or disturbance by animals was heaviest, the exotic buffel grass (Cenchrus ciliaris) replaced the native grass. The only tree on the site was kiawe (Prosopis pallida). Generally a minor component of the vegetation in this part of the study site, there were some large groves along Kamakoa Gulch. Shrubs were not a major component of the

vegetation, but were represented by 'aheahea, 'ilima (Sida fallax), and 'uhaloa (Waltheria indica var. americana). The native prostrate vines pa'u-o-hi'i'aka (Jacquemontia ovalifolia subsp. sandwicensis), and alena (Boerhavia diffusa) were occasional between tussocks of the love-grass. Peppergrass (Lepidium hyssopifolium) and centaurium (Centaurium erythraea) were the only widespread weedy annuals. In low areas, where water persisted longest, ageratum (Ageratum conyzoides), sowthistle (Sonchus oleraceus), and threadstem carpetweed (Mollugo cerviana) were found. Weedy annuals were also common on the cliff-faces above Kamakoa Gulch.

In the southwestern portion of the study site, a more recent 'a'a flow, or series of flows, overlay the substrate that was exposed in the northeastern portion. This flow rose above the northeastern ash-plain by 20-80 or more feet, and was marked by boulders of various sizes with little intervening soil. Walking in this area was very treacherous. Vegetation was similar to that in the northeastern portion, with a relative decrease in grass-cover and increase in shrubs and trees. On the rocky hillsides, the diminutive fern 'iwa'iwa was occasional. Only single occurrences of nehe (Lipochaeta lavarum), uhiuhi (Senna gaudichaudii), and pua-kala (Argemone glauca) were noted. Spider flower (Cleome sp.) and hairy merremia (Herremia aegyptia) were locally common. The shrubs lantana (Lantana camara) and koa-haole (Leucaena leucocephala) were characteristic of this part of the site. The latter formed a very dense stand along the dry stream bottom that marked the southern boundary of the study site. Kiawe trees were found in increasingly denser stands toward the south, at times approaching a scrub-forest situation.

Along the road at the upper boundary of the site, there were numerous piles of landscape rubbish. For the most part, the plant materials were dying, posing little threat to the future composition of the vegetation of the site. At least three exotic species, however, were observed to have established: bittermelon (Momordica charantia), an unknown bean (Phaseolus sp.), and California pepper tree (Schinus molle). Bittermelon is probably of little significance, as it is already widely established in the Islands where there is somewhat more soil moisture. The bean will probably not be able to

persist indefinitely, and so may also be ignored. California pepper tree, on the other hand, is not widely established as an escaped plant, but has the potential to do so. The related Christmas berry (Schinus terebinthifolius) has escaped from cultivation and has become an extremely serious noxious weed in wetter parts of the Islands.

THREATENED AND ENDANGERED SPECIES

No listed, proposed, or candidate threatened and endangered species, as designated by the Federal and/or State governments (US Fish and Wildlife Service 1985; Herbst 1987) were found on the site. The Eragrostis grassland appears to be a remnant native plant community, but is so disturbed that essentially only the grass remains. Most other native plants associated with this grassland community are either so uncommon on the site as to have all but disappeared, or like wiliwili (Erythrina sandwicensis) and a'ali'i (Dodonaea viscosa), were observed a short distance outside of the site, but were not found on the site itself.

RECOMMENDATIONS

It is suggested that native plants be used in future landscaping of the site. A number are both attractive and adapted to the present climate, while others would thrive with common landscape practices. Some control should be exercised in bringing in exotic species. A number of undesirable weedy species (toxic, invasive, or both) could potentially escape from cultivation and become serious problems in the future. Examples are a cactoid euphorbia (perhaps Euphorbia lactea) and Aloe, both of which were seen in rubbish piles along the roadside.

The presence of exploded ordnance on the site suggests that unexploded ordnance may be present, though none was seen during the survey. Another problem is that the ash-soil in the northeastern half of the site appears to be subject to rapid and severe erosion. It should be landscaped as soon as possible after disturbance. This would also mitigate problems with dust.

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SPECIES LIST

A list of all the vascular plants found on the site follows. Plants are organized in three groups -- ferns, monocots, and dicots. Within each group, they are further arranged in alphabetical order by family and genus. For each species, an accepted common name is given. For Hawaiian plants, the Hawaiian name is given if known. Biogeographic status is indicated by a letter code. An explanation of abbreviations used (other than author citations) is given below.

SCIENTIFIC NAME

sp. - correct species name not determined

STATUS

E - endemic, native only to the Hawaiian Islands

I - indigenous, native to the Hawaiian Islands, but also native elsewhere.

P - Polynesian, not considered native, but thought to have been introduced by the Polynesians prior to 1778

X - exotic, not native, introduced after 1778

SPECIES LIST

SCIENTIFIC NAME	COMMON NAME	BIOGEOGRAPHIC STATUS
FERNS AND FERN ALLIES		
Adiantaceae		
Doryopteris decora Brack.	'iwa'iwa	I
FLOWERING PLANTS		
MONOCOTS		
Gramineae		
Aristida adscensionis L.	aristida	X
Cenchrus ciliaris L.	buffel grass	X
Eragrostis atropioides Hillebr.	hard-stemmed love-grass	E
Heteropogon contortus (L.) Beauv. ex R. & S.	pili	P
Pennisetum setaceum (Forsk.) Chiov.	fountain grass	X
Rhynchelytrum repens (Willd.) C. E. Hubb.	Natal redtop	X
DICOTS		
Anacardiaceae		
Schinus molle L.	California pepper tree	X
Cactaceae		
Hylocereus undatus (Haw.) Britt. & Rose	night-blooming cereus	X
Opuntia ficus-indica (L.) Mill.	panini	X

SCIENTIFIC NAME	COMMON NAME	STATUS
Capparaceae		
Cleome sp.	spider flower	X?
Chenopodiaceae		
Chenopodium murale L.	chenopodium	X
Chenopodium oahuense (Meyen) Aellen	'aheahea, 'aweoweo	E
Compositae		
Ageratum conyzoides L.	ageratum	X
Bidens cynapifolia HBK.	beggars' ticks	X
Bidens pilosa L.	Spanish needle	X
Cirsium arvense (L.) Scop.	Canada thistle	X
Lipochaeta lavarum (Gaud.) DC.	nehe	E
Pluchea symphytifolia (Miller) Gillis	pluchea	X
Sonchus oleraceus L.	sowthistle	X
Zinnia pauciflora L.	wild zinnia	X
Undetermined composite		X
Convolvulaceae		
Jacquemontia ovalifolia (Choisy) H. Hallier subsp. *sandwicensis* (Gray) Robertson	pa'u-o'hi'i'aka	E
Merremia aegyptia (L.) Urban	hairy merremia	I?
Cruciferae		
Lepidium hyssopifolium Desv.	peppergrass	X

SCIENTIFIC NAME	COMMON NAME	STATUS
Cucurbitaceae		
Momordica charantia L.	bittermelon	X
Euphorbiaceae		
Chamaesyce hirta (L.) Millsp.	hairy spurge	X
Ricinus communis L.	castorbean	X
Gentianaceae		
Centaurium erythraea Rafn.	centaurium	X
Labiatae		
Hyptis pectinata (L.) Poit.	comb hyptis	X
Leguminosae		
Chamaecrista nictitans (L.) Moench.	partridge pea, lau-ki	X
Desmanthus virgatus (L.) Willd.	desmanthus	X
Desmodium tortuosum (Sw.) DC.	beggars' ticks	X
Indigofera suffruticosa Mill.	indigo	X
Leucaena leucocephala (Lam.) deWit	koa-haole	X
Phaseolus sp.	bean	X
Prosopis pallida (Humb. and Bonpl. ex Willd.) HBK	kiawe, mesquite	X
Senna gaudichaudii (H. & A.) Irwin & Barneby	uhiuhi, kolomona	I
Malvaceae		
Sida fallax Walp.	'ilima	I

SCIENTIFIC NAME	COMMON NAME	STATUS
Molluginaceae		
Mollugo cerviana (L.) Ser.	threadstem carpetweed	X
Nyctaginaceae		
Boerhavia diffusa L.	alena	I
Papaveraceae		
Argemone glauca Pope	pua-kala	E
Portulacaceae		
Portulaca pilosa L.	'ihi	X
Solanaceae		
Datura stramonium L.	Jamestown (Jimson) weed	X
Solanum americanum Mill.	popolo	I?
Sterculiaceae		
Waltheria indica L. var. *americana* (L.) R. Br. ex Hosaka	'uhaloa, hi'aloa	I?
Verbenaceae		
Lantana camara L.	lantana	X

APPENDIX B

Survey of Avifauna and Feral Animals by Phillip Bruner

APPENDIX B

Survey of the Avifauna and Feral Mammals at
Waikoloa Village Property, Waikoloa, Hawaii

Prepared By:
Phillip L. Bruner
Assistant Professor of Biology
Director, Museum of Natural History
BYU-H

SURVEY OF THE AVIFAUNA AND FERAL MAMMALS AT
WAIKOLOA VILLAGE PROPERTY, WAIKOLOA, HAWAII

Prepared for
Belt Collins & Associates

By

Phillip L. Bruner
Assistant Professor of Biology
Director, Museum of Natural History
BYU-H
Laie, Hawaii 96762

30 August 1988

SURVEY OF THE AVIFAUNA AND FERAL MAMMALS AT
WAIKOLOA VILLAGE PROPERTY, WAIKOLOA, HAWAII

INTRODUCTION

The purpose of this report is to summarize the findings of a three day (22-24 August 1988) bird and mammal field survey of property proposed for development at Waikoloa Village, Hawaii (see Fig. 1). Also included are references to pertinent literature as well as unpublished reports.

The objectives of the field survey were to:

1- Document what bird and mammal species occur on the property or may likely occur given the range of habitats available.

2- Provide some baseline data on the relative density of each species.

3- Determine the presence or likely occurance of any native fauna particularly any that are considered "endangered" or "threatened". If such occur or are likely to occur on the property identify what features of the habitat may be essential for these species and suggest how those resources may be protected.

GENERAL SITE DESCRIPTION

The project property is located in the Waikoloa Village area of the district of South Kohala, Hawaii. The property consists of approximately 580 acres (Fig.1). The general appearance of the habitat is one of a dry parkland. Vegetation consists of mostly exotic (introduced) trees with an understory of dry weeds and grasses. Kiawe (Prosopis pallida) and Koa Haole (Leucaena glauca) are the most abundant tree species. The site has a rolling topography but patches of more open, flat grassland occur on the north sections of the property.

Weather during the field survey was clear and hot. Winds were from the NE and were particularly gusty in the late afternoon and early evening periods.

STUDY METHODS

Field observations were made with the aid of binoculars and by listening for vocalizations. These observations were concentrated during the peak bird activity periods of early morning and late afternoon. Attention was also paid to the presence of tracks and scats as indicators of bird and mammal activity.

At various locations (see Fig.1) eight minute counts were made of all birds seen or heard. Between these count stations walking tallys of birds seen or heard were also kept. These

counts provide the basis for the population estimates given in this report. Unpublished reports of birds known from similar habitat on adjacent lands were also consulted in order to acquire a more complete picture of possible avifaunal activity (Bruner 1979, 1980, 1984a, 1984b, 1984c, 1985b). Observations of feral mammals were limited to visual sightings and evidence in the form of scats and tracks. No attempts were made to trap mammals in order to obtain data on their relative density and distribution. Two nights were devoted to searching for the presence of owls and the Hawaiian Hoary Bat (Lasiurus cinerus semotus).

Scientific names used herein follow those given in the most recent American Ornithologist's Union Checklist (A.O.U. 1983), Hawaii's Birds (Hawaii Audubon Society 1984), Birds of Hawaii and the Tropical Pacific (Pratt et al. 1987) and Mammal species of the World (Honacki et al. 1982).

RESULTS AND DISCUSSION

Resident Endemic (Native) Land and Water Birds:

No endemic birds were recorded during the course of the field survey. The Short-eared Owl or Pueo (Asio flammeus sandwichensis) is relatively common on Hawaii and potentially

could occur on the site (Berger 1972, Hawaii Audubon Society 1984, Pratt et al. 1987). This endemic subspecies is listed as endangered on Oahu by the State of Hawaii Department of Land and Natural Resources Division of Forestry and Wildlife but not elsewhere in Hawaii. No other endemic birds would be expected given the location and type of habitat.

Migratory Indigenous (Native) Birds:

Migratory shorebirds winter in Hawaii between the months of August and May. Some juveniles will stay through the summer months (Johnson et al. 1981, in press). Of all the shorebird species which winter in Hawaii the Pacific Golden Plover (Pluvialis fulva) is the most abundant. Plovers prefer open areas such as mud flats, lawns and grazed pasture land. They arrive in Hawaii in early August and depart to their artic breeding grounds during the last week of April (Johnson et al. 1981). Johnson et al. (1981) and Bruner (1983) have also shown plover are extremely site-faithful on their wintering grounds and many establish foraging territories which they defend vigorously. Such behavior makes it possible to acquire a fairly good estimate of the abundance of plover in any one area. These populations likewise remain relatively stable over many years (Johnson et al. in press). A total of only two plover were counted during the survey. These plover were seen flying over the property. No plover were actually seen on the ground. Both plover observed

had some remaining breeding plumage which would indicate they had recently returned from the artic and were not birds which had "over-summered" (Johnson et al. 1983, Johnson et al. in press).

No other migratory shorebirds were observed and none would really be expected in this particular habitat. The grassland is too dense and high to be attractive to shorebirds such as plover and Ruddy Turnstone (Arenaria interpres).

Resident Indigenous (Native) Birds:

None were recorded nor expected in this habitat at this site.

Resident Indigenous (Native) Seabirds:

None were observed on the property.

Exotic (Introduced) Birds:

A total of only nine species of exotic birds were recorded during the field survey. Table One shows the total number of each species by day. No species were abundant. In fact populations of all species were smaller than I would have predicted on first examination of the site. Given the type of habitat and its location and based on earlier studies (Bruner 1979, 1980, 1984a, 1984b, 1984c, 1985a, 1985b), and information provided in Berger (1972), Hawaii Audubon Society (1984) and Pratt et al. (1987) the following exotic species might also be expected to occur on the property: Ring-necked Pheasant (Phasianus colchicus),

Erckel's Francolin (Francolinus erckelii), California Quail (Callipepla californica), Japanese Quail (Coturnix japonica), Barn Owl (Tyto alba), Yellow-billed Cardinal (Paroaria capitata), Northern Mockingbird (Mimus polyglottos), Saffron Finch (Sicalis flaveola), Lavender Waxbill (Estrilda caerulescens), House Finch (Carpodacus mexicanus) and House Sparrow (Passer domesticus).

Feral Mammals:

The only feral mammals observed during the survey were the Small Indian Mongoose (Herpestes auropunctatus), dogs and goats. No rats, mice or cats were recorded but it would be highly unusual if these ubiquitous mammals did not occur on the property. Without a trapping program it is difficult to conclude much about the relative abundance of rats, mice, mongooses, dogs, cats and goats. However, it is likely that their numbers are typical of what one would find elsewhere in similar habitat on Hawaii.

Records of the endemic and endangered Hawaiian Hoary Bat (Lasiurus cinerus semotus) are sketchy but the species has been reported from Hawaii (Tomich 1986). None were observed on this field survey despite two nights of observations. This species roost solitarily in trees. So it is not unreasonable to assume that it might occasionally occur on the property. Much remains to be known about the natural history of this species and its requirements here in Hawaii. Bruner (1984d) found bats at locations makai of the Waikoloa Village property.

CONCLUSION

A brief field survey can at best provide a limited perspective of the wildlife present in any given area. Not all species will necessarily be observed and information on their use of the site must be sketched together from brief observations and the available literature. The number of species and the relative density of each species may vary throughout the year due to available resources and reproductive success. Species which are migratory will quite obviously be a part of the ecological picture only at certain times during the year. Exotic species sometimes prosper for a time only to later disappear or become a less significant part of the ecosystem (Williams 1987). Thus only long term studies can provide an in depth view of the bird and mammal populations in a particular area. However, when brief field studies are coupled with data gathered from other similar habitats the value of the conclusions drawn are significantly increased.

The following are broad conclusions related to bird and mammal activity on the property:

1- The present habitat provides a limited range of habitats which are utilized by the typical array of exotic species of birds one would expect at this elevation and in this type of environment on Hawaii. Some species typically found on Hawaii in this habitat were not recorded. This may be due to the very dry conditions. No endemic birds or seabirds were recorded nor were they expected.

2- The proposed development would create a more diversified habitat than presently exists and would likely result in the following changes in the avifauna and feral mammals on this property:

   a- Some species might experience a decline in numbers of individuals. Species in this situation could be: Gray Francolin, and perhaps Spotted Dove.

   b- Populations of all exotic species, with the exception of Gray Francolin and Spotted Dove, will likely increase dramatically following the proposed development. Residential property to the east of the site clearly demonstrates this effect. A brief drive/walk through census of birds in the residential area revealed more total species and greater numbers of individuals of all species.

3- In order to obtain more data on mammals, a trapping program would be required. The brief observations of this survey did not reveal any ususual mammal activity. No endangered species were observed.

Phillip Bruner
Assistant Professor of Biology
Director, Museum of Natural History
BYU-H
Laie, Hawaii 96762

30 August 1988

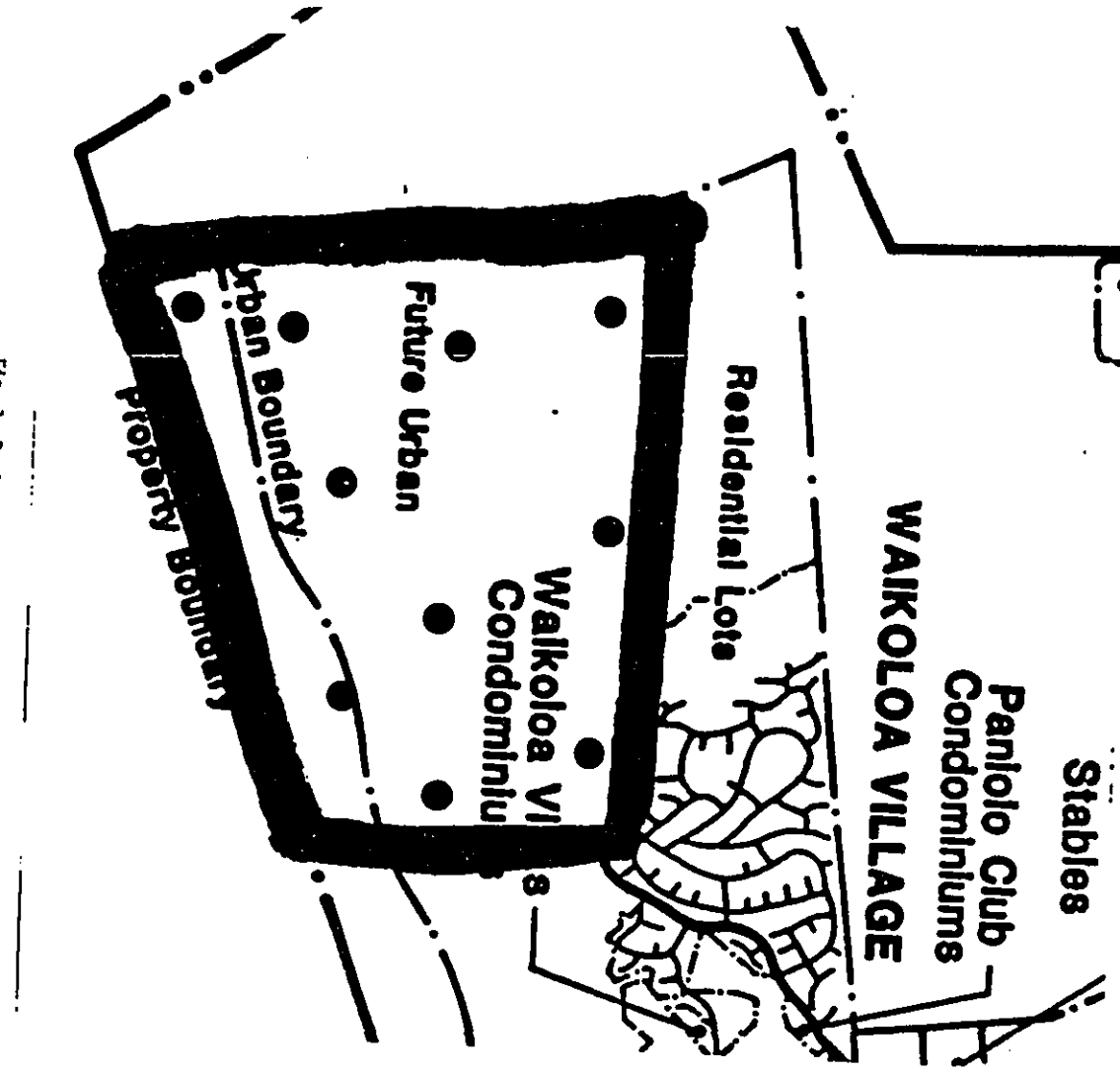

Fig. 1. Project property with eight minute count stations marked by a ●.

Exotic species of birds recorded on Waikoloa Village, Property, Hawaii.

COMMON NAME	SCIENTIFIC NAME	TOTAL NUMBER (For each day of Survey)		
		Day 1	2	3
Gray Francolin	Francolinus pondicerianus	6	10	11
Spotted Dove	Streptolia chinensis	9	8	12
Zebra Dove	Geopelia striata	9	6	5
Common Myna	Acridotheres tristis	0	2	3
Northern Cardinal	Cardinalis cardinalis	0	0	2
Japanese White-eye	Zosterops japonicus	8	10	6
Eurasian Skylark	Alauda arvensis	0	3	7
Nutmeg Mannikin	Lonchura punctulata	6	5	3
Warbling Silverbill	Lonchura malabarica	5	8	11

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APPENDIX C

Air Quality Impact Analysis by Barry D. Neal & Associates

DRAFT

AIR QUALITY STUDY

FOR THE PROPOSED

WAIKOLOA AFFORDABLE HOUSING PROJECT

WAIKOLOA, SOUTH KOHALA, HAWAII

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October 29, 1990

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1.0 INTRODUCTION AND PROJECT DESCRIPTION

The Hawaii County Office of Housing and Community Development is proposing for development an affordable residential housing project at Waikoloa Village in the South Kohala District on the island of Hawaii. (Figure 1 is a project location map.) When fully developed, the proposed project will provide approximately 1200 single- and multi-family housing units plus associated community facilities and infrastructure. Currently, the 340 acres of land the project will occupy is vacant. Construction of the proposed project is scheduled to begin during the latter part of 1991. Full development is projected to be achieved by 1997.

The purpose of this study is to describe existing air quality in the project area and to assess the potential short-term and long-term direct and indirect air quality impacts that could result from construction and use of the proposed facilities as planned. Measures to mitigate these impacts are suggested where possible and appropriate.

2.0 AMBIENT AIR QUALITY STANDARDS

Ambient concentrations of air pollution are regulated by both national and state ambient air quality standards (AAQS). National AAQS are specified in Section 40, Part 50 of the Code of Federal Regulations (CFR), while State of Hawaii AAQS are defined in Chapter 11-59 of the Hawaii Administrative Rules. Table 1 summarizes both the national and the state AAQS that are specified in the cited documents. As indicated in the table, AAQS have been established for six air pollutants. These regulated air pollutants include: particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone and lead. National AAQS are stated in terms

of primary and secondary standards. National primary standards are designed to protect the public health with an "adequate margin of safety". National secondary standards, on the other hand, define levels of air quality necessary to protect the public welfare from "any known or anticipated adverse effects of a pollutant". Secondary public welfare impacts may include such effects as decreased visibility, diminished comfort levels, or other potential injury to the natural or man-made environment, e.g., soiling of materials, damage to vegetation or other economic damage. In contrast to the national AAQS, Hawaii State AAQS are given in terms of a single standard that is designed "to protect public health and welfare and to prevent the significant deterioration of air quality".

Each of the regulated air pollutants has the potential to create or exacerbate some form of adverse health effect or to produce environmental degradation when present in sufficiently high concentration for prolonged periods of time. The AAQS specify a maximum allowable concentration for a given air pollutant for one or more averaging times to prevent harmful effects. Averaging times vary from one hour to one year depending on the pollutant and type of exposure necessary to cause adverse effects. In the case of the short-term (i.e., 1- to 24-hour) AAQS, both national and state standards allow one exceedance per year.

State of Hawaii AAQS are in some cases considerably more stringent than comparable national AAQS. In particular, the State of Hawaii 1-hour AAQS for carbon monoxide is four times more stringent than the comparable national limit.

Under the provisions of the Federal Clean Air Act [1], the U.S. Environmental Protection Agency (EPA) is required to periodically review and re-evaluate national AAQS in light of research findings more recent than those which were available at the time the standards were originally set. Occasionally new standards are created as well. Most recently, the national standard for particulate matter has been revised to include specific limits for particulates 10 microns or less in diameter (PM-10) [2]. The State of Hawaii has not explicitly addressed the question of whether to set limits for this category of air pollutant, but national AAQS prevail where states have not set their own more stringent levels.

Hawaii AAQS for sulfur dioxide were relaxed in 1986 to make them essentially the same as national limits. It has been proposed in various forums that the state also relax its carbon monoxide standards to the national levels, but at present there are no indications that such a change is being considered.

3.0 REGIONAL AND LOCAL CLIMATOLOGY

Regional and local climatology significantly affect the air quality of a given location. Wind, temperature, atmospheric turbulence, mixing height and rainfall all influence air quality. Although the climate of Hawaii is relatively moderate throughout most of the state and most of the year, significant differences in these parameters may occur from one location to another. Most differences in regional and local climates within the state are caused by the mountainous topography.

South Kohala, the site of the proposed project, is located on the northwestern side of the island of Hawaii. The topography of this

island is dominated by the great volcanic masses of Mauna Loa (13,653 feet), Mauna Kea (13,796 feet), and of Hualalai, the Kohala Mountains and Kilauea. The island consists entirely of the slopes of these mountains and of the broad saddles between them. Mauna Loa and Kilauea, located on the southern half of the island, are still active volcanoes. The site of the proposed project occupies a portion of the lower northwestern slope of Mauna Kea, extending from an elevation of about 550 feet near the northwest boundary up to an elevation of about 900 feet near the southeast boundary.

Hawaii lies well within the belt of northeasterly trade winds generated by the semi-permanent Pacific high pressure cell to the north and east. Nearly the entire western coast of the island of Hawaii, however, is sheltered from the trade winds by high mountains, except when unusually strong trade winds sweep through the saddle between the Kohala Mountains and Mauna Kea and reach the areas to the lee. Due to wind shadow effects caused by the terrain, winds in the South Kohala area are predominantly light and variable. Local winds such as land/sea breezes and/or upslope/downslope winds tend to dominate the wind pattern for the area. During the daytime, winds typically move onshore because of seabreeze and/or upslope effects. At night and during the early morning hours, winds generally are land breezes and/or drainage winds which move downslope from the east and out to sea; oftentimes, early morning drainage winds are quite strong for a few hours just near sunrise and then subside. Calms occur about 9 percent of the time at nearby Kawaihae.

Air pollution emissions from motor vehicles, the formation of photochemical smog and smoke plume rise all depend in part on air temperature. Colder temperatures tend to result in higher emissions of contaminants from automobiles but lower concentrations

of photochemical smog and ground-level concentrations of air pollution from elevated plumes. In Hawaii, the annual and daily variation of temperature depends to a large degree on elevation above sea level, distance inland and exposure to the trade winds. Average temperatures at locations near sea level generally are warmer than those at higher elevations. Areas exposed to the trade wind tend to have the least temperature variation, while inland and leeward areas often have the most. The project site's leeward location and low-level elevation results in a relatively moderate temperature profile compared to windward locations near sea level. At Kamuela, located a few miles to the northeast of the project and at an elevation on about 2700 feet, average daily minimum and maximum temperatures are 55°F and 73°F, respectively [3]. The extreme minimum temperature on record at this location is 34°F, and the extreme maximum is 90°F. Temperatures at the project site are estimated to be about 5 to 10 degrees warmer on the average than those at Kamuela due to the lower elevation.

Small scale, random motions in the atmosphere (turbulence) cause air pollutants to be dispersed as a function of distance or time from the point of emission. Turbulence is caused by both mechanical and thermal forces in the atmosphere. It is oftentimes measured and described in terms of Pasquill-Gifford stability class. Stability class 1 is the most turbulent and class 6 the least. Thus, air pollution dissipates the best during stability class 1 conditions and the worst when stability class 6 prevails. In the South Kohala area, stability class 5 or 6 is generally the highest stability class that occurs, developing during clear, calm nighttime or early morning hours when temperature inversions form either due to radiational cooling or to downslope winds that push warmer air aloft. Stability classes 1 through 4 occur during the daytime, depending mainly on the amount of cloud cover and incoming solar radiation and the onset and extent of the sea breeze.

Mixing height is defined as the height above the surface through which relatively vigorous vertical mixing occurs. Low mixing heights can result in high ground-level air pollution concentrations because contaminants emitted from or near the surface can become trapped within the mixing layer. In Hawaii, minimum mixing heights tend to be high because of mechanical mixing caused by the trade winds and because of the temperature moderating effect of the surrounding ocean. Low mixing heights may sometimes occur, however, at inland locations and even at times along coastal areas early in the morning following a clear, cool, windless night. Coastal areas may also experience low mixing levels during sea breeze conditions when cooler ocean air rushes in over warmer land. Although there is no mixing height data for the South Kohala area, mixing heights elsewhere in the state typically are above 3000 feet (1000 meters). Mixing heights in the South Kohala area probably tend to be somewhat lower due to the fact that light winds often prevail and also because sea breeze conditions often develop during the daytime.

Rainfall can have a beneficial effect on the air quality of an area in that it helps to suppress fugitive dust emissions, and it may also "washout" gaseous contaminants that are water soluble. Rainfall in Hawaii is highly variable depending on elevation and on location with respect to the trade wind. The lower elevations of South Kohala are some of the driest areas in the state. Some of the rainfall occurs in conjunction with winter storms, and some occurs during summer afternoons and evenings as a result of the onshore and upslope movement of moisture laden marine air. Annual rainfall reported for Waikoloa Village during 1988 was about 18 inches [4], but this may vary substantially from one year to the next.

4.0 PRESENT AIR QUALITY

Present air quality in the project area is mostly affected by air pollutants from natural, agricultural and/or vehicular sources. Natural sources of air pollution emissions which may affect the project area but cannot be quantified very accurately include the ocean, plants, wind-blown dust and volcanoes. Of these natural sources of air pollution, volcanoes are the most significant. Volcanic emissions have chronically plagued the project area since the latest eruption phase of Kilauea Volcano began in 1983. Air pollution emissions from Kilauea consist primarily of sulfur dioxide. After entering the atmosphere, these sulfur dioxide emissions are carried away by the wind and either washed out as acid rain or gradually transformed into particulate sulfates. Although emissions from Kilauea are vented more than 60 miles southeast of the project site, the prevailing wind patterns eventually carry the emissions into the Kona and South Kohala area. These emissions can be seen in the form of the volcanic haze (vog) which persistently hangs over the area. The American Lung Association is currently studying the character and concentrations of volcanic air pollution in the Kona area, but to date no results of the study are available.

Although the project site is located between two major regional arterial roadways, Queen Kaahumanu Highway and Mamalahoa Highway, it is several miles from either and unlikely to be significantly affected by the exhausts of motor vehicles traversing these roadways. Any air pollution from motor vehicles is likely confined to limited areas near intersections where and when traffic congestion occurs during poor dispersion conditions.

The State Department of Health operates a network of air quality monitoring stations at various locations around the state. Unfortunately, very little data are available for the island of Hawaii, and none are available for the South Kohala area specifically. As indicated in Table 2, the only existing monitoring data anywhere near the project site consist of sulfur dioxide and particulate measurements that were made about 30 miles to the south at Kealakekua during 1985 and 1986. During this two-year period, measurements of 24-hour average sulfur dioxide concentration at this location were consistently low with daily mean values ranging from less than 5 to 12 $\mu g/m^3$. No exceedances of the state/national 24-hour AAQS for sulfur dioxide were recorded. Twenty-four hour average particulate concentrations ranged from 4 to 28 $\mu g/m^3$; no violations of the state AAQS were measured.

At this time, there are no reported measurements of lead, ozone, nitrogen dioxide or carbon monoxide in the project vicinity. These are primarily motor vehicle related air pollutants. Lead, ozone and nitrogen dioxide typically are regional scale problems; concentrations of these contaminants generally have not been found to exceed AAQS elsewhere in the state. Carbon monoxide air pollution, on the other hand, typically is a microscale problem caused by congested motor vehicular traffic. In traffic congested areas such as urban Honolulu, carbon monoxide concentrations have been found to occasionally exceed the state AAQS. Present concentrations of carbon monoxide in the project area are estimated later in this study based on mathematical modeling of motor vehicle emissions.

5.0 SHORT-TERM IMPACTS OF PROJECT

Short-term direct and indirect impacts on air quality could potentially occur due to project construction. For a project of this nature, there are two potential types of air pollution emissions which could directly result in short-term air quality impacts during the construction phase: (1) fugitive dust from vehicle movement and site excavation; and (2) exhaust emissions from on-site construction equipment. Indirectly, there could also be short-term impacts from slow-moving construction equipment traveling to and from the project site and from a temporary increase in local traffic caused by commuting construction workers.

Fugitive dust emissions may arise from the grading and dirt/rock-moving activities associated with site preparation once the area is cleared. The emission rate for fugitive dust emissions from construction activities is difficult to estimate accurately because of its elusive nature of emission and because the potential for its generation varies greatly depending upon the type of soil at the construction site, the amount and type of earth-disturbing activity taking place, the moisture content of exposed soil in work areas, and the wind speed. The EPA [5] has provided a rough estimate for uncontrolled fugitive dust emissions from construction activity of 1.2 tons per acre per month under conditions of "medium" activity, moderate soil silt content (30%), and precipitation/evaporation (P/E) index of 50. Uncontrolled fugitive dust emissions from project construction would probably be somewhere near this level. In any case, State of Hawaii Air Pollution Control Regulations [6] stipulate that emissions of fugitive dust from construction activities cannot be visible beyond the property line. Thus, an effective dust control plan for the project construction phase is essential.

Adequate fugitive dust control can usually be accomplished by the establishment of a frequent watering program to keep bare-earth surfaces in work areas from becoming significant dust generators. In dust-prone areas like South Kohala, other control measures such as limiting the area that can be disturbed at any given time, applying chemical soil stabilizers and/or using wind screens may be necessary. Control regulations also require that open-bodied trucks be covered at all times when in motion if they are transporting materials likely to give rise to airborne dust. Paving of parking areas and roads and establishing landscaping as early in the construction process as possible can also lower the potential for fugitive dust emissions.

On-site mobile and stationary construction equipment will also emit some air pollutants in the form of engine exhausts. The largest of this equipment is usually diesel-powered. Nitrogen oxides emissions from diesel engines can be relatively high compared to gasoline-powered equipment, but the standard for nitrogen dioxide is set on an annual basis and is not likely to be violated by short-term construction equipment emissions. Carbon monoxide emissions from diesel engines, on the other hand, are low and should be relatively insignificant compared to vehicular emissions on nearby roadways.

Indirectly, slow-moving construction vehicles on roadways leading to and from the project site could obstruct the normal flow of traffic to such an extent that overall vehicular emissions are increased, but this impact can be mitigated by moving heavy construction equipment during periods of low traffic volume. Likewise, the schedules of commuting construction workers can be adjusted to avoid peak hours in the project vicinity. Thus, most

potential short-term air quality impacts from project construction can be mitigated.

6.0 LONG-TERM IMPACTS OF PROJECT

6.1 Roadway Traffic

After construction is completed, use of the proposed facilities will result in increased motor vehicle traffic on nearby roadways, potentially causing long-term impacts on ambient air quality in the project vicinity. Motor vehicles with gasoline-powered engines are significant sources of carbon monoxide. They also emit nitrogen oxides, and those burning leaded gasoline contribute lead to the atmosphere. The use of leaded gasoline in new automobiles is now prohibited. As older vehicles continue to disappear from the numbers of those currently operating on the state's roadways, lead emissions are approaching zero. Nationally, so few vehicles now require leaded gasoline that the EPA is proposing a total ban on leaded gasoline to take effect immediately. Even without such a ban, reported quarterly averages of lead in air samples collected in urban Honolulu have been near zero since early 1986. Thus, lead in the atmosphere is not considered to be a problem anywhere in the state.

Federal air pollution control regulations also call for increased efficiency in removing carbon monoxide and nitrogen oxides from the exhausts of new motor vehicles. By the year 1995 carbon monoxide emissions are expected to be about 30 percent less than the amounts now emitted due to the replacement of older vehicles with newer models. Further reductions in vehicular emissions have recently been proposed by the President for areas of the country which do

not currently meet AAQS, mainly through the use of alternative fuels.

To evaluate the potential long-term indirect ambient air quality impact of increased roadway traffic associated with a project such as this, computerized emission and atmospheric dispersion models can be used to estimate ambient carbon monoxide concentrations along roadways leading to and from the project. Carbon monoxide is selected for modeling because it is both the most stable and the most abundant of the pollutants generated by motor vehicles. Furthermore, carbon monoxide air pollution is generally considered to be a microscale problem, whereas nitrogen oxides air pollution most often is a regional issue. This is reflected in the fact that the AAQS for carbon monoxide are specified on a short-term basis (1-hour and 8-hour averaging times) while the AAQS for nitrogen dioxide is set on an annual basis.

For this project, three scenarios were selected for the carbon monoxide modeling study: year 1990 with present conditions, year 1997 without the project, and year 1997 assuming the project is built and complete. To begin the modeling study, critical receptor areas in the vicinity of the project were identified for analysis. Generally speaking, roadway intersections are the primary concern because of traffic congestion and because of the increase in vehicular emissions associated with traffic queuing. For this study, the key intersections identified in the traffic study [7] were also selected for air quality analysis. These include: Queen Kaahumanu Highway at Waikoloa Road, Paniolo Drive/Pua Melia Street at Waikoloa Road and Mamalahoa Highway at Waikoloa Road. Modeling of the present scenario was performed assuming the existing roadway configurations. For the future air quality modeling scenarios, it was assumed that Queen Kaahumanu Highway will be signalized at

Waikoloa Road either with or without the project at least temporarily until a grade-separated interchange is constructed. In the with project case, it was further assumed that a second left-turn lane will be provided for westbound traffic at this intersection. The intersection of Waikoloa Road and Paniolo Drive/Pua Melia Street was also assumed to be signalized and improved in the with project case. More details concerning the present and future conditions and configurations of these intersections are provided in the traffic impact assessment report referenced above.

The main objectives of the modeling study were to estimate both current and projected levels of maximum 1-hour average carbon monoxide concentrations which could then be directly compared to the national and state AAQS. The traffic impact assessment report indicates that traffic volumes generally are or will be higher during the afternoon peak hour than during the morning peak period. Worst-case emission and meteorological dispersion conditions typically occur during the morning hours at many locations. Thus, even though traffic volumes may be higher in the afternoon than in the morning, worst-case air pollution concentrations may occur during the morning. To ensure that worst-case concentrations were identified, both morning and afternoon peak traffic periods were studied.

The EPA computer model MOBILE4 [8] was used to calculate vehicular carbon monoxide emissions for each of the years studied. One of the key inputs to MOBILE4 is vehicle mix. Based on recent vehicle registration figures, the present and projected vehicle mix in the project area is estimated to be 91.9% light-duty gasoline-powered vehicles, 5% light-duty gasoline-powered trucks and vans, 0.5% heavy-duty gasoline-powered vehicles, 0.6% light-duty diesel-

powered vehicles, 1% heavy-duty diesel-powered trucks and buses, and 1% motorcycles.

Other key inputs to the MOBILE4 emission model are the cold/hot start fractions. Motor vehicles operating in a cold- or hot-start mode emit excess air pollution. Typically, motor vehicles reach stabilized operating temperatures after about 4 miles of driving. For traffic operating through the Paniolo Drive/Waikoloa Road intersection, it was assumed that about 25 percent of all vehicles would be operating in the cold-start mode and that about 5 percent would be operating in the hot-start mode. Motor vehicles using the Waikoloa Road intersections with Mamalahoa Highway and Queen Kaahumanu Highway were assumed to be mostly stabilized due to the relatively isolated locations of these roadways. Cold- and hot-start fractions of 5 percent and 1 percent, respectively, were assumed for these analyses. These operational mode values were estimated based on a report from the California Department of Transportation [9] and taking into consideration the likely origin of morning and afternoon traffic in the project area. MOBILE4 idle emissions were adjusted to account for excess cold/hot-start emissions per a recent U.S. EPA memorandum [10].

An ambient temperature of 50 degrees F was used for morning peak-hour emission computations while a temperature of 59 degrees F was used for the afternoon case. These are conservative assumptions since morning/afternoon ambient temperatures will generally be warmer than this and emission estimates given by MOBILE4 are inversely proportional to the ambient temperature.

After computing vehicular carbon monoxide emissions through the use of MOBILE4, these data were then input to the latest version

of the computer model CALINE4 [11]. CALINE4 was developed by the California Transportation Department to simulate vehicular movement and atmospheric dispersion of vehicular emissions. It is designed to predict 1-hour average pollutant concentrations along roadways based on input traffic and emission data, roadway/receptor geometry and meteorological conditions.

Input peak-hour traffic data were obtained from the traffic study cited previously. The traffic volumes given in the traffic study for the future scenario include project traffic as well as traffic from other growth that is expected to occur in the area by the year 1997. Traffic queuing estimates were made based on the project traffic study, Transportation Research Board procedures [12], U.S. EPA guidelines [13], and traffic observations at the subject intersections. For the 1990 analyses, vehicles using the intersections of Queen Kaahumanu Highway and Mamalahoa Highway with Waikoloa Road were assumed to accelerate to 55 mph, while Waikoloa Road traffic near the village and Paniolo Drive traffic were assumed to move at 35 and 25 mph, respectively. These are the posted speed limits. Deceleration and acceleration times of 25 and 30 seconds, respectively, were assumed for vehicles traveling at 55 mph, whereas values of 16 and 18 seconds were assumed for those traveling at 35 mph. For vehicles moving at 25 mph, deceleration/acceleration times of 10 and 12 seconds were used. For the 1997 scenarios, the posted speed limits near the intersection of Queen Kaahumanu Highway and Waikoloa Road were assumed to be reduced to 45 mph.

Model roadways were set up to reflect actual roadway geometry, physical dimensions and operating characteristics. Presently, there are no pedestrian walkways along many of the roadways within the project area. Where walkways do exist or are likely to exist

in the future, model receptors were located between 2 and 4 meters from the edge of the roadway. At those locations where sidewalks do not and will likely not exist, model receptor sites were located near the edge of the road right-of-ways at distances of 10 meters from the traveled portions of the roadways near the intersections studied. All receptor heights were placed at 1.5 meters above ground to simulate levels within the normal human breathing zone.

Input meteorological conditions for this study were defined to provide "worst-case" results. One of the key meteorological inputs is atmospheric stability category. For these analyses, atmospheric stability category 6 was assumed for morning scenarios and stability category 4 was assumed for afternoon cases. These are the most conservative stability categories that can be used for estimating pollutant dispersion at suburban or undeveloped locations. A surface roughness length of 100 cm was assumed with a mixing height of 300 meters. Worst-case wind conditions were defined as a wind speed of 1 meter per second with a wind direction resulting in the highest predicted concentration.

Existing background concentrations of carbon monoxide in the project vicinity are believed to be at relatively low levels. Hence, background contributions of carbon monoxide from sources or distant roadways not directly considered in the analysis were accounted for by adding a background concentration of 0.1 ppm to all predicted concentrations for the 1990 scenarios. Due to the expected development that is predicted to occur in the project area within the next several years, a background value of 0.2 ppm was used for all 1997 scenarios.

Table 3 summarizes the final results of the modeling study in the form of the estimated worst-case 1-hour afternoon ambient carbon monoxide concentrations. These results can be compared directly to the state and the national AAQS. Estimated worst-case carbon monoxide concentrations are presented in the table for three scenarios: year 1990 with existing traffic, year 1997 without project traffic and year 1997 with project traffic. The locations of these estimated worst-case 1-hour concentrations all occurred at or very near the indicated intersections.

As indicated in the table, the estimated present worst-case 1-hour carbon monoxide concentration in the project area, 5.9 mg/m^3, occurred near the intersection of Paniolo Drive and Waikoloa Road during the morning peak-traffic hour. Concentrations tend to be higher here due to excess cold-start emissions. The worst-case 1-hour concentrations at the other intersections studied were 5.5 mg/m^3 during the morning at Queen Kaahumanu Highway and Waikoloa Road and 2.3 mg/m^3 during the afternoon at Mamalahoa Highway and Waikoloa Road.

In the year 1997 without the proposed project, a worst-case 1-hour concentration of 16.2 mg/m^3 was predicted to occur during the morning near the intersection of Queen Kaahumanu Highway and Waikoloa Road. Concentrations were predicted to increase substantially at this location compared to the existing case due to the projected increase in traffic and the assumed signalization of this intersection. Worst-case concentrations at other locations and times in the study area were estimated to range from about 4 to 8 mg/m^3.

Predicted 1-hour worst-case concentrations for the 1997 with project scenario range from 5.1 mg/m^3 during the afternoon at the intersection of Mamalahoa Highway with Waikoloa Road to 15.2 mg/m^3 during the morning at the Queen Kaahumanu Highway and Waikoloa Road intersection. As noted in the table, Waikoloa Road intersections both at Queen Kaahumanu Highway and at Paniolo Drive were assumed to be signalized and further improved. Compared to the without project case, predicted concentrations at the Queen Kaahumanu Highway/Waikoloa Road intersection were estimated to be about 5 percent lower in the morning and about 25 percent higher in the afternoon. Worst-case 1-hour concentrations near the Paniolo Drive/Waikoloa Road intersection will be significantly higher compared to the without project case due to the increase in traffic and the installation of a traffic signal, while concentrations near Mamalahoa Highway and Waikoloa Road will be marginally higher. Compared to the present case, worst-case concentrations in 1997 with the proposed project will be about two to three times higher at most locations.

All estimated worst-case 1-hour carbon monoxide levels for all scenarios are well within the national AAQS of 40 mg/m^3. Present worst-case 1-hour values are also estimated to meet the more stringent state standard of 10 mg/m^3. It appears likely, however, that future concentrations with or without the project may exceed the state 1-hour AAQS on occasion at the Queen Kaahumanu Highway/Waikoloa Road intersection. With the project, morning concentrations near Paniolo Drive at Waikoloa Road may also exceed the state 1-hour standard during worst-case conditions.

Worst-case 8-hour carbon monoxide concentrations were estimated by multiplying the worst-case 1-hour values by a persistence factor of 0.5. This accounts for two factors: (1) traffic volumes

averaged over eight hours are lower than peak 1-hour values, and (2) meteorological dispersion conditions are more variable (and hence more favorable) over an 8-hour period than they are for a single hour. Based on monitoring data, 1-hour to 8-hour persistence factors for most locations generally vary from 0.4 to 0.8 with 0.6 being the most typical. One recent study based on modeling [14] concluded that 1-hour to 8-hour persistence factors could typically be expected to range from 0.4 to 0.5. EPA guidelines [13] recommend using a value of 0.6 to 0.7 unless a locally derived persistence factor is available. Recent monitoring data for Honolulu reported by the Department of Health [15] suggests that this factor may range between about 0.35 and 0.55 depending on location and traffic variability. Considering the location of the project and the traffic pattern for the area, a 1-hour to 8-hour persistence factor of 0.5 is probably most appropriate for this application.

The resulting estimated worst-case 8-hour concentrations are indicated in Table 4. For the 1990 scenario, the estimated worst-case 8-hour carbon monoxide concentration was 3.0 mg/m^3 at the intersection of Paniolo Drive and Waikoloa Road; other locations studied ranged from 1.2 mg/m^3 near Mamalahoa Highway and Waikoloa Road to 2.8 mg/m^3 near Queen Kaahumanu Highway and Waikoloa Road. The predicted maximum value for the 1997 without project scenario was 8.1 mg/m^3 near Queen Kaahumanu Highway and Waikoloa Road. As mentioned above, concentrations are predicted to increase substantially at this location due to the installation of a traffic signal. The highest 8-hour concentrations elsewhere would range from about 2 to 4 mg/m^3 without the project. In 1997 with the project, the estimated maximum worst-case 8-hour concentration was 7.6 mg/m^3 near Queen Kaahumanu Highway and Waikoloa Road; other locations studied ranged from 3.1 mg/m^3 at Mamalahoa Highway and Waikoloa Road to 6.6 mg/m^3 at the intersection of Paniolo Drive and

Waikoloa Road. Either with or without the project, 1997 concentrations will be higher than existing concentrations at most locations. Comparing the predicted values for the existing case to the AAQS, it appears that both the state and the national 8-hour standards will be met during 1990. The same is true without the project in 1997 except at the intersection of Queen Kaahumanu Highway and Waikoloa Road. With the project, worst-case 8-hour concentrations will meet the national standard but may occasionally exceed the more stringent state standard along Waikoloa Road at Queen Kaahumanu Highway and at Paniolo Drive.

The results of this study reflect several assumptions that must be made concerning traffic movement and worst-case meteorological conditions. One such assumption concerning worst-case meteorological conditions is that a wind speed of 1 meter per second with a steady direction for 1 hour will occur. A steady wind of 1 meter per second blowing from a single direction for an hour is not very likely, and it may occur only once a year or less. With wind speeds of 2 meters per second, for example, computed carbon monoxide concentrations would be only about half the values given above.

6.2 Electrical Demand

The proposed project will also cause indirect emissions from power generating facilities as a consequence of electrical power usage. Peak project power demand at full build-out is not expected to exceed about 3 megawatts. Present generating capacity on the Big Island is 161 megawatts with most of this power provided by oil-burning generating units. Island wide, peak power demand is currently about 120 megawatts. Average annual electrical demand of the project when fully developed is not expected to exceed about

15 million kilowatt-hours. This power demand will most probably be provided mainly by oil-fired generating facilities located on the island. In order to meet the electrical power needs of the proposed project, power generating facilities will have to be expanded and/or burn more fuel, and hence more air pollution will be emitted at these facilities. Given in Table 5 are estimates of the indirect air pollution emissions that will result from the project electrical demand assuming all power is provided by burning more fuel oil at Hawaii's oil-fired power plants. Based on the ratio of peak project power demand to total present peak power demand on Hawaii, the project power demand will result in about a 3 percent increase in emissions from the electric utility if all project power is derived from fuel oil.

6.3 Solid Waste Disposal

Solid waste generated by the project when fully completed is expected to amount to about 15 tons of refuse (about two to three 6-ton truckloads) per day. Presently, the refuse district handles about 100 tons per day. Most if not all project refuse will likely be hauled away and either landfilled or burned at another location. If all refuse is landfilled, the only air pollution emissions associated with solid waste disposal (assuming problems similar to those which currently exist at the Kailua Landfill are avoided) will be due to exhaust fumes and fugitive dust from trucks and heavy equipment used to place the refuse in the landfill. If, on the other hand, all or part of the refuse is burned at a municipal incinerator, disposal of solid waste from the project will also result in emissions of particulate, carbon monoxide and other contaminants from the incineration facility. Table 6 gives emission factors for municipal refuse incinerators (without controls) in terms of pounds of air pollution per ton of refuse material charged. Thus, uncontrolled air pollutant emission rates

in terms of pounds per year, for example, can be estimated by multiplying the emission factors given in the table by the number of tons per year of refuse that is burned. Use of emission filtration equipment will substantially reduce emissions of particulate.

7.0 SUMMARY OF IMPACTS AND MITIGATIVE CONSIDERATIONS

7.1 Impacts Summary

The major short-term air quality impact will be the potential emission of significant quantities of fugitive dust during project construction phases. Uncontrolled fugitive dust emissions from construction activities are estimated to amount to about 1.2 tons per acre per month. During the period of construction, emissions from engine exhausts (primarily consisting of carbon monoxide and nitrogen oxides) will also occur both from on-site construction equipment and from vehicles used by construction workers and from trucks traveling to and from the project.

The primary long-term air pollution impact from the project will arise from the increased motor vehicle traffic associated with the project. Potential increased levels of carbon monoxide concentrations along roadways leading to and from the proposed development will be the primary concern. Based on mathematical modeling of projected vehicular traffic and on atmospheric dispersion estimates of vehicular emissions, it is predicted that with the proposed project carbon monoxide concentrations along roadways in the project vicinity will unavoidably be higher at several locations compared to the without project case, but worst-case concentrations will remain within the national standards. The highest concentrations will occur in the vicinity of Queen Kaahumanu Highway at Waikoloa Road.

The more stringent State of Hawaii ambient air quality standards for carbon monoxide should be achieved in the project vicinity during the current year but will likely be exceeded either with or without the project in the year 1997 at the Queen Kaahumanu Highway intersection with Waikoloa Road due to vehicular emissions. Concentrations near the intersection of Paniolo Drive and Waikoloa Road may also exceed the state standards in the with project case but will likely meet these standards without the project. It should be mentioned here, however, that the state standards are set so low that they are likely exceeded at many intersections in the state that have even moderate traffic volumes. It is also worth noting that, although the national AAQS allow higher levels of carbon monoxide, the national standards were developed after extensive research with the objective of defining levels of air quality that would protect the public health with an adequate margin of safety.

Some long-term impacts on air quality also could potentially occur due to indirect emissions from power generating facilities supplying the project with electricity and from the disposal of waste materials generated by the project. Quantitative estimates of these impacts were not made, but it appears likely that any impacts will be small due to the magnitude of the project electrical and solid waste demands compared to the present county demands.

7.2 Mitigative Considerations

Strict compliance with State of Hawaii Air Pollution Control Regulations regarding establishment of a regular dust-watering program and covering of dirt-hauling trucks will be required to effectively mitigate fugitive dust emissions from construction activities. Twice daily watering is estimated to reduce dust emissions by up to 50 percent. Using of wind screens, applying chemical soil stabilizers and/or limiting the area that is disturbed at any given time may be required in sensitive or dust-prone areas. Paving of parking areas and establishment of landscaping early in the construction schedule will also help to control dust. Increased vehicular emissions due to disruption of traffic by construction equipment and/or commuting construction workers can be alleviated by moving equipment and personnel to the site during off-peak traffic hours.

Options available to mitigate traffic-related air pollution are to improve roadways, reduce traffic or reduce individual vehicular emissions. Long-term projections of carbon monoxide emissions from vehicular traffic associated with the completed development are based on the traffic impact study findings. It has been assumed that the roadway improvements recommended in the traffic study will be implemented to move traffic efficiently through the project area and adjacent locations. Future air pollution concentrations in the vicinity of Queen Kaahumanu Highway and Waikoloa Road will be lower than predicted if and when a grade-separated interchange is constructed at this location. Also, air quality impacts near the intersection Paniolo Drive and Waikoloa Road will be diminished if the north-south collector road west of and parallel to Paniolo Drive is built in 1995 as planned.

Aside from further improving roadways, air pollution impacts from vehicular emissions can be mitigated by reducing traffic through the use of mass transit and car pooling and/or by adjusting local school and business hours to begin and end during off-peak times. Due to the extended completion date for the project, it is conceivable that the efficiency of motor vehicle engines and/or emission control equipment will be improved or that vehicles will be developed which burn cleaner fuels before the project reaches full build-out. If this occurs, then impacts will be less than predicted. With regard to cleaner burning fuels, vehicles burning methanol or compressed natural gas or powered by electrical motors are some of the possibilities for technological development that are currently being contemplated. Lastly, even without technological breakthroughs, it is also possible that at some point in the future the state may decide to adopt either a motor vehicle inspection and maintenance program, which would ensure that emission control devices are properly maintained and thereby reduce emissions, or more restrictive emission control standards.

Indirect emissions from project electrical demand could be reduced somewhat by utilizing solar energy design features to the maximum extent possible. This might include installing solar water heaters, designing homes and building space so that window positions maximize indoor light without unduly increasing indoor heat, and using landscaping where feasible to provide afternoon shade to cut down on the use of air conditioning. Use of wind power generating units, sloar energy, geothermal energy, ocean thermal energy conversion and/or other alternative energy sources by the utility instead of fuel-burning facilities also would lessen indirect emissions from project electrical demand.

Most probably solid waste from the project will be buried at a landfill, and any air pollution impacts will be minimal if the landfill is operated properly. If project refuse is burned instead at a municipal incinerator, air pollution impacts could be reduced substantially if the incinerator is fitted with pollution control equipment, i.e., electrostatic precipitators or fabric filters. Conservation and recycling programs also could reduce solid waste which would reduce any related air pollution emissions proportionately. Lastly, if the new H-Power garbage-to-energy facility located on Oahu proves successful, similar facilities on the other islands may be developed before project completion. Use of solid waste to generate power will offset emissions that would otherwise occur from fossil-fueled power plants if the waste would be simply incinerated instead.

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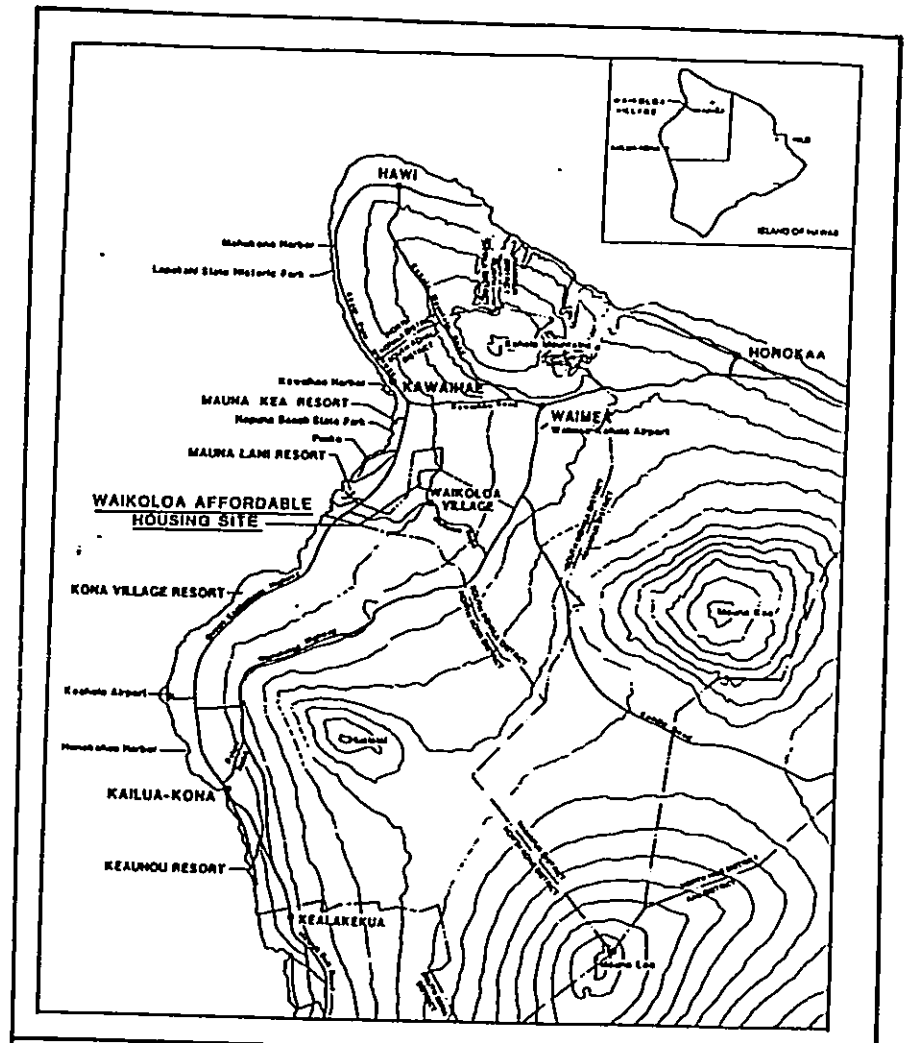


WAIKOLOA AFFORDABLE HOUSING PROJECT MASTER PLAN EIS

Figure 1
PROJECT LOCATION MAP

Table 1

SUMMARY OF STATE OF HAWAII AND NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Units	Averaging Time	Maximum Allowable Concentration		
			National Primary	National Secondary	State of Hawaii
Suspended Particulate Matter	$\mu g/m^3$	Annual	-	-	60[a]
		24 Hours	-	-	150[b]
Particulate Matter[c]	$\mu g/m^3$	Annual	50	50	-
		24 Hours	150[b]	150[b]	-
Sulfur Dioxide	$\mu g/m^3$	Annual	80	-	80
		24 Hours	365[b]	-	365[b]
		3 Hours	-	1300[b]	1300[b]
Nitrogen Dioxide	$\mu g/m^3$	Annual	100	100	70
Carbon Monoxide	mg/m^3	8 Hours	10[b]	-	5[b]
		1 Hour	40[b]	-	10[b]
Ozone	$\mu g/m^3$	1 Hour	235[b]	235[b]	100[b]
Lead	$\mu g/m^3$	Calendar Quarter	1.5	1.5	1.5

[a]Geometric mean

[b]Not to be exceeded more than once per year

[c]Particles less than or equal to 10 microns aerodynamic diameter

Table 2

ANNUAL SUMMARY OF AIR QUALITY MEASUREMENTS FOR MONITORING STATIONS NEAREST WAIKOLOA AFFORDABLE HOUSING PROJECT

Parameter / Location	1985	1986
Sulfur Dioxide / Kealakekua, Kona		
Period of Sampling (months)	7	8
No. of 24-Hr Samples	31	40
Range of 24-Hr Values (ug/m3)	<5-8	<5-12
Average Daily Value (ug/m3)	<5	<5
No. of State AAQS Exceedances	0	0
Particulate / Kealakekua, Kona		
Period of Sampling (months)	7	8
No. of 24-Hr Samples	34	40
Range of 24-Hr Values (ug/m3)	6-22	4-28
Average Daily Value (ug/m3)	12	16
No. of State AAQS Exceedances	0	0

Source: State of Hawaii Department of Health, "Hawaii Air Quality Data for the Period of January 1985 to December 1987"

Table 3

ESTIMATED WORST-CASE 1-HOUR CARBON MONOXIDE CONCENTRATIONS ALONG ROADWAYS NEAR WAIKOLOA AFFORDABLE HOUSING PROJECT (milligrams per cubic meter)

Roadway Intersection	Year/Scenario: 1990/ Present AM	PM	1997/ Without Project AM	PM	1997/ With Project AM	PM
Queen Kaahumanu Highway at Waikoloa Road	5.5	2.6	16.2[a]	7.7[a]	15.2[b]	9.8[b]
Paniolo Drive at Waikoloa Road	5.9	5.0	8.2	5.2	13.2[c]	9.8[c]
Mamalahoa Highway at Waikoloa Road	1.9	2.3	4.4	4.5	6.2	5.1

Hawaii State AAQS: 10
National AAQS: 40

[a]Assumes intersection signalized and speed limits reduced to 45 mph.

[b]Assumes intersection signalized and second left-turn lane added for westbound traffic; speed limits reduced to 45 mph.

[c]Assumes intersection signalized and eastbound left-turn lane and westbound right-turn lane added.

Table 4

ESTIMATED WORST-CASE 8-HOUR CARBON MONOXIDE CONCENTRATIONS ALONG ROADWAYS NEAR WAIKOLOA AFFORDABLE HOUSING PROJECT (milligrams per cubic meter)

Roadway Intersection	Year/Scenario: 1990/ Present	1997/ Without Project	1997/ With Project
Queen Kaahumanu Highway at Waikoloa Road	2.8	8.1[a]	7.6[b]
Paniolo Drive at Waikoloa Road	3.0	4.1	6.6[c]
Mamalahoa Highway at Waikoloa Road	1.2	2.2	3.1

Hawaii State AAQS: 5
National AAQS: 10

[a]Assumes intersection signalized and speed limits reduced to 45 mph.

[b]Assumes intersection signalized and second left-turn lane added for westbound traffic; speed limits reduced to 45 mph.

[c]Assumes intersection signalized and eastbound left-turn lane and westbound right-turn lane added.

Table 5

ESTIMATED INDIRECT AIR POLLUTION EMISSIONS FROM WAIKOLOA AFFORDABLE HOUSING PROJECT ELECTRICAL DEMAND[a]

Air Pollutant	Emission Rate (tons/year)
Particulate	3
Sulfur Dioxide	38
Carbon Monoxide	8
Volatile Organics	3
Nitrogen Oxides	36

[a]Based on U.S. EPA emission factors for utility gas turbines [5]. Assumes net electrical demand of 15 million kw-hrs per year and low sulfur oil used to generate power.

Table 6

UNCONTROLLED AIR POLLUTION EMISSION FACTORS FOR MUNICIPAL REFUSE INCINERATORS (lb/ton)[a]

Air Pollutant	Emission Factor
Particulate	14[b]
Sulfur Oxides	2.5
Carbon Monoxide	35
Organics	1.5
Nitrogen Oxides	3

[a]Emission factors are given in terms of weight of material emitted per unit weight of refuse material charged.
[b]Assumes incinerator equipped with settling chamber and water spray.

Source: U.S. Environmental Protection Agency [5]

APPENDIX D

Archaeological Reconnaissance Survey by William Bonk

AN ARCHAEOLOGICAL RECONNAISSANCE SURVEY AT WAIKOLOA VILLAGE, SOUTH KOHALA, HAWAI'I

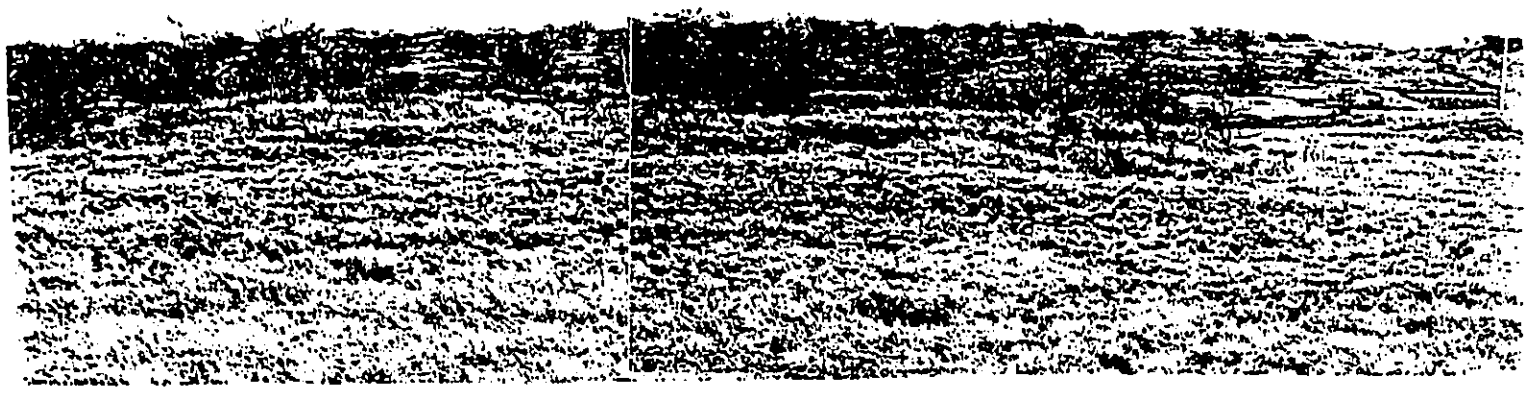
by

WILLIAM J. BONK

UNIVERSITY OF HAWAII AT HILO

prepared for

BELT, COLLINS & ASSOCIATES



Hilo, Hawaii

December, 1988

INTRODUCTION

During the early part of May, 1968 this writer was contacted and asked to submit a proposal for an archaeological reconnaissance survey and report for a parcel of land in the Waikoloa area of Hawaii. After examining the particulars regarding area, access, etc. a proposal was drafted and sent to Belt, Collins and Associates of Honolulu. Early in July I received authorization to proceed with the project and the following pages of this report provide the results of the investigation and the recommendations that result from that research.

Prior to completion of this report a preliminary letter statement of my findings was communicated to Belt, Collins and Associates, to pertinent State and County offices, and to the Director of Planning at Waikoloa.

AREA

The area surveyed and reported on in this report is in the *ahupua'a* of Waikoloa, South Kohala District, on the island of Hawaii. It consists of a 580 acre parcel of land at the north end of Waikoloa Village (See Figure 1.) In addition, it may be further identified through its Tax Map Key: 6-8-02:26, which places its location to the north and west of Paniolo Drive (See Figure 2.)

The general shape of the project area is slightly longer in its north-south axis than in its east-west direction although there is a slight bulge in the center of its eastern margin. A rough dirt road extends northward from the end of Paniolo Drive and so forms the 6000± feet eastern boundary of the plot. The northern border follows the center of Kamakoa Gulch for approximately 4600 feet, whereas a smaller, unnamed gulch is at the southern perimeter. Here the study area is at its narrowest, with only about 4000 feet separating the southeast corner of the parcel from that of the southwest. The 5000 feet of the western borderline curves slightly in a northwest direction thereby allowing for a greater width in the northern portion of the parcel in comparison to that of the southern portion of the plot.

The surface gradient within the tract exhibits a general downward slope toward the west. In the north the terrain drops some 213 feet from east to west, with the lowest elevation, some 567 feet above sea level, recorded in the northwest corner of the project area. In contrast, a drop of only 135± feet was noted for the southern margin. The highest points within the tract are usually along or just within the eastern border. In the northeast we recorded 780± feet above sea level, in the southeast approximately 785 feet, and at a point roughly one-third of the distance north of the southeast corner we recorded the highest elevation in the parcel at 893 feet above sea level.

The region in and around Waikoloa Village is noted for its savanna-like quality of the physical environment. Rainfall is light, probably no more than 35 to 40 inches a year. As a result course grasses with scattered scrub tree growth, most often *keawe*, dominate within the ecosystem. In addition, there are numerous days during the year when the wind is quite strong and sometimes gusty. The project area is very typical of that just described for the broader region (See Title Page illustration and Figures 3-6.)

The ground surface varies somewhat from place to place

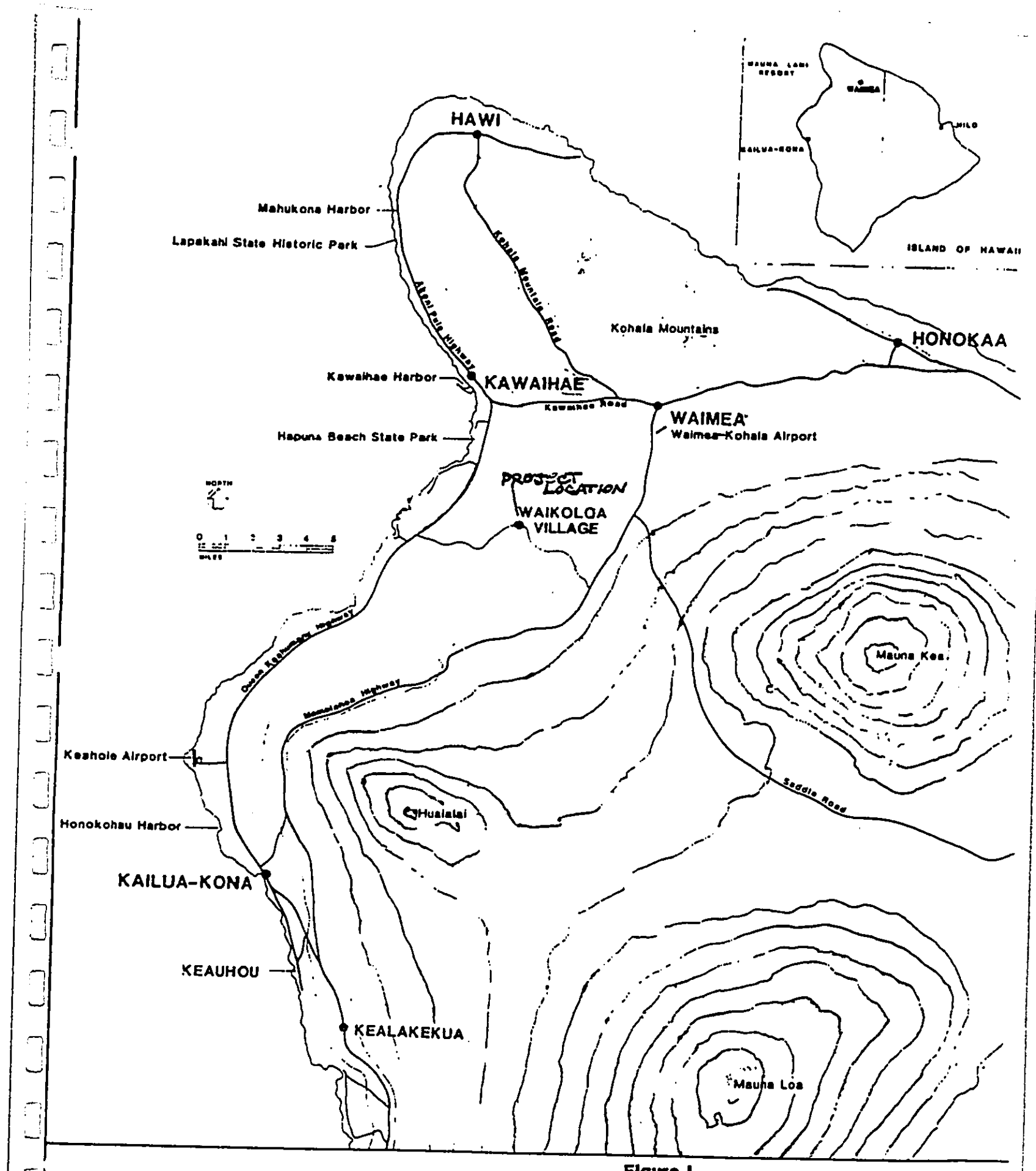


Figure 1

REGIONAL MAP

Kohala and Kona, Hawaii

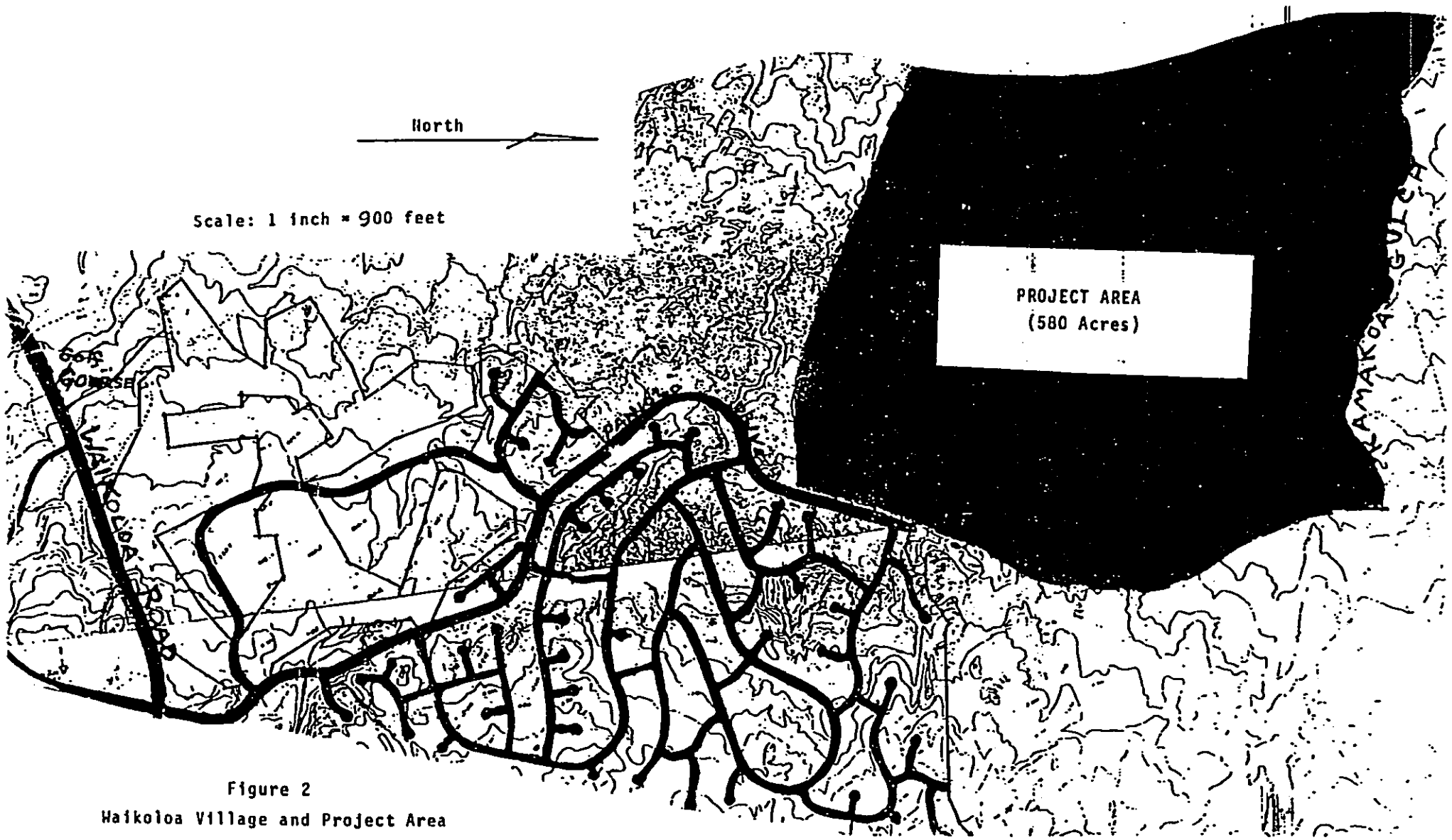


Figure 2
Waikoloa Village and Project Area

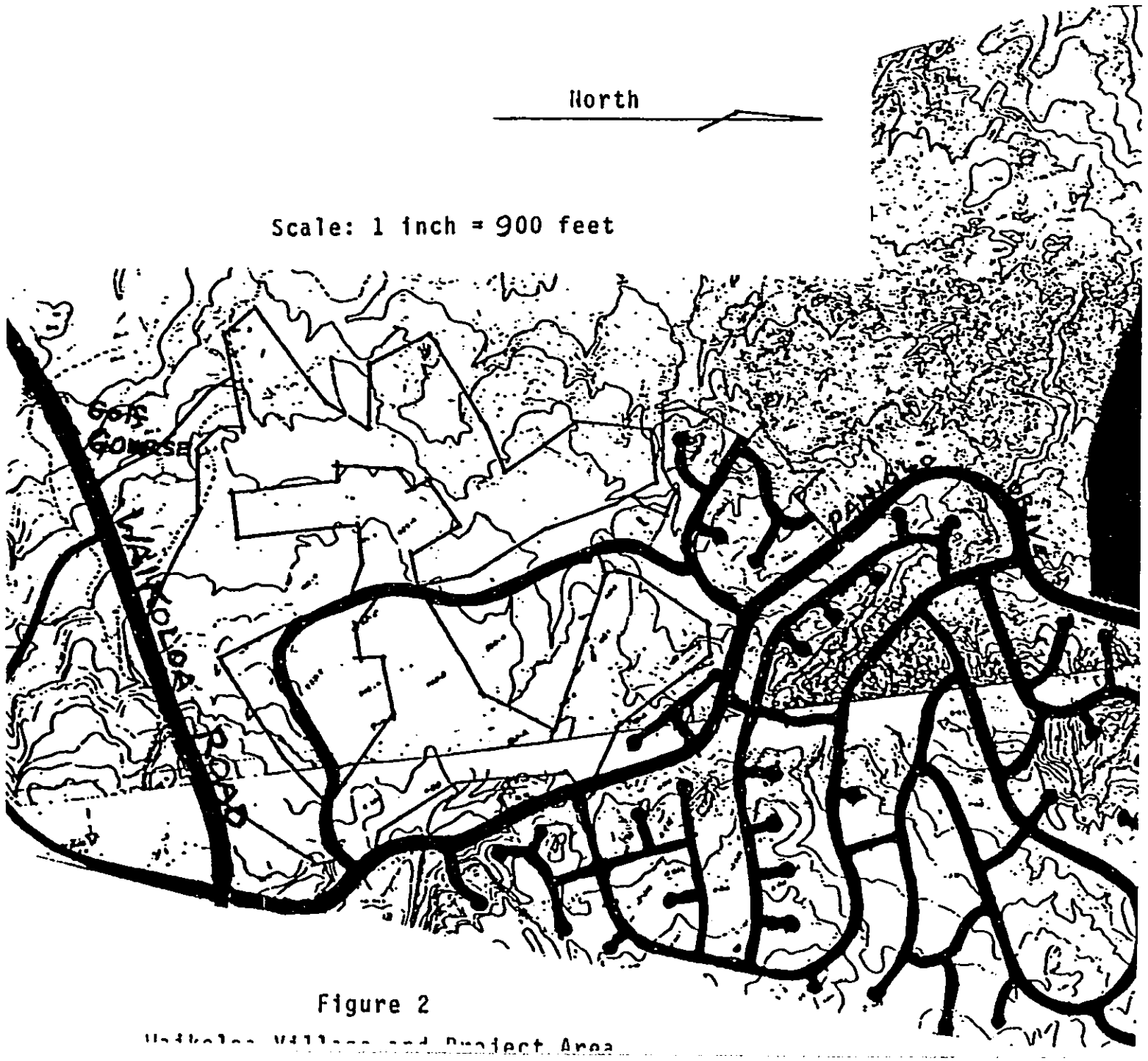


Figure 2

Waikoloa Village and Project Area

Figure 3
At Southeast of the Project Area (Looking westward)

Figure 4
At Northeast of the Project Area (Looking westward)

Figure 5

At Southeast of the Project Area (View South and Southwestward)

Figure 6

At Northeast of the Project Area (View West and Northwestward)

within the study area but for most of the northern half of the tract it tends to effectuate a visual appearance of that best described as a rolling or slightly undulating expanse (See Figures 4 and 6.) This northern section was much more readily traversed, for the ground underfoot was more secure than that to the south. The southern half of the project area includes places where the ground surface drops more precipitously as well as where rock outcroppings hinder steady movement. Furthermore, localized tracts covered with *'a'ā* resulted in difficulty of movement and a reasonable time for examination. More difficult yet were the *'a'ā* tracts covered by grass. Here both footing as well as sight were limited. One result was the sharp increase in time required to examine a particular section of the study area. On numerous occasions while in the field this writer struggled and eventually fell or stumbled because of the terrain.

METHODOLOGY

This report is the end product of a field investigation commonly referred to as a reconnaissance survey. Visual observation and record keeping while walking through an area to be investigated is normally part of the methodology used in the field for this type of survey. In this case notes were recorded in a field book and photographs were taken in both black and white and color film. Many times when cultural data or material is encountered the survey leads to additional stages of investigation. When this takes place it usually is the result of recommendations included as part of the reconnaissance survey.

For this investigation the field survey was carried out by myself with the aid of my son, Ken, who quite often accompanies me in the field.

Approximately 115 hours went into the field portion of this survey. Eight transects in an east-west/west-east direction were first carried out, followed by four transects in a south-north/north-south direction. With this amount of detailed coverage of the area we feel quite confident that no portion of the study area was overlooked.

FINDINGS AND RECOMMENDATIONS

Throughout the field examination we found nothing to indicate past use of the project area other than some scattered shrapnel fragments indicative of use as a military target area in the recent past. However, these fragments were quite limited and therefore it is surmised that this use was of an accidental or sporadic nature rather than one of a regular occurrence. Perhaps the event that led to the presence of these metal fragments in this area dates to the period of World War II when large numbers of U.S. servicemen were based and trained at Waimea and used the surrounding region for training purposes.

In conclusion, and as a result that we found nothing of prehistoric or historic significance within the area investigated, we therefore must recommend that no further archaeological work be required. In addition, it is further recommended that, based on the above, any land transformation would not be archaeologically detrimental and therefore can proceed.

ADDENDUM

The following additional remarks to my report of December 1988 should be viewed as a form of clarification and addition. This is so as to add to what has originally been set down as well as to illuminate that which may have been questionable.

The first two figures (maps) are both descriptive and interrelated, in that the study area is to be found north of Waikoloa Village and west of the northernmost end of Paniolo Drive. This road is paved and completed for somewhat less than one-third the distance along the east border of the study area. Beyond that an unpaved "jeep" trail extends along the east border and beyond the northern limits of the study area.

An additional map, originally drafted by Engineers Surveyors Hawaii, Inc. is included in this supplement so as to illustrate the lay of the land. As one can see from a perusal of this map only two gullies are found and these delineate the southern and northern ends of the area examined. Nowhere were we restricted from examining the ground surface although the banks of the gullies are somewhat more difficult to view, as was a region in the south-west where thin slabs of clinker *'a'ā*, partially covered by grass, produced unsure footing. This portion of the area examined also has the greatest incidence of surface declivity, hence the need for more time in coverage.

No recorded lava flows are within the area examined. A brownish patination on the rock surface also supports a minimal age of more than 200 years for the flow. How much beyond this time, however, is fathomless. The northern half of the tract was walked over more readily and with less difficulty, for all but the immediate locale of Kamakoa gulch. The northern portion of the area examined exhibits no steep slopes and very little rough ground surface.

In terms of climate and vegetation the land is quite arid. Mean annual temperature is about 24°C (75°F) and mean annual rainfall is a little over 250 m (about 10 in.) If we use the Koeppen classification system we have to refer to this area as Hot Desert (BWh.)

The Waikoloa Village area is noted for its windy conditions. Land breezes tend to sweep across this open region, predominantly from the northeast, but occasionally during the winter months there is a shift and they then blow from the southwest.

With this reversal of wind pattern comes most of the moisture during the winter months.

The subject area falls within McEldowney's Vegetation Zone III (1983: 410). Grasses form the dominant vegetation interspersed with scattered stands of *kiawe*. Buffelgrass and *pili* predominate over other grasses, and shrubs are seen more often than in lower elevations. Fountain grass is seen here and there and seems to be gaining in significance over time.

In the northern half of the study area, soils are shallow aridsols of the Kawaihae series (KNC). Well drained, gritty, and stony, they tend to be moderately eroded by wind and water. Formation is from aeolian fine sand and silt, although weathering of volcanic ash is also part of the formative process. An upper horizon of very fine sandy loam overlays loam or silt loams with a weak medium and/or coarse prismatic structure. Calcium carbonate collections are seen as coatings on rocks (USDA Soil Conservation Service; 1973:26.) Hard *pahoehoe* bedrock is at a depth of between 20 to 40 inches, permeability is moderate and runoff is medium. Roots usually penetrate to bedrock. This soil is used mostly for pasture although no cattle were seen in the area during the field investigation.

The southern half of the area examined is classified as Very Stony Land (rVS.) It shows very shallow soil material and a high proportion of *'a'ā* lava outcroppings. Slope increases here with a range of between 10 and 15 percent. Between lava outcrops and in the cracks of the lava, the soil extends to a depth of 5 to 20 inches. Erosion here is slight. (USDA Soil Conservation Service, 1973:52.)

The prehistoric land use pattern in the Waimea-Waikoloa area was originally subsistence horticulture and a subsistence marine exploitation. By the later half of the 16th century, we see changes in this pattern with an increase, through time, of what I have called a "subsistence-support" economy. This reaches its peak in the late prehistoric of the second half of the 18th century (Bonk, 1985:6.) As foreign ships increased in numbers at Kawaihae, in the early historic period, we see a further development to a "subsistence-trade" economy for the environs of Waimea. Through the 19th century, cattle became a greater and more important part of the economic base, the transporting of products, and a money-based economic system gradually substituted for that of a subsistence base.

As was mentioned previously (Bonk, 1985:6) these cultural changes went hand in hand with a related environmental evolution in the form of botanical and zoological change. Subsequently, this had an effect on the land surface. Exotic animals

and plants substituted for endemic varieties, which furthermore set off a new ecological movement that changed the physical as well as the cultural environment.

The above cultural-ecological overview, although originally written with respect to the Waimea area, has implications as well for Waikoloa. It was Soehren (1980) who pointed out that:

> "At the Mahele of 1848, the land, Waikoloa, was awarded to George Huen Davis, son of Isaac Davis, the English companion and advisor to Kamehameha I."

The viewing of a present day tax map tends to over state this award to Davis by the king. Because of the nature of the land many "commonly regarded" Waikoloa not "as an *ahupua'a* but as "an *'ili'aina* of Waimea." Soehren goes on to say that Waikoloa' gargantuan size is in inverse proportion to its value to the ancient Hawaiian economy." Because of the availability of water and the productive soils of the Waimea area, the development depicted previously (Bonk, 1985) allowed Waimea to become the "food-basket" of South Kohala. It became more significant as time passed and the surrounding areas became more subordinate to its power. This could well account for the interpretation of Waikoloa as an *'ili'aina*. It could also be the reason for its large size, for value is not necessarily based upon size alone, nor size of great value. In fact we might better evaluate on the basis of other criteria, such as the effectiveness of cultural and population support criteria. This discussion leads one to sum up by quoting Soehren (1984) who says, "In aboriginal times, before cattle, these lands (Waikoloa) were marginal to the Hawaiian economy, serving as a reservoir of material products such as *pili* grass and birds." Certainly, without an assured source of water, as the people of Waimea provided through the building of their extensive irrigation system, the midlands of Waikoloa were not able to support horticulture. A yearly rainfall of 10 inches and a soil base inherent with limitations of a cultural nature would not allow permanent settlement at the time. This can account for the paucity of archaeological remains in the midlands of Waikoloa and explains as well why we found nothing of prehistoric cultural significance in the region that we scrutinized. As cultural evolution proceeds, however, cultural transformation can substitute for the lack of use in the past. Today, the village of Waikoloa, is fast growing. However, only the cultural "umbilical cords" of piped water, financial support from elsewhere, speedy transportation, and a national-international economic/cultural base is this possible at this time.

Marine exploitation was more readily available for the coastal inhabitants of Waikoloa and its neighboring *ahupua'a*.

This is readily noted by a examination of the archaeological and historical literature. Starting with Reinecke in 1930 and extending to the present, we see an increasing number of reports covering the lowland regions. The summarization and analysis of this data shows the use of these coastal, inshore and offshore areas as of economic importance in the prehistoric period. If the midlands were marginal, the coastal regions were of import. This produced a drawing attraction for people and cultural development within the coastal region, but not in the midlands. Here, only off and on incursions were made for the gathering of *pili* grass for the thatching of homes and other structures, and the passage through these lands on travels elsewhere, hardly a reason for settlement, or even lingering long enough to leave their cultural marks on the surface of the ground. Only in recent years do we see the accumulation of cultural debris. Prior to the development of the village of Waikoloa in the early 1970's only the military left their mark on the study area. There is no question that some military personnel were in the region, perhaps during WW II, for we found the remains of field communication wire as well as a fair number of examples of schrapnel fragments. The latter showed clumping about centers of dispersal, just what would be expected if shells were fired into the area

Finally, and with regard to methodology, we made use of aerial photos and walked the length of the gullies to examine for the presence of cultural transformation, but to no avail. Nothing of a cultural nature, other than recent fence-lines, showed on the aerials.

As my son was with me in the field and aided in the transects, we were able to make eight passages each in a north-south, south-north direction. With these 16 north-south crossings combined with a larger number of east-west, west-east transects we were able to pass a given point on the landscape at no greater distance than approximately 80 to 90 feet. Even with this rather close proximity to previous passages we often times diverted if something caught our eye. In all cases what caught our attention proved to be nothing more than at best, an outcropping of rock.

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GLOSSARY OF HAWAIIAN WORDS

'a'ā	Lava, stony, rough clinker type.
ahupua'a	A land division usually extending from the uplands to the sea. So called because the boundary was marked by a heap (*ahu*) of stones.
kiawe	The algaroba tree. (Prosopis Sp.)
'ili 'āina	An *'ili* land division whose chief pays tribute to the chief of the *ahupua'a* of which it is a part, rather than directly to the king.
pāhoehoe	Smooth, unbroken type of lava, contrasting with *'a'a*

APPENDIX E

Market Analysis by Real Estate Services, Inc.

MARKET RESEARCH AND ANALYSIS

WAIKOLOA AFFORDABLE HOUSING

COUNTY OF HAWAII

PREPARED FOR:

R.M. TOWILL CORPORATION

DEPARTMENT OF PLANNING AND LAND DEVELOPMENT

PREPARED BY:

REAL ESTATE SERVICES, INC.

PETER T. YOUNG, CREA CRB CRA SCV

JUNE 1990

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WAIKOLOA AFFORDABLE HOUSING

This report reviews and addresses the anticipated housing demands created by resort development at Waikoloa, outlines affordable housing alternatives for the County's designated property there and identifies the market for such housing.

The recommendations for the number and type of housing units are based on a review of available data of existing and future market demand for housing in the West Hawaii region.

Population studies and projections, income data, and employee surveys have been reviewed and evaluated along with proposed and potential housing development projects in West Hawaii. A listing of these resources is provided.

The ultimate mix, number of units and project layout and design will be determined by developer(s) of the site. The findings and recommendations found in this report are subject to adjustment.

In summary, with regard to the County's affordable housing project at Waikoloa, it is recommended:

1) Number of units - The overall number of residential units be 1,200 to 1,500.

2) Price/Rental Range - The units should fall within a price or rental range to accommodate households within the 50 to 140 percent of median income.

3) Housing Mix - A variety of housing "models" is appropriate.

"Traditional" single-family and multi-family development, "cluster" development, "self-help" construction, zero lot line construction, vacant lot sales with conditions to built homes within a specified period and possibly the "dormitory" model should be considered.

Single family vs. multi-family of all types should be 40/60, 40 percent single family, 60 percent multi-family (multi-family uses include the multi-plex, shared house and traditional apartment buildings).

Within conventional apartments the unit mix should be as follows: 10 percent studios, 40 percent one bedroom, 40 percent two bedroom and 10 percent three bedroom.

Many of the single-family units would likely be in the 3-bedroom/1.5- to 2-bathroom range, but a substantial number of studios, 1- and 2-bedroom units are also appropriate.

It is reasonable to "copy" some of the apparently "successful" existing housing models including:

- The "duplex" subdivision at Kinohou in Waimea (duplexes built on 10,000 SF lots)
- The Pines condominium in Kailua-Kona (individual units with adjoining "limited common element" land area that serves as small front and back yards)
- La'ilani apartments at Kealakehe

4) Unit Summary - It is recommended that the project include 700 single family units and 800 multi-family units. Single family units could include 200 conventional single family units with a land area of 7,500 square feet and 500 Zero Lot-line units with a land area of 4,500 square feet.

The multi-family units could include 100 shared units, 400 multi-plex units and 300 conventional units. The conventional units could include 10% studios, 40% 1-bedrooms, 40% 2-bedrooms, and 10% 3-bedrooms.

5) The diversity of housing types is important as well as the diversity of the appearance within any specific area of the 300 acres. While the Pines is illustrated as a model to follow, it is not specifically something to duplicate. With a variety of roof styles, exterior coloration and setback from the road, the same product can be shown significantly differently than the "sameness" and routine seen in the Pines project. The ultimate goal is to produce a product that is affordable but does not necessarily look like "affordable housing".

6) Other potential market responses: In addition to traditional single-family and multi-family product, non-traditional housing may be expected to absorb a small percentage of the market. One form already used in the market is the "Shared house". Here rooms are made available at modest rents to mostly transient workers. Self-help or "sweat-equity" housing may also find a small market among resort workers if reasonably

priced lots are made available. A third form, already popular and ready to grow, is the ohana unit in existing residence, both legal and illegal.

7) Sale vs. Rent Ratio - A 50/50 ratio (or close to it) of "for rent" vs. "for sale" is an appropriate housing tenure mix. The ratio is consistent with the existing mix of South Kohala employees.

It should be noted that survey results show a higher percentage of management positions are in rentals rather than owned units. As such, it is reasonable to provide single family rental housing in addition to the single family sales. Many of these management positions involve transient personnel "climbing the corporate ladder" who are relatively mobile and not tied down with home ownership.

8) Lot Size - Lot sizes for the single family property should be varied with a minimum of approximately 4,000 square feet (in a formation similar to the Pines project in North Kona) to approximately 7,500 square feet. A typical multiplex and shared housing is recommended to have a combined land area of 4,000 to 10,000 square feet.

9) Buy-Back - To maintain the "affordability" of housing developed on the County's site, it is reasonable to consider a "buy-back" condition similar to HFDC's buy-back. A 10-year buy-back term appears reasonable to help eliminate speculation, maintain an affordable housing stock and it does not unreasonably restrict the homeowner.

10) Financing Alternatives - Two alternatives to the 'buy-back' include a 'sleeping second mortgage' or the 'shared equity' approach. These alternatives offer the opportunity to reduce selling prices while maintaining cost recovery to the County.

11) Projected Market - The demographics of consumers for affordable housing market at Waikoloa include:

- Construction workers for continued resort development along the North Kona/South Kohala coast;
- Permanent work force at completed hotels;
- General population growth resulting from continued economic growth.

While we can not "reserve" or "limit" the housing opportunities only to employees of the developments in Waikoloa, primary emphasis should be placed on their apparent needs. These needs are further discussed in the report.

These recommendations are made with consideration to increased economic and population growth in the Waikoloa area, to the varied demographics and needs of the potential consumer market, and to the maximum efficiency of construction and land use while incorporating traditional with innovative housing alternatives.

This report incorporates data from existing public documents was well as studies, surveys and prospectus done by the private sector. They include:

- County of Hawaii General Plan
- County of Hawaii Infrastructure Needs Assessment
- County of Hawaii Office of Housing and Community Development 1983 Survey
- Office of State Planning West Hawaii Regional Plan
- State of Hawaii Housing Finance and Development Corporation
- Office of Housing and Urban Development Housing Market Analysis
- Keahole to Kailua Development Plan
- DBED Statistical & Economic Report
- Kealakehe Planned Community Concept Feasibility Study by Belt Collins (and Peat Marwick Mitchell Progress Presentation for Kealakehe Planned Community Development Housing Market Assessment)
- La'ilani Housing Project Environmental Assessment
- Bank of Hawaii "Construction in Hawaii 1989" and a 1988 report prepared by Donnelly Demographics of New York
- First Hawaiian Bank "Economic Indicators," September 1989
- Mauna Kea/Mauna Lani employee survey, January 1987
- Environmental Impact Statement, Ritz-Carlton/Mauna Lani, May 1987
- A 1986 executive summary, "West Hawaii Housing: Actions to Improve Affordability and Requirements for Employee Housing."
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- The Sunday Star-Bulletin & Advertiser, 8/20/89
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- Population Projections:
    - District by district breakdown for 1970 & 1980 from US Census
    - District by district breakdown for 1987 from State Department of Business and Economic Development
    - Parker Ranch 2020
    - Queens Medical Center Population Projection Analysis
    - Puako Mauka
    - Signal Puako

POPULATION ESTIMATES - STATE AND COUNTY

The County of Hawaii encompasses the Island of Hawaii, which is the Southernmost and largest of the Hawaiian Archipelago. The land area of the County is approximately twice that of all the other islands of the State.

Within the past twenty-five years, tourism has emerged as the primary economic activity on the island. Much of the economic growth experienced during this period can be linked with the expansion of the visitor industry.

In 1970, just prior to the adoption of the General Plan, the population in the county of Hawaii numbered 63,468. The 1970 census count was the first to show an increase, albeit small, since 1930. Population in modern history peaked at 73,325 during that year, largely as a result as the importation of labor for the sugar industry. The population decline between 1930 and the 1960s was primarily due to the increasing mechanization of the sugar plantation, limited job opportunities in other economic sectors, and the out migration of residents. This decline was reversed during the 1960s with the modest growth of 2,140 residents between the 1960 and 1970 census.

Since 1970, the county's population has continued to grow. The 1980 census registered an island-wide population of 92,053 people representing a growth of 28,585 residents for a 45% increase over the 1970 census. Estimates prepared in the 1989 Hawaii County Data Book suggests a population of 117,500 in 1988. This estimate represents the County's approaching the island's native population in 1779 estimated to have between 100,000 to 150,000.

Three sets of population projections were developed for the County's comprehensive planning review program, series A, B, and C. The major variable in each of these projections was the rate of growth of the visitor industry. Plans for resort complexes and other factors were considered in the forecast of hotel rooms.

Series A is the most conservative projection. It assumes the demise of the sugar industry and modest expansion in the visitor industry. The overall 1985-2005 rate of growth for series A of 2.0% per annum is less than the 2.9% rate of growth of employment in the County during the last five years.

Series B projections were developed as a medium series. These projections lie between series A and C. Sugar employment is maintained and the overall per annum employment growth rate anticipated in Series B is approximately 3.7%.

Series C is an optimistic outlook of the County's future. It is assumed that 17,800 hotel rooms plus additional condominium units will be built in the County by 2005. The average annual growth rate of employment in series C is 4.7%

From the estimates of the island-wide resident population, other estimates have been made which attempt to project the distribution of population over the various districts of the island. They are based on assumptions of potential employment growth rates described in the previous island employment and population estimates, past district growth trends, and trends in the distribution of population over the islands.

District Distribution
(Year 2005 Projections)

District	Series A	Series B	Series C
Puna	39,790	49,910	58,340
S. Hilo	44,115	55,335	65,790
N. Hilo	1,211	1,519	1,806
Hamakua	5,363	6,721	7,896
N. Kohala	5,363	6,721	7,896
S. Kohala	19,203	24,087	28,638
N. Kona	43,250	54,250	64,500
S. Kona	10,899	13,671	16,254
Kau	3,806	4,774	5,676
Total	170,000	216,988	256,796

The proportion of 1980 residential population in East Hawaii to West Hawaii was 67 percent to 33 percent, respectively. County projections for the year 2005 indicate a shift in population from East Hawaii to West Hawaii. The county projects that by the year 2005, 45.5 percent of the residential population will be living in West Hawaii.

Patterns and population settlement and growth are defined for the most part by an area's economic opportunities and it's energy resources. In this respect, the West Hawaii region already has the foundations for providing an economic base as diverse as the island's environmental and climatic conditions. The region has many opportunities to sustain a stable and diversified economy supported by energy resources, high technology research and development, aquaculture, diversified agriculture, commercial and sport fishing, seafood marketing and ocean research. Expansion in these areas will increase job choice and the availability of higher paying jobs.

Unpublished population estimates from a Department of Transportation study show, within Waikoloa Village, 334 single family units, 226 multi-family units and 69 resort condos

existing in 1987. Projections for 2010 show an additional 2430 single family and 1000 multi-family units. Projected total units by 2010 are 3921 with a population of 11,760.

POPULATION PROJECTIONS

The following is a summary of population estimates from various reports including the County of Hawaii General Plan, the Office of State Planning West Hawaii Regional Plan, the County of Hawaii Infrastructure Needs Assessment and a preliminary plan prepared by Peat Marwick and Mitchell for the Housing and Finance Development Corporation (HFDC) for Kealakehe.

SOURCE		WEST HAWAII	NO. KONA	SO. KOHALA
County General Plan				
	-A		43,250	19,203
(2005)	-B		54,250	24,087
	-C		64,500	28,638
State West Hawaii Regional Plan				
	Planning	79,000		
(2005)	Max. bld	99,000		
County Infrastructure Needs				
	A	59,200		
	B	63,500		
(1995)	C	71,700		
	A	84,100	43,200	19,200
(2005)	B	105,500	54,300	24,100
	C	125,400	64,600	28,600
Kealakehe Plan (Peat Marwick) (2005)		102,000		

Units authorized by building permit
County of Hawaii
1980 to 1989

Year	Single family Units	Multi family Units(1)	Total units
1980	1,192	739	1,931
1981	1,033	285	1,318
1982	809	245	1,054
1983	880	96	976
1984	910	181	1,091
1985	988	190	1,178
1986	1,129	39	1,168
1987	1,367	361	1,728
1988	1,715	474	2,189
1989(2)	1,929	576	2,505
average	1,200	320	1,520

(1) Duplexes counted as multi-family units.
(2) Projected from January-July date.

Sources: Bank of Hawaii, "Construction in Hawaii 1989", and First Hawaiian Bank, "Economic Indicators", September 1989.

Hawaii County's housing supply by district from 1980 to 1987 is charted below.

District	Total housing units 1980	1987	Change 1980-1987	Annual growth rate 1980-1987
N Kohala	1,122	1,263	141	1.7%
S Kohala	2,218	2,938	720	4.1%
N Kona	7,540	9,717	2,177	3.7%
S Kona	1,722	2,097	375	2.9%
Hamakua	1,741	1,804	63	0.5%
Subtotal	14,343	17,819	3,476	3.1%
Other				
N Hilo	581	639	58	1.4%
S Hilo	14,301	16,220	1,919	1.8%
Puna	4,126	6,463	2,337	6.6%
Ka'u	1,441	1,733	292	2.7%
Subtotal	20,449	25,055	4,606	2.9%
Total	34,792	42,874	8,082	3.0%

Sources: Hawaii County Planning Department, "Hawaii County General Plan" 1987 counts estimated by Planning Department from unpublished sources as of December 5, 1989.

The following is a list of the major proposed projects in the West Hawaii area. They are described in terms of location, and number of units. There is no indication as to the planned price range of these units. The numbers involved, however, suggest that a majority will need to be priced to the bulk of the residential market in order to assure their marketability.

Major Proposed Residential Projects in West Hawaii

Project	Location	Total units
Ainakea Unit II	N. Kohala	70
Kohala Ranch	N. Kohala	1,800
Kohala by the Sea	N. Kohala	73
Waiwailani	N. Kohala	89
Kapaanui	N. Kohala	170
Calif-Kohala	S. Kohala	2,000
Puako Heights	S. Kohala	3,000
Signal Puako	S. Kohala	2,700
Puako Mauka	S. Kohala	2,000
Parker 2020	S. Kohala	800
Waikoloa	S. Kohala	3,450
Estates at Waimea	S. Kohala	45
Taiyo Fudasan	N. Kona	300
Hi. Kona Coast Assoc.	N. Kona	950
Waiki'i Ranch	N. Kona	200
Y-O Ltd.	N. Kona	1,433
Gamlon	N. Kona	690
Keauhou View	N. Kona	275
Kona Coast	N. Kona	512
Lanihau	N. Kona	3,000
Kealakehe	N. Kona	4,100
Alii Village	N. Kona	368
Kaulana at Kona	N. Kona	276
Pualani	N. Kona	364
Kona Woods	N. Kona	110
Pu'uhonua	N. Kona	479
Kau-Kona	N. Kona	3,000
Kamehameha Garden	N. Kona	336

The above list represents proposed projects in various levels of approval and development. Some of the projects may be developed in the near future, others may never occur. The ultimate number of units, and actual development, may change as time passes.

living farthest from their jobs are somewhat more likely to want to live somewhere else, and the "somewhere else" is usually in South Kohala (usually makai South Kohala, although dissatisfied Hamakua residents just want to move to Waimea).

Employee Survey results indicate that 71-percent of current workers live in single-family housing and 21 percent in multi-family units, although a higher proportion (31 percent) of recent in-migrants live in multi-family units. The average number of rooms per unit reported in the survey was six, indicating a typical unit size of two to three bedrooms. It is therefore concluded that the housing in demand by resort workers will be two to three bedroom units--primarily single-family homes, but with increasing willingness to reside in apartment units as more in-migrants enter the West Hawaii work force.

Responses could indicate something about where future in-migrant hotel workers would choose to live if not constrained by housing supply. There is an even clearer preference among dissatisfied Newcomers for moving to makai (as opposed to mauka) South Kohala. But the general picture is still that most Newcomers would remain where they already are.

In-migrants originally from other Hawaiian islands (ignoring recency of move) were relatively more likely to settle in South Kohala, while in-migrants originally from the Mainland were relatively more likely to end up in Kona or makai South Kohala.

COUNTY HOUSING SURVEY - 1983

The County Office of Housing and Community Development undertook the development of a comprehensive housing plan in early 1983. One of those sources was determined to be an in-person survey of Big Island residents.

In June, 1983, the County commissioned Hawaii Opinion, Inc. to compete 1,055 interviews with the Big Island residents concerning planning and housing issues. The interviews were completed in the respondents' homes over an eight week period. The 1,055 completed interviews were distribut
County's six major regions in the following manne

Hilo	-356 interviews	Hamakua	- 80 inter
Kona	-338 interviews	Puna	- 117 inter
Kohala	- 90 interviews	Kau	- 74 inter

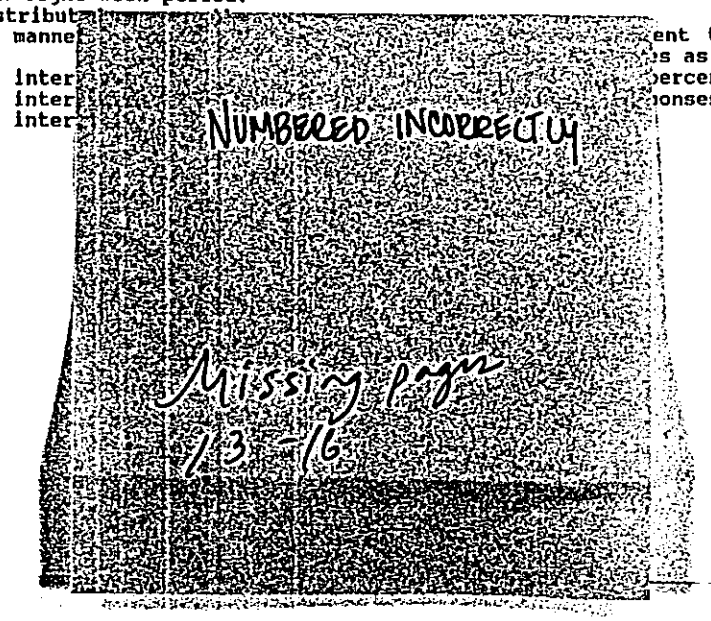
The following are relative questions and responses to the 1983 County survey.

Important Housing Features

Which three or four of the following housing features do you consider to be most important in selecting a home?

	total %	Kona %	Kohala %
cost	67	65	56
privacy	54	59	56
security and safety	45	35	39
type of building	40	38	36
people in neighborhood	36	33	27
design, floor plan, and layout of unit	24	33	28
tenure, own vs. rent	23	16	19
location with respect to stores/services/ leisure activities	22	25	19
number of rooms	22	20	32
size of rooms	14	17	22
location with respect to jobs	14	16	9
relations with land-lord/management/owner	5	8	3
location with respect to public transportation	5	3	4
amenities available	3	5	2

ent the percentages of respondents who mentioned
s as important in selecting a home.
ercentages may exceed 100 percent because of
ponses.



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people in neighborhood	36	33	27
design, floor plan, and layout of unit	24	33	28
tenure, own vs. rent	23	16	19
location with respect to stores/services/ leisure activities	22	25	19
number of rooms	22	20	32
size of rooms	14	17	22
location with respect to jobs	14	16	9
relations with land-lord/management/owner	5	8	3
location with respect to public transportation	5	3	4
amenities available	3	5	2

These represent the percentages of respondents who mentioned these features as important in selecting a home.
note: the percentages may exceed 100 percent because of multiple responses.

Rent Or Own Housing Unit.

Do you rent or own this housing unit?

	total %	Kona %	Kohala %
own	65	51	61
rent	31	42	34
other	4	6	4

Type of Building

	total %	Kona %	Kohala %
single family	87	71	93
duplex	1	1	--
townhouse	1	2	--
low rise apartment (1-4 stories)	10	24	7
high rise apartment (5 or more stories)	1	2	--

Prefer A Complete Home Or One With Just Basics

If you had to choose between a home that was complete with all the features you want or a home that had just the basic requirements but was half the cost, which would you choose?

	total %	Kona %	Kohala %
all features	22	31	33
basic requirements	75	64	67
don't know/refused	3	5	--

Preference: Type of Unit

If you were to move, which of the following housing units would you prefer?

	total %	Kona %	Kohala %
single family house on lot larger than 10,000 sq. ft.	65	63	66
single family house on a 7,500 to 10,000 sq. ft. lot	13	12	13
single family house on a 5,000 sq. ft. lot	5	5	4
duplex	1	1	--
townhouse	5	8	3
low rise apartment (1-4 stories)	6	7	6
high rise apartment (5 or more stories)	3	1	3
don't know/refused	2	3	4

Preference: Number of Bedrooms

How many bedrooms would you like to have in this house?

	total %	Kona %	Kohala %
one	5	4	2
two	27	34	13
three	46	42	54
four or more	19	17	19
don't know	4	4	11

Preference: Number of Bathrooms

How many bathrooms would you like to have in this house?

	total %	Kona %	Kohala %
one	18	15	12
two	69	71	66
three	11	11	12
four or more	1	1	--
don't know	2	2	10

RENTAL PROFILE - LA'ILANI

La'ilani is a rental project in North Kona. It is further described in this document. The demographics of La'ilani residents are summarized below:

	Percent
Marital Status:	
Single with Children	36.25
Single without Children	23.75
Married with Children	35.00
Married without Children	5.00
Total	100.00
Monthly Household Income:	
less than $1,500	61.25
$1,500 - $1,799	14.38
$1,800 - $2,099	5.63
$2,100 - $2,399	7.50
$2,400 - $2,699	3.13
$2,700 - $2,999	5.00
$3,000 - $3,299	0.63
$3,300 and more	2.50
Total	100.00
Median Monthly Income:	$1,320
Median Annual Income:	$15,840
Average Monthly Income:	$1,422
Average Annual Income:	$17,064

Reason for Moving:	Percent
Closer to Job	8.13
Need Rental that Accepts Children	4.38
Affordability	11.88
Family Problems	5.00
Want Independence from Parents	14.38
Need Larger Place	9.38
Personal Reasons	10.00
Other	24.38
No Reason Given	12.50
Total	100.00

Note: Information based on data available prior to the full occupancy of the Project. Information based upon 184 tenants residing at the Project at the time of this survey.

INCOME ESTIMATES

Income limits are calculated for family size for each metropolitan area and non-metropolitan county in the United States and its territories. They are based on the Department of Housing and Urban Development's (HUD) estimates of median family income, with adjustments for areas which have unusually high or low income to housing costs relationships.

The statutory basis for HUD's income limit policies is found in the U.S. Housing Act of 1937, as amended, which contains the following provisions related to income limits:

- "Lower income families" are defined as families whose incomes do not exceed 80 percent of the median family income in the area.

- "Very low-income families" are defined as families whose incomes do not exceed 50 percent of the median family income for the area.

- Income limits must be adjusted for family size.

Income Limit Calculations:

The process of developing limits involves a number of calculations, starting with the development of estimates of median family income.

Median family income estimates are based on decennial Census data updated with Bureau of the Census p-60 income data and Department of Commerce County Business Patterns employment and earnings data.

A 35 percent rent-to-income ratio was selected for use in setting minimum income limits because many non-subsidized low-income families pay this amount or more for housing, and because households tend not to participate in assisted housing programs unless they are eligible for a significant subsidy. Eighty five percent of the fair market rent standard represents the lowest rent range at which a supply of standard quality units is normally available.

The following Bank of Hawaii data summarizes income groups based on household income for 1987 and projected for 1992 in Hawaii County. The summary lists the percentage of total population that was (1987) and is expected to be (1992) in various income groups.

A Report from Bank of Hawaii Economic Department
February 1988
by Donnelly Demographics of New York

Income Group

Household Annual Income	% total	Year
0 - $7,499	15.3	1987
	12.8	1992
$7,500 - $9,999	5.5	1987
	4.4	1992
$10,000 - $14,999	11.6	1987
	9.5	1992
$15,000 - $24,999	21.8	1987
	18.7	1992
$25,000 - $34,999	18.0	1987
	16.6	1992
$35,000 - $49,999	14.7	1987
	16.8	1992
$50,000 - $74,999	8.6	1987
	12.3	1992
$75,000 +	4.6	1987
	8.8	1992

Households

37,321 - 1987
43,313 - 1992

There is a HUD statutory requirement that income limits be adjusted for family size. The starting point for all adjustments is the four-person family income limit. Once the four-person income limit is established standard factors are applied as follows:

Number of Persons in Family

1	2	3	4	5	6	7	8
70%	80%	90%	100%	106.25%	112.5%.	118.75%	125%

HUD periodically estimates and computes the base 'median income' for a family of four within certain regions. According to the Office of Housing and Community Development (OHCD), the 1990 HUD median income estimate for Hawaii County is $ 32,000. (This assumes a household size of four persons.)

Lately it has been customary to separate affordable units into family income categories as follows:

VERY LOW - families earning less than 50% of median income (under $16,000).

LOW - families earning between 50% and 80% of median income (between $16,000 and $25,600).

LOW/MODERATE - families earning between 80% and 120% of median income (between $25,600 and $38,400).

MODERATE - families earning between 120% and 140% of median income (between $38,400 and $44,800).

These income limits can be converted to selling price ranges. A bank and savings and loan were contacted for current loan underwriting policies and they are as follows:

Loan Underwriting for Typical Bank:

gross monthly income/ mortgage payment	3.6 to 1
gross monthly income/ mortgage and all debt	2.8 to 1

Current 30 year loans (amortization and term) have rates at approximately 10.58% per annum.

Loan to value ratios are typically 80% to 90%.

Loan Underwriting for Typical Savings and Loan:

housing debt	=	28% of gross monthly income
total debt	=	36% of gross monthly income

Current 30 year fixed loans have rates at 10.50%

Loan to value ratios are typically 80% to 90%

SALES PRICE RANGES

The various selling prices for houses within the income groups (ie. low, low/moderate and moderate) can be computed based on the underwriting policies of the lenders and the current home mortgage terms.

Category	Sales Price Range
Very Low Income (up to 50%)	(Assume Rentals Only)
Low Income (50% to 80%)	up to $ 77,800
Low/Moderate (80% to 120%)	$ 77,800 - $117,900
Moderate (120% to 140%)	$117,900 - $140,200

RENTAL RANGES

Based on HUD evaluation standards, a projected rent to income ratio of 35% is used. Based on this policy, the following are indicated rental ranges for each income group.

Assume: Rent is 35% of gross monthly income

	Annual Income	Monthly Income	Rent Range
Very Low	up to $16,000	up to $ 1,330	up to $ 470
Low	$16,000 to $25,600	$ 1,330 - $ 2,130	$ 470 to $ 745
Low/Mod.	$25,600 to $38,400	$ 2,130 - $ 3,200	$ 745 to $1120
Moderate	$38,400 to $44,800	$ 3,200 - $ 3,730	$1120 to $1300

NOTE: The above projections are based strictly on a family of four household. For varying family sizes the estimated median income is adjusted; therefore the selling price and rental ranges must be adjusted.

ALTERNATIVE HOUSING OPPORTUNITIES

The following are various housing alternatives that should be considered for the County's 300 acre site at Waikoloa. Several of these alternatives exist in the West Hawaii market place today. Others are included for consideration though no specific models exist.

LA'ILANI

Mauna Lani Resort Inc. collaborated with the Office of Housing and Community Development, County of Hawaii and the Hawaii Housing Authority, State of Hawaii in the development of this multi-family rental housing project encompassing an area of approximately 15.5 acres.

The 200 multi-family rentals units were constructed according to the following mix:

Unit Type	Living Area	Number of Units
1 BDR	509 SF	32
2 BDR	682 SF	144
3 BDR	903 SF	24

Twenty-five detached manor-type structures are plotted in four clusters across the site. Buildings do not exceed two floors in height and units are allocated four per floor. Each cluster was designed with its own entry, uncovered parking area and laundry facility.

Mauna Lani developed the project, turnkey to the Hawaii Housing Authority. Project density is approximately 12.9 units/acre. A 10,000 square foot lot has been set aside for a multi-purpose building. All roads and improvements are constructed to County standards.

Rental rates started from $450.00 per month for the 1-bedroom units, $650.00 per month for the 2-bedroom units and approximately $775.00 per month for the 3-bedroom units. Rents are subsidized up to $175.00 per month and approximately 60% of the units are provided some form of subsidy.

THE PINES AT KAILUA-KONA

The Pines at Kailua-Kona is a Taiyo Hawaii Company, Ltd. development of 91 fee simple condominium homes on approximately 12+ acres with an additional 98 units planned in Phase 2 on an adjacent 15+ acres. The project has a density of approximately seven units per acre.

When both phases are complete, the neighborhood will include

landscaped common areas, two 20,000 square foot parks and a 40,000 square foot commercial center.

The one-story single family detached condo units are designed with four floor plans, offering two and three bedroom/two bath options, ranging from 924 to 1,162 square feet of living area. There are 28 three-bedroom units and 63 two-bedrooms. Each unit has two parking spaces and all share common areas.
The project has variance approval for 10-foot building separation. All other uses, structures and lots are conforming. The project, built under the condominium for of ownership, has private interior roads not built to subdivision code standards.

Original pricing in The Pines (September 1988) ranged from approximately $120,000 to $142,000. Resales in the project have been marketed (early 1990) for $175,000 to just under $200,000.

KINOHOU

Total land area for Kinohou in Waimea is 10 acres, 2.5 acres are zoned commercial and seven are RS10. The commercial parcel was broken into five lots ranging from 14,000 to 22,000 SF. The RS10 area was broken into 22 parcels of a minimum of 10,000 SF. Twenty-one of the lots were approved ohana and 2 bedroom, 2 bath duplexes were constructed (1,100 SF under roof with single car garage) sharing a common wall. The additional RS10 parcel (with a drainage easement) was constructed as a single family home. The 1987 project took one year to complete.

OHANA

According to the Sunday Star-Bulletin & Advertiser August 20, 1989 article, "Homeowners are adding 'apartments' to meet housing shortage," accessory apartments - living quarters within a house that have a separate entrance, kitchen, bathroom and one or more bedrooms - have shown up in metropolitan areas across the country where housing prices have soared and where many older homeowners now have more space than they need or can afford to maintain.

The unique concept of ohana, as reflected in this article, is in effect in Hawaii County.

Housing experts say that spread of accessory apartments reflects a wider housing problem caused by changing demographics in the suburbs.

"We have a housing shortage and a bedroom surplus," said the

Westchester County commissioner of planning, Peter Q. Eschweiler.

Today, 56 percent of all households in the country are composed of one or two people, according to the federal Census Bureau. And while many young couples cannot afford the high cost of new housing, many old people who bought large houses in the 1950s and 1960s now have grown children, too much space and not enough cash to pay rising property taxes.

While acknowledging that accessory apartments exist, communities around the region have taken starkly different steps to control their rising numbers.

Legalizing accessory apartments, advocates contend, creates new housing stock at no cost to taxpayers, generates new property tax revenue for municipalities and offers social benefits by providing affordable rental housing to young couples and renters for elderly homeowners.

"Accessory apartments fit the new generation lifestyle into the older generation housing pattern," said William B. Shore, senior vice president of the Regional Plan Association, a non-profit group in New York.

"It's a lot cheaper than creating new housing," said Jeffrey Osterman, director of planning for Bedford, N.Y., a Westchester town that recently relaxed its two-family zoning code.

Planners say that many of the towns and villages that have kept single-family codes on the books but have neither the resources nor the inclination to enforce them are inviting trouble.

"Unchecked, accessory apartments increase traffic and garbage, and place strains on municipal services that contribute to the deterioration of the suburbs' attractive qualities," said Philip Y. Nicholson, a history professor at Nassau Community College who studies suburban problems.

Communities that first ignored the situation and then cracked down are now searching for a compromise. Fourteen months ago, Long Beach began sending inspectors door to door to eliminate some of the city's estimated 1,200 illegal accessory apartments. The experiment has yielded painful results, city officials said.

"We're supposed to be protecting the community for the common good," said the City Manager, Edwin L. Eaton, in recounting the story of a long-time resident, a woman in her 80s, who was evicted from her apartment.

Several years ago the Hawaii State Legislature acknowledged the Ohana concept and created the opportunity for the various Counties to adopt their own Ohana ordinances. While different in implementation, the Ohana concept has produced a wide variety of housing opportunities, including apartments in existing single-family dwellings (as illustrated in the above article), more elaborate duplex configurations and separate single family dwellings on the same lot.

SINGLE ROOM OCCUPANCY (SRO)

On October 15, 1989, the Sunday Star-Bulletin & Advertiser ran the article, "Residential hotels seen as solution to housing," which discusses single-room hotels. According to the article, the hotels, which offer guests an inexpensive room on a nightly, weekly or monthly basis, have been around for years in most cities. They often are better known as sleazy hotels or flop houses.

As far as San Diego City Planner Judy Lenthall is concerned, SROs could play a major role in solving Hawaii's housing shortage. She envisions building SROs near luxury resorts to house hotel workers and in urban areas to shelter minimum wage workers and those now living on the street.

"Any place that has low wages, expensive housing and single people can benefit from SROs," she said.

Most of the SRO hotels in San Diego offer guests about 80 square feet of living space at rents averaging $220 a month, she said. Slightly larger rooms may include a private bathroom and cooking facilities. The SROs are run like a hotel, with a front desk, check-out times and 24-hour managers and security.

"The differences between a sleaze-bag hotel and a non-sleaze bag hotel are security and good management," Lenthall said.

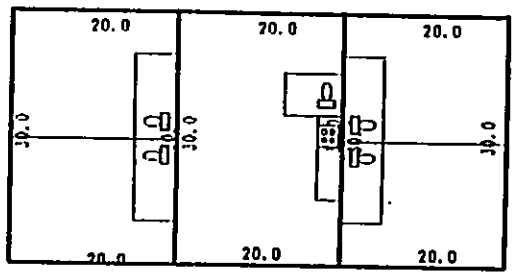
SHARED HOME

The "shared home" concept is an alternative to dormitories or SROs at Waikoloa.

Shared housing should be built in mini-neighborhoods using a cul-de-sac formation with approximately 10 houses on each cul-de-sac and each of the shared houses would accommodate between two and four households. This would be set up like a mini-dorm, a minuscule scale of SRO, but would look like a single family dwelling from the outside. There would be a higher density of households per cul-de-sac than for the same number of single-family dwellings.

A shared house concept has a common living room, kitchen and dining area with adjoining studio or studio and private bedroom and full bath attached. The studio living units would have a private entrance and interior access to the common area. Each studio occupant would have private sleeping and bathing space but would share kitchen and other common areas in the 'house'.

The following illustrates the concept:



SELF-HELP

The Hawaii Island Community Development Corporation (HICDC), a Hawaii based non-profit, and the County of Hawaii's Office of Housing and Community Development (OHCD) is providing housing opportunities for very low- and low-income families of Hawaii County through the Self-Help program.

The Self-Help program is a strategy to lower housing costs by having homeowners do most of the construction work. HICDC hires technical assistance staff which includes an Executive Director, Construction Supervisor and a Bookkeeper/Secretary to help the homeowners through the entire process of constructing their homes. Financing for building materials and sub-contracting costs will be provided by the Farmers Home Administration's (FmHA) Section 502 low interest mortgage program.

HICDC will break ground on their first self-help project at the Ainakea Village Subdivision, Unit I, in Kapaau, North Kohala in October 1990. This project will consist of 10 single family house and lot packages priced between $55,000 and $60,000. In addition to the FmHA Section 502 low interest mortgage program, this project was enhanced by below market finished lot cost of $15,000/unit which was Oceanic Properties' contribution to satisfy an affordable housing requirement. Ten families will be selected from among qualified very low- and low-income applicants. Each family will contribute at least 35 hours a week of labor to build the houses as a team, performing all phases of construction except electrical and plumbing.

The HICDC plans to do similar self-help projects in other districts throughout the County.

ZERO-LOT LINE

The zero lot line housing concept is a practical alternative to the conventional unit, based on the success of existing models in benefiting homeowners at an affordable cost.

The multi-unit building, illustrated in the attached sketches, is designed with four units positioned in the corner of each lot, sharing two common walls. This minimizes construction costs and maximizes usable land area for landowners, even though the lot size is smaller than traditional.

Current zoning standards require side and rear yard setbacks to create small front and back yards with marginal side yards, as listed below from the Hawaii County Code Chapter 25, Article 4.

Section 25-124. Minimum yards.

(a) The minimum yard requirements in an RS district shall be as follows:

(1) On a building site with a required area of 7,500 square feet to and including 9,999 square feet.

(A) Front and rear yards, 15 feet; and

(B) Side yards, eight feet.

(2) On a building site with a required area of 10,000 square feet to and including 19,999 square feet:

(A) Front and rear yards, 20 feet; and

(B) Side yards, 10 feet.

(3) On a building site with a required area of 20,000 square feet or more:

(A) Front and rear yards, 25 feet; and

(B) Side yards, 15 feet.

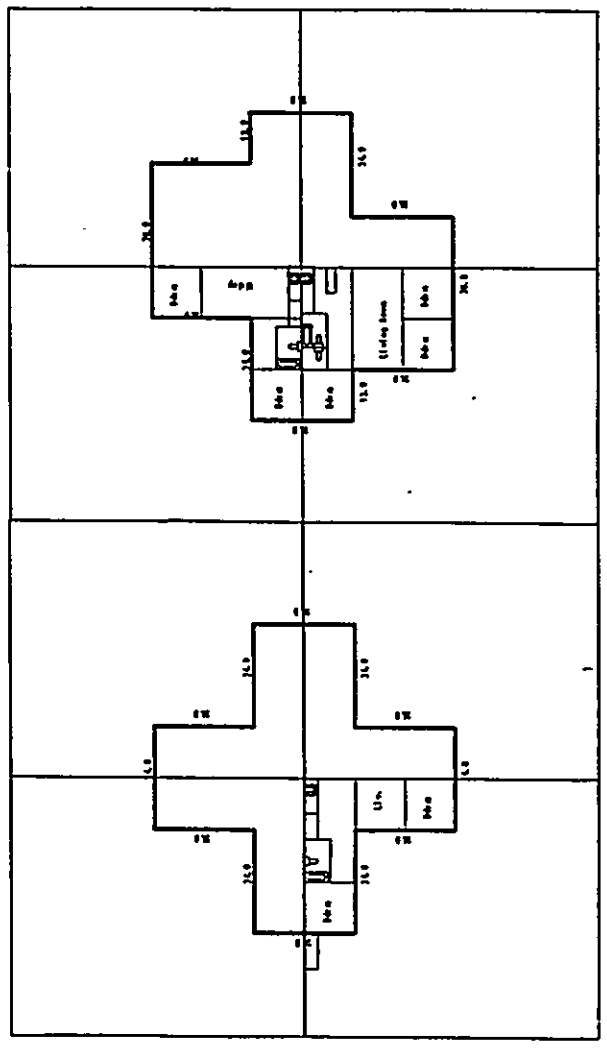
As shown in the attached sketches, the gap between improvements is almost 50 feet, greater than the minimum building separation called for in the zoning ordinance. Placing the improvements in the corner of the lot leaves more than three quarters of the lot available for a variety of uses including recreational, open space.

The compactness of the "house" and lot allows for a higher actual density while being perceived as having wide open spaces.

The configuration of the "houses" should vary. Some would contain all two-bedroom units, others are a combination of two- and three-bedroom units, and some, three-bedrooms. This variability provides more desirability while giving an overall neighborhood appearance of diversity.

The individual L-shaped configuration economizes space, particularly through the absence of interior hallways. Economy of construction has been considered in back-to-back placement of kitchens and bathrooms.

The following illustrates some varieties of the zero lot line house. These 'homes' area actually four-plexes with units sharing two common walls. Perimeter lot lines show 60' by 70' lots (4,200 square feet) each.



BUY-BACK PROVISIONS

It is recommended that buy-back provisions, similar to those of the Housing Finance Development Corp. listed below, be adapted to maintain the housing inventory as 'affordable' housing.

201E-221 Dwelling units; restrictions on transfer, waiver or restrictions.

(a) Except for dwelling units which are financed under a federally subsidized mortgage program, the following restrictions shall apply to the transfer of dwelling units purchased from the corporation, whether on fee simple or leasehold property:

(1) For a period of ten years after the purchase, whether by lease, assignment of lease, deed, or agreement of sale, if the purchaser wishes to transfer title to the dwelling unit and the property or the lease, the corporation shall have the first option to purchase the unit and property or lease at a price which shall not exceed the sum of:

(A) The original cost to the purchaser;

(B) The cost of any improvements added by the purchaser; and

(C) Simple interest on the purchaser's equity in the property at the rate of seven per cent a year. The corporation may purchase the unit either outright, free and clear of all liens and encumbrances, or by transfer subject to an existing mortgage.

(2) After the end of the tenth year from the date of purchase, or execution of an agreement of sale, the purchaser may sell the unit and sell or assign the property to any person free from any price restrictions;

201E-222 Dwelling units; restrictions on use.

(a) A dwelling unit purchased from the corporation shall be occupied by the purchaser at all times during the ten-year restriction period set forth in section 201E-221.

SLEEPING SECOND MORTGAGES

In addition, consideration should be placed on the possibility of offering a 'sleeping second mortgage' or 'shared equity' as a means of reducing sales prices and maintaining the affordable inventory.

A sleeping second mortgage provides a means for the County to recover the costs involved with the affordable housing development, while maintaining a lower initial price for the housing and a lower qualifying price for the buyer.

The sleeping second mortgage can be without an interest rate applied and typically has no specific due date. Typically the outstanding principal balance is due upon the resale of the property, or when there is a refinancing of the property.

SHARED EQUITY

The shared equity concept can take many forms. The theory behind shared equity assumes that upon resale the County would have the ability to recover the subsidy (difference between actual cost and sales price for the property). The actual interest of the County would be based on the amount subsidized.

APPENDIX F

Traffic Impact Analysis by Parsons Brinckerhoff

TRAFFIC IMPACT STUDY

WAIKOLOA AFFORDABLE HOUSING PROJECT

South Kohala, Hawaii

R.M. Towill Corporation

October 1990

Parsons Brinckerhoff

TRAFFIC IMPACT STUDY

WAIKOLOA AFFORDABLE HOUSING PROJECT

South Kohala, Hawaii

Prepared for:
R.M. Towill Corporation

Prepared by:
Parsons Brinckerhoff
Quade & Douglas, Inc.

October 1990

Parsons Brinckerhoff Quade & Douglas, Inc.

RMT		WES	
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RYK		RDE	
REC'D	NOV	1 1990	RMTC
GSY			
DKM			

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October 29, 1990

Ms. Colette Sakoda
R.M. Towill Corporation
420 Waikamilo Road Suite 411
Honolulu, HI 96817

SUBJECT: Waikoloa Affordable Housing Project

Dear Ms. Sakoda:

With regards to the two proposed intersections to Paniolo Drive which will be formed by the project access roads, our analyses reveals that signalization will not be warranted. Traffic volumes at both intersections do not meet traffic signal warrants as outlined in the Manual on Uniform Traffic Control Devices (MUTCD).

Our analysis was based on the assumption that Paniolo Drive would be four-lanes wide and would terminate south of the project, the project collector roads would be two-lanes wide, and that the project traffic would be divided equally between the project collector roads.

The proposed collector roads will form the stem of a T-intersection with Paniolo Drive. At these intersections, the proposed project collector roads should be striped to provide a dedicated left-turn and a dedicated right-turn lane. Dedicated left-turn lanes should also be provided on Paniolo Drive at these collector roads. Roadway cross sections and striping should conform to the County of Hawaii Standard Details R-32, T-9 and T-10 dated September 1984.

Should you need further assistance please do not hesitate to call on us.

Sincerely,

PARSONS BRINCKERHOFF
QUADE & DOUGLAS INC.

Robert Miyasaki

Traffic Engineer

RYN:kkn

A Century of Engineering Excellence

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TRAFFIC IMPACT STUDY

WAIKOLOA AFFORDABLE HOUSING PROJECT

INTRODUCTION

The Office of Housing and Community Development (OHCD) of the County of Hawaii has proposed to develop affordable residential housing at Waikoloa Village. The project will encompass the development of 1,400 residential dwelling units, a commercial/church area, and a community park on a total of 280 acres. Descriptions of the existing and future conditions with and without project traffic for the average weekday morning (a.m.) and afternoon (p.m.) peak hours are included.

EXISTING CONDITIONS

The project site is located in the South Kohala district on the island of Hawaii. The site will be located just north of the existing Waikoloa Village as shown in Figure 1. Vehicular access will be provided by the northerly extension of Paniolo Drive.

Roadway System

Queen Kaahumanu Highway is a two-lane arterial road with unpaved shoulders. The posted speed limit for Queen Kaahumanu Highway is 55 mph. Left turn bays for southbound traffic and right turn acceleration and deceleration lanes are provided for northbound traffic at the intersection with Waikoloa Road. The northbound right turns from Queen Kaahumanu Highway to Waikoloa Road are yield controlled.

Mamalahoa Highway is a narrow two-lane major collector road with sharp vertical and horizontal curves. The posted speed limit for Mamalahoa Highway is 55 miles per hour. A left turn bay for northbound traffic and a deceleration lane for southbound right turn movements is provided at the Waikoloa Road intersection.

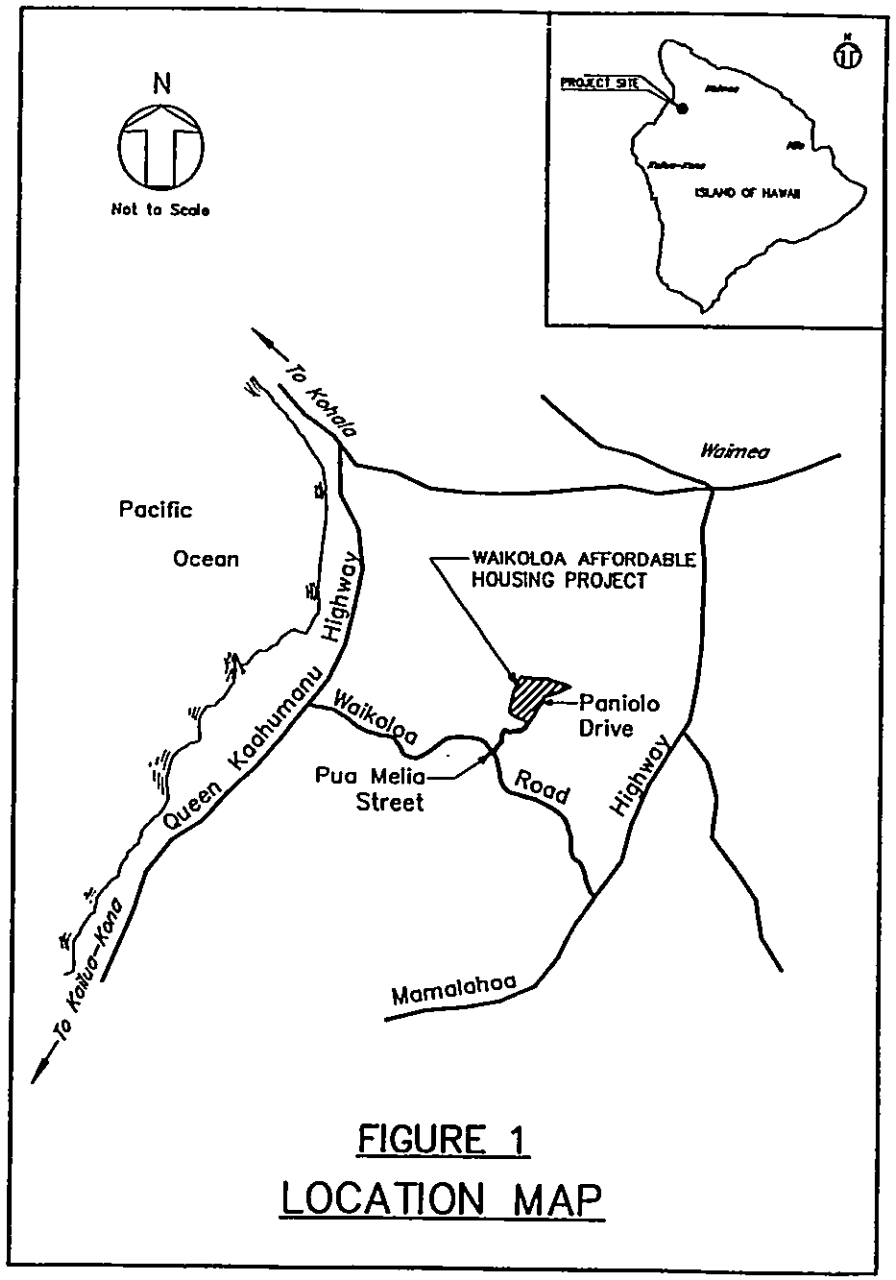


FIGURE 1
LOCATION MAP

Waikoloa Road is a two-lane east-west collector road that widens to four lanes in the vicinity of Waikoloa Village. The posted speed limit is 55 mph, which decreases to 35 miles per hour near Waikoloa Village. At its eastern terminus, Waikoloa Road forms the stop controlled stem of a T-intersection with Mamalahoa Highway. At the western end it forms the stop controlled stem of a T-intersection with Queen Kaahumanu Highway.

Paniolo Drive serves as a collector road for Waikoloa Village. Paniolo Drive has an 80-foot right-of-way and its southern terminus intersects Waikoloa Road and Pua Melia Street forming a cross intersection. The posted speed limit of Paniolo Drive is 35 miles per hour.

Existing Traffic Conditions

Manual traffic counts were taken on August 7 and 8, 1990, at the intersections of Queen Kaahumanu Highway/Waikoloa Road, Waikoloa Road/Pua Melia Street/Paniolo Drive, and Mamalahoa Highway/Waikoloa Road. The morning peak hour occurs from 6:30 to 7:30 a.m., and the afternoon peak was from 3:30 to 4:30 p.m. Summaries of the manual traffic counts are attached in Appendix A. Existing peak-hour volumes are shown in Figure 2.

The unsignalized intersection methodology specified in the 1985 Highway Capacity Manual[1] evaluates gaps in the major street traffic flow and calculates capacities available for left turns from the major street to cross oncoming traffic. It also calculates capacities available for left turns from the minor street onto the major street and for right turns from the minor street onto the major street. Operating conditions at unsignalized intersections are expressed as a qualitative measure known as level of service. These levels of service are designated from A to F, with level of service (LOS) A representing the best operating conditions and LOS F the worst. A level of service D or better at an intersection is good. Level of service criteria for unsignalized intersections are identified in Appendix B.

At the Queen Kaahumanu Highway/Waikoloa Road intersection, westbound traffic on Waikoloa Road making a left turn onto Queen Kaahumanu Highway operates at LOS D during the a.m. and p.m. peak hours. All other turning movements operate at LOS A during both peak hours.

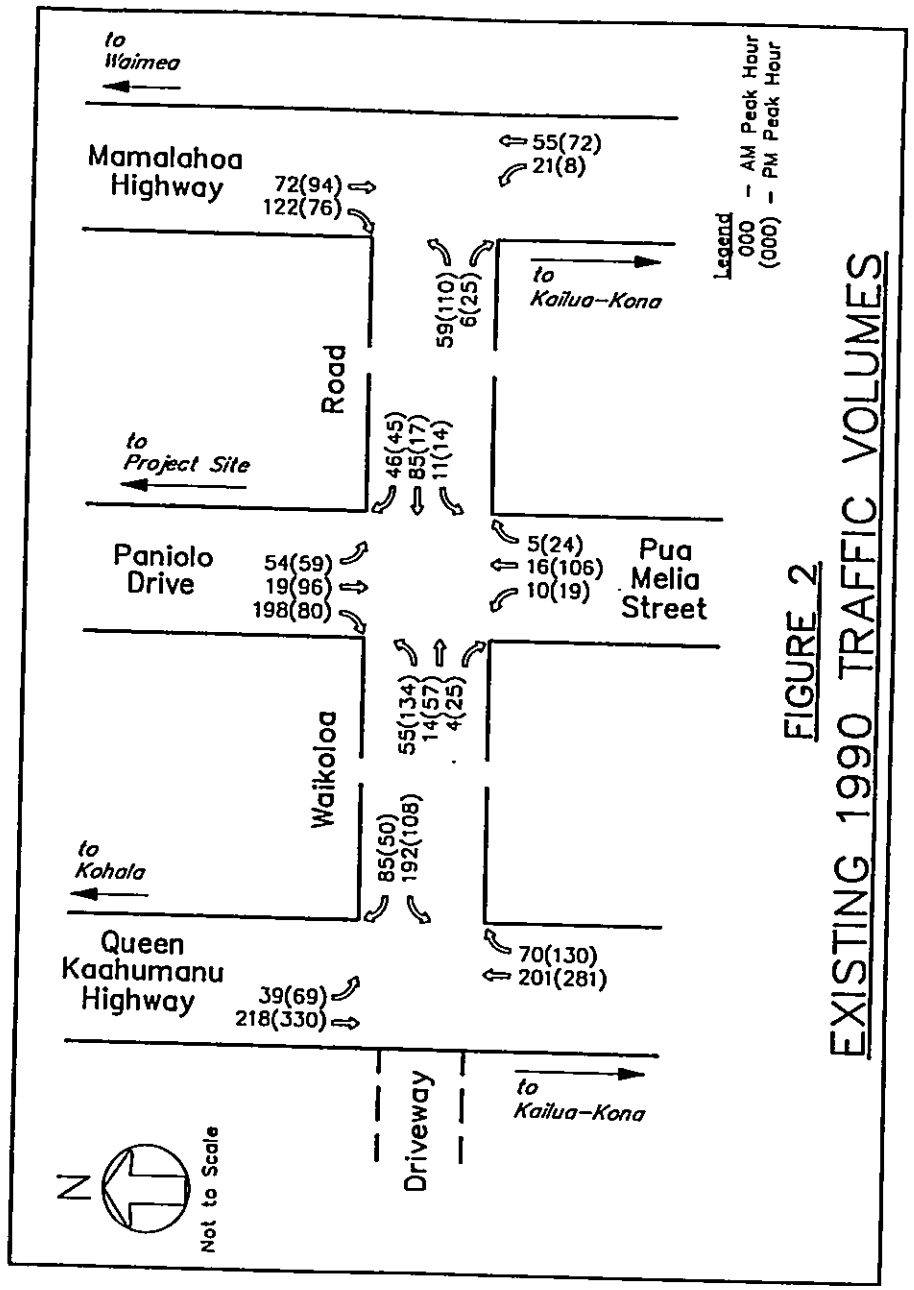


FIGURE 2
EXISTING 1990 TRAFFIC VOLUMES

At the intersection of Mamalahoa Highway/Waikoloa Road, all turning movements experience LOS A during both peak hours.

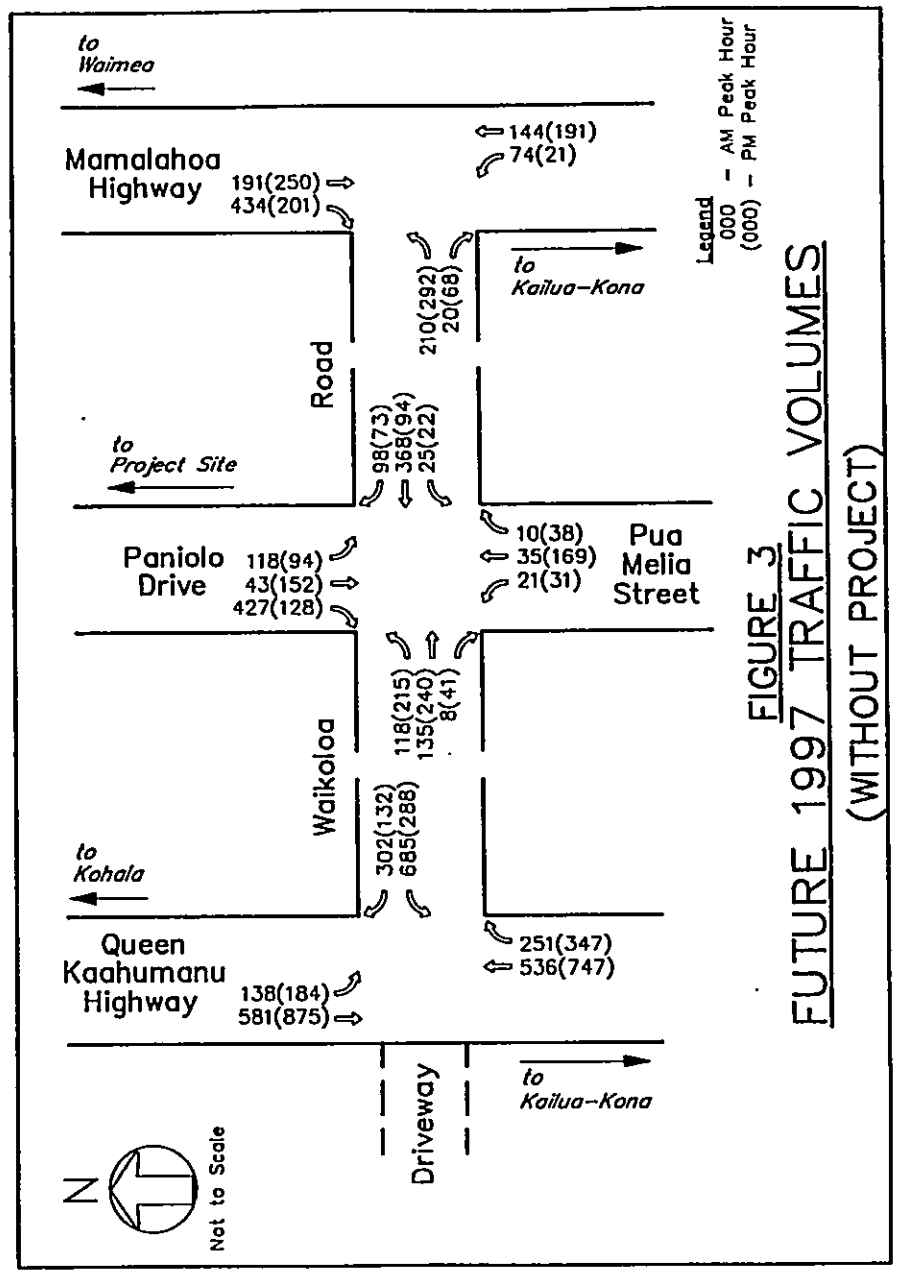
At the Waikoloa Road/Pua Melia Street/Paniolo Drive intersection, northbound traffic on Pua Melia Street executing a left turn experiences LOS B during the a.m. and p.m. peak hours. Southbound traffic on Paniolo Drive executing a left turn onto Waikoloa Road experiences LOS B during the p.m. peak hour and LOS A during the a.m. peak hour. The analysis indicates that all other movements at this intersection operate at LOS A during both the a.m. and p.m. peak hours.

Two-lane highway analysis reveals that traffic on Queen Kaahumanu Highway is experiencing LOS C during the a.m. and p.m. peak hours. Capacity analysis also reveals that traffic on Mamalahoa Highway south of Waikoloa Road experiences LOS B during both peak hours. North of Waikoloa Road, Mamalahoa Highway operates at LOS C conditions during both peak hours.

FUTURE CONDITIONS WITHOUT PROJECT

Future conditions refer to the year 1997, when the proposed project is expected to be completed. The traffic impact study for Mauna Lani Cove[2] indicated an increase of 15 percent per year in traffic volume on Queen Kaahumanu Highway without the project. Further, the Draft Report of Island of Hawaii Long-Range Highway Plan[3] also projects a 15 percent annual increase in traffic in the vicinity of Waikoloa. Existing traffic volumes were increased by 15 percent per year to account for increases in regional traffic volumes. Figure 3 shows the traffic assignment for future conditions without the proposed housing project.

The Queen Kaahumanu Highway/Waikoloa Road intersection would experience overcapacity, or LOS F, conditions for southbound left turns from Waikoloa Road because of the increase in traffic volumes. Analysis revealed LOS D conditions during both peak hours for northbound right turn movements from Waikoloa Road. The eastbound left turn movements from Queen Kaahumanu Highway would continue to experience LOS A conditions during the a.m. peak hour and LOS C conditions during the p.m. peak hour.



Capacity analysis conducted at similar unsignalized locations indicate that the methodology outlined in the 1985 Highway Capacity Manual is conservative in nature. It is not uncommon for the left turn movements out of minor street locations onto major streets to create LOS E or LOS F conditions, since they are the hardest movements to make, requiring gaps in both directions of traffic on the major street.

Traffic signals can improve the operation of unsignalized intersections with high minor street approach volumes; however, traffic signals should only be provided at locations that meet nationally accepted warrants, as outlined in the Federal Highway Administration's Manual on Uniform Traffic Control Devices [4] (MUTCD). A review of the Queen Kaahumanu Highway/Waikoloa Road intersection reveals that the unsignalized intersection meets the Peak Hour Volume Warrants, Warrant 11, as outlined in the MUTCD. Peak hour volume warrants computations are shown in Appendix C. With signalization, the Queen Kaahumanu Highway/ Waikoloa Road intersection is projected to operate near or under capacity.

With the increase in traffic volumes, the Mamalahoa Highway/Waikoloa Road intersection would experience LOS D conditions during the a.m. peak hour for the northbound left turn movements from Waikoloa Road and LOS E conditions during the p.m. peak hour. The westbound left turns from Mamalahoa Highway and southbound right turns from Waikoloa Road would continue to experience LOS A conditions during both peak hours.

At the Waikoloa Road/Paniolo Drive/Pua Melia Street intersection, near-capacity, or LOS E, conditions would result for the northbound approach during the a.m. and p.m. peak hours. The southbound left turn movements from Paniolo Drive will function at LOS D during the a.m. peak hour and LOS E during the p.m. peak hour. The southbound through movements will operate at LOS B and LOS D conditions during the a.m. and p.m. peak hours, respectfully. The southbound right turns on Paniolo Drive will experience LOS C during the a.m. peak hour and LOS A during the p.m. peak hour. The westbound and eastbound left turns from Waikoloa Road will operate at LOS A during both peak hours.

Two-lane highway analysis reveals that traffic conditions on Queen Kaahumanu Highway would increase to LOS E during the a.m. and p.m. peak hours. Traffic on Mamalahoa Highway south of Waikoloa Road will experience LOS C during the a.m. peak hour and LOS D during the p.m. peak hour. North of Waikoloa Road, LOS E conditions during both peak hours can be expected on Mamalahoa Highway.

FUTURE WITH PROJECT TRAFFIC

With project traffic, conditions are composed of trip generation, trip distribution, and traffic assignment. Trip generation estimates the number of trips produced and attracted by the proposed project. Trip distribution determines the origins and destinations of the project trips, and traffic assignment places these trips onto the existing roadway network.

Trip generation for the proposed project is based on 560 single-family dwelling units, 840 multifamily dwelling units, a 9.2-acre park, a 5,000 square-foot commercial building, and several churches with a total area of 75,000 square feet.

Trip Generation

Trip generation was estimated using the trip rates or equations for land use categories from the Institute of Transportation Engineers' Trip Generation, Fourth Edition[5]. Table 1 shows the trip generation rates used, while Table 2 summarizes the trips generated by the Waikoloa Affordable Housing Project.

Table 1
TRIP RATES

		A.M. Peak Hour		P.M. Peak Hour	
Land Use (Parameter)	Daily	Trip Rate	% In	Trip Rate	% In
Single-family dwelling units	6.507	0.691	27%	0.980	63%
Multifamily dwelling units	5.981	0.505	18%	0.461	68%
Park in acres	36.548	2.391	27%	3.370	26%
Commercial (1,000 square feet)	887.056	67.600	50%	71.200	51%
Church (1,000 square feet)	7.699	0.067	80%	0.520	54%

Table 2
PROJECT TRAFFIC

Land Use (Parameter)	Daily (vpd)	A.M. Peak Hour Enter (vph)	A.M. Peak Hour Exit (vph)	P.M. Peak Hour Enter (vph)	P.M. Peak Hour Exit (vph)
Single-family (560 dwelling units)	5644	104	283	346	203
Multifamily (840 dwelling units)	5024	76	348	263	124
Park (9.2 acres)	356	6	16	8	23
Commercial (5,000 square feet)	4435	169	169	182	174
Church (75,000 square feet)	577	4	1	21	18
Total:	14,016	359	817	820	542

Note:
vpd = vehicles per day
vph = vehicles per hour

Trip Distribution/Traffic Assignment

Various land uses would encourage internal trips within Waikoloa Village. Internal trips include trips between residential areas and nonresidential areas such as industrial/shopping centers, parks, and churches. The internal trips ranged from 25 percent for residential generated trips to 90 percent for trips generated by the park, commercial and church land uses. These internal trips were deducted from the total project trips to determine the number of external trips that would take place on the regional roadway system. Table 3 shows the external trips generated by the affordable housing project.

The trip distribution factors are based on information from the Preparation Notice for an Environmental Impact Study (EIS) for Waikoloa Affordable Housing Master Plan[6]. The project traffic was distributed to and from two directions: north and south via Mamalahoa Highway and Queen Kaahumanu Highway. Table 3 shows the trip distribution of the generated trips for the affordable housing project. Figure 4 shows the traffic assignment for the generated trips for the affordable housing project.

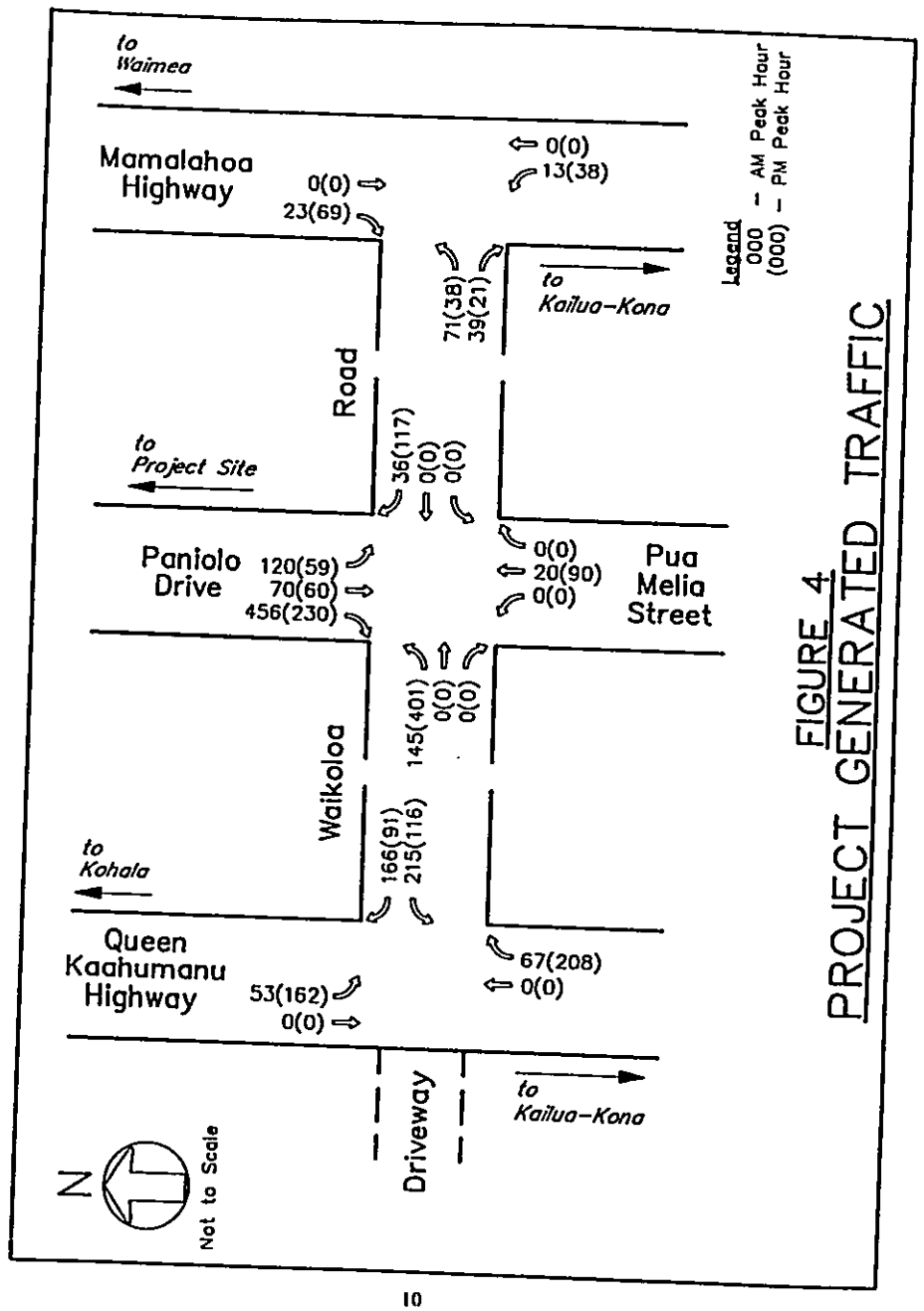


FIGURE 4
PROJECT GENERATED TRAFFIC

Table 3
TRIP DISTRIBUTION
(Location of Other Trip Ends)

	EXTERNAL	SOUTH	NORTH
A.M. IN	43% 156	51% 80	49% 76
A.M. OUT	60% 491	52% 254	48% 237
P.M. IN	58% 477	52% 246	48% 231
P.M. OUT	42% 266	52% 137	48% 129

PROJECT IMPACTS

Project generated traffic volumes for the affordable housing project were added to the 1997 future traffic volumes (without project), and the assignment is shown in Figure 5. Tables 4 and 5 summarize the levels of service for future traffic conditions with the project.

The intersection of Queen Kaahumanu Highway/Waikoloa Road would function at overcapacity, or LOS F, conditions for westbound left turns from Waikoloa Road during both peak hours. The westbound right turns would experience LOS F during the a.m. peak hour and LOS E during the p.m. peak hour. The southbound left turns from Queen Kaahumanu Highway would experience LOS B during the a.m. peak hour and LOS E in the p.m. peak hour. Should this intersection be signalized as described earlier, without project, the intersection would still operate at LOS F conditions because of the high number of westbound left turn movements on Waikoloa Road.

The Mamalahoa Highway/Waikoloa Road intersection would experience LOS E during the a.m. peak hour and LOS F during the p.m. peak hour for eastbound left turns from Waikoloa Road. The eastbound right turns from Waikoloa Road and the northbound left turns from Mamalahoa Highway will continue to experience LOS A during both peak hours.

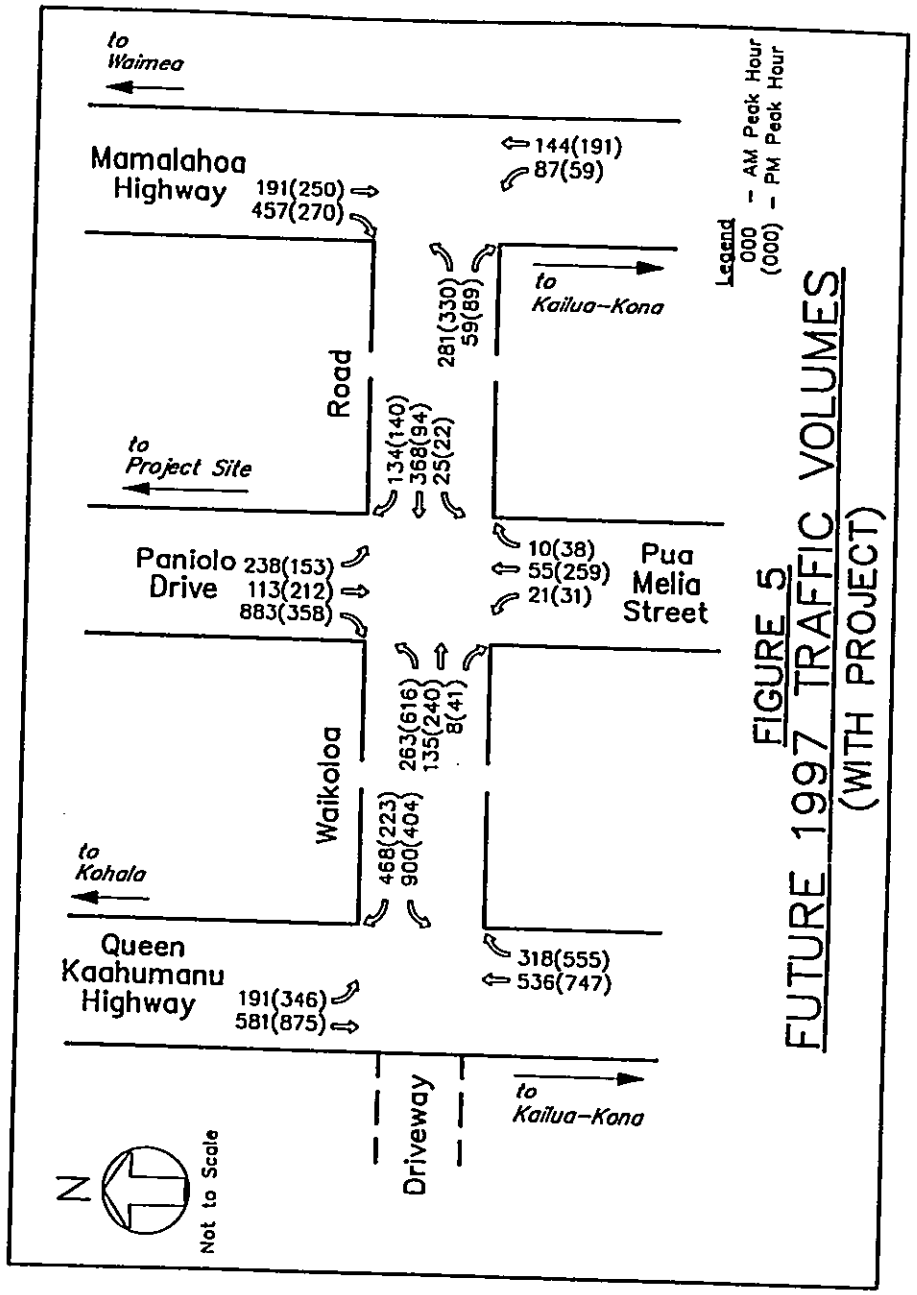


Table 4

LEVELS OF SERVICE
(Unsignalized Intersection)

	Existing A.M.	Existing P.M.	Future Conditions (Year 1997) w/o Project A.M.	w/o Project P.M.	w/ Project A.M.	w/ Project P.M.
Queen Kaahumanu/Waikoloa Rd.						
Westbound						
Left	D	D	F	F	F	F
Right	A	A	D	D	F	E
Southbound Left	A	A	A	C	B	E
Waikoloa Rd./Paniolo Dr./ Pua Melia St.						
Eastbound Left	A	A	A	A	A	C
Westbound Left	A	A	A	A	A	A
Pua Melia St. Approach						
Left	B	B	E	E	F	F
Through	A	A	E	E	F	F
Right	A	A	E	E	F	F
Paniolo Dr. Approach						
Left	A	B	D	E	F	F
Through	A	A	B	D	E	F
Right	A	A	C	A	F	A
Mamalahoa Hwy./Waikoloa Rd.						
Eastbound						
Left	A	A	D	E	E	F
Right	A	A	A	A	A	A
Northbound Left	A	A	A	A	A	A

Table 5

LEVELS OF SERVICE
(Two-Lane Highways)

	Existing A.M.	Existing P.M.	Future Conditions (Year 1997) w/o Project A.M.	w/o Project P.M.	w/ Project A.M.	w/ Project P.M.
Queen Kaahumanu Highway						
North of Waikoloa Rd.	C	C	E	E	E	E
South of Waikoloa Rd.	C	C	E	E	E	E
Mamalahoa Highway						
North of Waikoloa Rd.	C	C	E	E	E	E
South of Waikoloa Rd.	B	B	C	D	C	D

The unsignalized intersection of Waikoloa Road/Paniolo Drive/Pua Melia would experience overcapacity conditions, or LOS F, during the a.m. and p.m. peak hours for all northbound movements on Pua Melia Street. Southbound left turns from Paniolo Drive will also experience LOS F conditions during both peak hours. The southbound through movements from Waikoloa Road would experience LOS E during the a.m. peak hour and LOS F during the p.m. peak hour. The southbound right turns would experience overcapacity, or LOS F, conditions during the a.m. peak hour and LOS A conditions during the p.m. peak hour. The eastbound left turn movement will experience LOS C during the p.m. peak hour while the a.m. peak hour will remain at LOS A. The westbound left turns will continue to experience LOS A during both peak hours.

Two-lane highway capacity analysis reveals that Queen Kaahumanu Highway will experience LOS E during both peak hours. Traffic on Mamalahoa Highway south of Waikoloa Road will experience LOS C during the a.m. peak hour and LOS D during the p.m. peak hour, while north of Waikoloa Road will experience LOS E during both peak hours.

MITIGATION MEASURES

For 1997 with project condition, the capacity of the westbound left turn movements at the unsignalized intersection of Queen Kaahumanu Highway and

Waikoloa Road would be exceeded even without the affordable housing project traffic. There are two alternatives that could improve operating conditions at this intersection:

Alternative A: Signalization of this intersection would be warranted according to Warrant 11 (Peak-Hour Volume) of the Manual on Uniform Traffic Control Devices[6] even without the project traffic. Reconstruction of the Queen Kaahumanu Highway and Waikoloa Road intersection would be needed with project traffic to include double left turn bays and a single right turn lane for westbound traffic on Waikoloa Road. A two-phase traffic signal at the Queen Kaahumanu Highway/Waikoloa Road intersection, with these improvements is projected to operate at LOS D or better during the a.m. and p.m. peak hours for 1997 with the proposed project.

Alternative B: Realignment of Waikoloa Road to intersect Queen Kaahumanu at the existing intersection of Queen Kaahumanu Highway with the Waikoloa Resort access road and construction of a grade-separated interchange at this new cross intersection. This alternative involves constructing Waikoloa Road over or under Queen Kaahumanu Highway with on-ramps and off-ramps.

The Waikoloa Road/Paniolo Drive/Pua Melia Street intersection will experience capacity constraint conditions in 1997 with project traffic. Signalization would also be warranted under Warrant 11 (Peak-Hour Volumes). Reconstruction and signalization of this intersection would be needed to provide sufficient capacity at this intersection. The provision of a separate eastbound left turn lane and use of a westbound through lane for traffic on Waikoloa Road would be adequate to serve the projected volumes. A three-phase traffic signal, with improvements, at this intersection would operate at LOS D or better for both a.m. and p.m. peak hours.

RECOMMENDATIONS AND CONCLUSIONS

Capacity analysis conducted at the Queen Kaahumanu Highway/Waikoloa Road intersection analysis reveals overcapacity conditions for southbound left turns in the future year 1997 even without the affordable housing project. A grade-separated interchange would provide sufficient additional capacity to accommodate all turning movements at this intersection.

The intersection of Queen Kaahumanu with Waikoloa Road is projected to experience LOS F conditions for southbound left turns from Waikoloa Road as early as 1991; however, completion of a grade-separated interchange is not anticipated to be completed before 1995. Interim improvements, such as signalization, would provide additional capacity until an interchange is constructed.

The Mamalahoa Highway/Waikoloa Road intersection may not need to be signalized with the project traffic if the grade-separated interchange is constructed. Construction of the interchange at Queen Kaahumanu Highway may divert traffic away from the Mamalahoa Highway/Waikoloa Road intersection and lower volumes by providing easier access to Queen Kaahumanu Highway, where signalization of the intersection may not be warranted.

Traffic volumes are expected to increase with or without the proposed project. Analysis of the Waikoloa Road/Paniolo Drive/Pua Melia Street intersection indicates that the intersection would experience overcapacity conditions with project traffic and that improvements with signalization would be needed. However, a planned north/south collector road west of and parallel to Paniolo Drive is proposed. This north-south collector road which will connect Paniolo Drive with Waikoloa Road west of Paniolo Drive should divert some traffic away from the Waikoloa Road/Paniolo Drive/Pua Melia Street intersection; completion of the intersection is estimated to be in 1995. The Waikoloa Road/Paniolo Drive/Pua Melia Street intersection should be monitored to determine if signalization would still be needed with the new collector road.

With the proposed improvements described above, the roadway system would have sufficient capacity to serve the project traffic.

REFERENCES

1 Transportation Research Board, National Research Council, Highway Capacity Manual, Special Report 209, Washington, D.C., 1985.

2 Belt Collins & Associates, Traffic Impact Study--Mauna Lani Cove. October 1989.

3 Parsons Brinckerhoff Quade & Douglas Inc., Draft Report--Island of Hawaii--Long-Range Highway Plan. September 7, 1990.

4 U.S. Department of Transportation, Federal Highway Administration, Manual on Uniform Traffic Control Devices For Streets and Highways. 1988, as amended.

5 Institute of Transportation Engineers, Trip Generation, Fourth Edition, Washington, D.C., 1987.

6 R.M. Towill Corporation, Preparation Notice for an Environmental Impact Statement for the Waikoloa Affordable Housing Master Plan. July 1990.

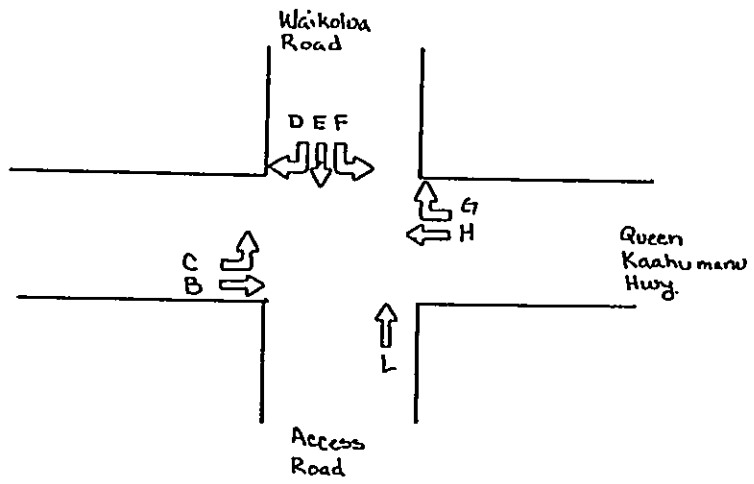
APPENDIX A

MANUAL TRAFFIC COUNTS

JSPB

NAME: WAIKOLOA AFFORDABLE HOUSING
LOCATION: QUEEN KAAHUMANU HWY/WAIKOLOA RD
DATE: AUGUST 8, 1990
BY: JKT

File Name: OKHR_AM



COUNT READINGS

TIME	A	B	C	D	E	F	J	H	G	N	L	K
6:00-6:15 AM		29	7	14	2	30		23	4		2	
-6:30		99	12	33	2	66		65	13		2	
-6:45		163	22	58	2	106		139	29		2	
-7:00		213	31	86	2	159		191	44		2	
-7:15		253	45	103	2	201		228	61		2	
-7:30		317	51	118	2	258		266	83		2	
-7:45		373	57	152	2	301		302	104		2	
-8:00		412	65	149	2	354		349	123		2	
-8:15		443	71	166	2	392		387	137		2	
-8:30		476	76	173	2	418		420	150		2	
-8:45		518	91	181	2	451		466	163		2	
-9:00 AM		562	94	198	2	482		510	180		2	

COUNT VOLUMES

TIME	A	B	C	D	E	F	J	H	G	N	L	K	TOTAL	TOT4
6:00-6:15 AM	0	29	7	14	2	30	0	23	4	0	2	0	111	
-6:30	0	70	5	19	0	36	0	42	9	0	0	0	181	
-6:45	0	64	10	25	0	40	0	74	16	0	0	0	229	
-7:00	0	50	9	28	0	53	0	52	15	0	0	0	207	720
-7:15	0	40	14	17	0	42	0	37	17	0	0	0	167	784
-7:30	0	64	6	15	0	57	0	38	22	0	0	0	202	805
-7:45	0	56	6	14	0	43	0	35	21	0	0	0	176	752
-8:00	0	39	8	17	0	53	0	47	19	0	0	0	183	728
-8:15	0	31	6	17	0	38	0	38	14	0	0	0	144	705
-8:30	0	33	5	7	0	26	0	41	13	0	0	0	125	628
-8:45	0	42	15	8	0	33	0	38	13	0	0	0	149	601
-9:00 AM	0	44	3	17	0	31	0	44	17	0	0	0	156	574
6:00-9:00 TOTAL	0	562	94	198	2	482	0	510	180	0	2	0	2030	
6:30-7:30 HOUR	0	238	39	85	0	192	0	201	78	0	0	0	805	

APPROACH/DEPARTURE VOLUMES

	ABC	DEF	GHJ	KLM	AEJ	BFK	CGL	DHM
6:00-6:15 AM	36	46	27	2	2	59	13	37
-6:30	75	55	51	0	0	106	14	61
-6:45	74	65	90	0	0	104	26	99
-7:00	59	81	67	0	0	103	24	80
-7:15	54	59	54	0	0	82	31	54
-7:30	70	72	60	0	0	121	28	53
-7:45	62	57	57	0	0	99	27	50
-8:00	47	70	66	0	0	92	27	64
-8:15	37	55	52	0	0	69	20	55
-8:30	38	33	54	0	0	59	18	48
-8:45	57	41	51	0	0	75	28	46
-9:00 AM	47	48	61	0	0	75	20	61
6:00-9:00 TOTAL	556	682	552	2	2	1044	276	708

GF88

NAME: MAIKOLOA AFFORDABLE HOUSING
LOCATION: QUEEN KAAHUMANU HWY/MAIKOLOA RD
DATE: AUGUST 7, 1990
BY: JXT

File Name: COMM_PM

COUNT READINGS

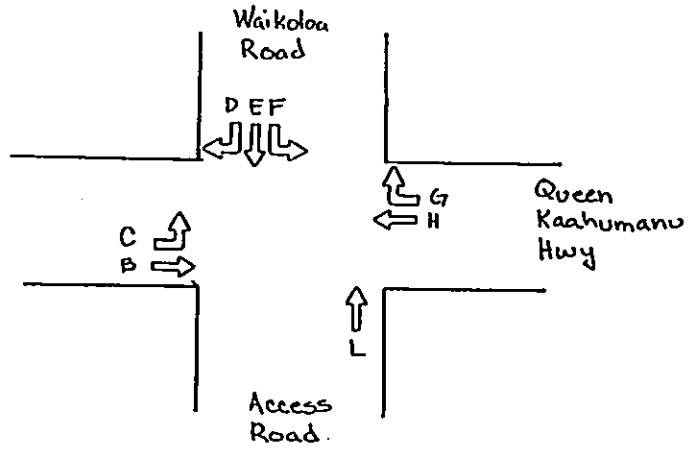
TIME	A	B	C	D	E	F	J	H	G	M	L	K
3:00-3:15 PM		73	17	9	0	19		61	27		0	
-3:30		141	30	20	0	46		153	55		0	
-3:45		252	54	30	0	81		221	89		0	
-4:00		327	68	45	3	104		265	113		0	
-4:15		403	86	59	3	127		342	157		1	
-4:30		482	103	65	3	151		407	193		1	
-4:45		532	112	73	3	175		473	220		1	
-5:00		598	128	81	3	198		533	257		1	
-5:15		649	138	91	3	215		590	273		1	
-5:30		699	146	99	3	225		649	299		1	
-5:45		750	154	104	3	238		701	329		1	
-6:00 PM		797	165	112	3	260		749	355		1	

COUNT VOLUMES

TIME	A	B	C	D	E	F	J	H	G	M	L	K	TOTAL	TOTA
3:00-3:15 PM	0	73	17	9	0	19	0	61	27	0	0	0	206	
-3:30	0	68	13	11	0	27	0	92	28	0	0	0	239	
-3:45	0	111	24	10	0	35	0	68	34	0	0	0	282	
-4:00	0	75	14	15	3	23	0	44	24	0	0	0	198	925
-4:15	0	76	18	14	0	23	0	77	44	0	1	0	253	972
-4:30	0	79	17	6	0	24	0	65	36	0	0	0	227	960
-4:45	0	50	9	8	0	24	0	66	27	0	0	0	184	862
-5:00	0	66	16	8	0	23	0	60	37	0	0	0	210	874
-5:15	0	51	10	10	0	17	0	57	16	0	0	0	161	782
-5:30	0	50	8	8	0	10	0	59	26	0	0	0	161	716
-5:45	0	51	8	5	0	13	0	52	30	0	0	0	159	691
-6:00 PM	0	47	11	8	0	22	0	48	26	0	0	0	162	643
3:00-6:00 TOTAL	0	797	165	112	3	260	0	749	355	0	1	0	2442	
3:15-4:15 HOUR	0	330	69	50	3	108	0	281	130	0	1	0	972	

APPROACH/DEPARTURE VOLUMES

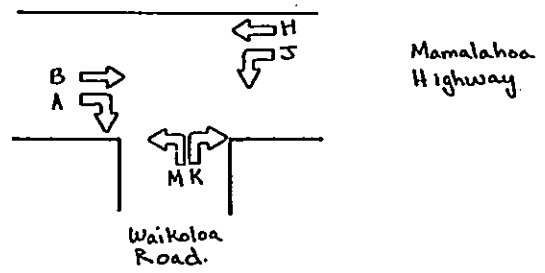
	ABC	DEF	GHJ	KLM	AEJ	BFK	CGL	DHM
3:00-3:15 PM	90	28	88	0	0	92	44	70
-3:30	81	38	128	0	0	95	41	103
-3:45	135	45	102	0	0	146	58	78
-4:00	89	41	68	0	3	98	38	59
-4:15	94	37	121	1	0	99	63	91
-4:30	96	30	101	0	0	103	53	71
-4:45	59	32	93	0	0	74	36	78
-5:00	82	31	97	0	0	85	53	68
-5:15	61	27	73	0	0	68	26	67
-5:30	58	18	85	0	0	50	34	67
-5:45	59	18	82	0	0	64	38	57
-6:00 PM	58	30	74	0	0	69	37	56
3:00-6:00 TOTAL	962	375	1104		3	1057	521	961



6:28

NAME: WAIKOLOA AFFORDABLE HOUSING
LOCATION: MAMALAHOA HWY/WAIKOLOA RD
DATE: AUGUST 8, 1990
BY: KKN

File Name: MHWR_AM



COUNT READINGS

TIME	A	B	J	H	M	K
6:00-6:15 AM	14	13	0	6	3	0
-6:30	38	33	1	17	10	1
-6:45	82	48	7	30	24	2
-7:00	114	69	13	39	35	5
-7:15	141	89	16	52	55	6
-7:30	160	105	22	72	69	7
-7:45	183	126	23	90	92	9
-8:00	200	138	30	109	110	13
-8:15	212	148	31	126	124	13
-8:30	222	156	33	153	148	13
-8:45	230	170	33	170	166	16
-9:00 AM	247	204	34	187	195	17

COUNT VOLUMES

TIME	A	B	J	H	M	K	TOTAL	TOT4	
6:00-6:15 AM	14	13	0	6	3	0	36		6:00-6:15 AM
-6:30	24	20	1	11	7	1	64		-6:30
-6:45	44	15	6	13	14	1	93		-6:45
-7:00	32	21	6	9	11	3	82	275	-7:00
-7:15	27	20	3	13	20	1	84	323	-7:15
-7:30	19	16	6	20	14	1	76	335	-7:30
-7:45	23	21	1	18	23	2	88	330	-7:45
-8:00	17	12	7	19	18	4	77	325	-8:00
-8:15	12	10	1	27	14	0	64	305	-8:15
-8:30	10	8	2	17	24	0	61	290	-8:30
-8:45	8	22	0	17	18	3	68	270	-8:45
-9:00 AM	17	26	1	17	29	1	91	284	-9:00 AM
6:00-9:00 TOTAL	247	204	34	187	195	17	884		
6:30-7:30 HOUR	122	72	21	55	59	6	335		

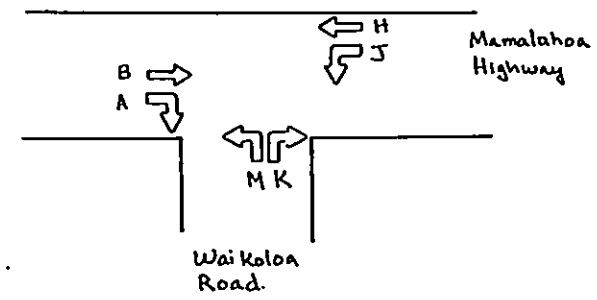
APPROACH / DEPARTURE

TIME	AB	JK	MK	AJ	BK	HK
6:00-6:15 AM	27	6	3	14	13	9
-6:30	44	12	8	25	21	18
-6:45	59	19	15	50	16	27
-7:00	53	15	14	38	24	20
-7:15	47	16	21	30	21	33
-7:30	35	26	15	25	17	36
-7:45	44	19	25	24	23	41
-8:00	29	26	22	24	16	37
-8:15	22	28	14	13	10	41
-8:30	18	19	24	12	8	41
-8:45	30	17	21	8	25	35
-9:00 AM	43	18	30	18	27	46
6:00-9:00 TOTAL	451	221	212	231	221	382
6:30-7:30 HOUR	154	76	55	143	78	114

JOB

NAME: WAIKOLOA AFFORDABLE HOUSING
LOCATION: MAMALAHOA HWY/WAIKOLOA RD
DATE: AUGUST 7, 1990
BY: XXX

File Name: MWR_PM



COUNT READINGS

TIME	A	B	J	H	M	K
3:00-3:15 PM	20	22	3	20	15	0
-3:30	38	37	5	36	38	2
-3:45	55	63	9	51	63	10
-4:00	74	84	9	70	92	19
-4:15	86	109	12	89	123	23
-4:30	114	131	13	108	148	27
-4:45	133	153	16	123	167	32
-5:00	151	169	16	145	193	33
-5:15	169	192	16	167	213	36
-5:30	187	212	17	179	227	40
-5:45	216	237	19	204	239	41
-6:00 PM	231	259	22	218	253	43

COUNT VOLUMES

TIME	A	B	J	H	M	K	TOTAL	TOT4	
3:00-3:15 PM	20	22	3	20	15	0	80		3:00-3:15 PM
-3:30	18	15	2	16	23	2	76		-3:30
-3:45	17	26	4	15	25	8	95		-3:45
-4:00	19	21	0	19	29	9	97	348	-4:00
-4:15	12	25	3	19	31	4	94	362	-4:15
-4:30	28	22	1	19	25	4	99	385	-4:30
-4:45	19	22	3	15	19	5	83	373	-4:45
-5:00	18	16	0	22	26	1	83	359	-5:00
-5:15	18	23	0	22	20	3	86	351	-5:15
-5:30	18	20	1	12	14	4	69	321	-5:30
-5:45	29	25	2	25	12	1	94	332	-5:45
-6:00 PM	15	22	3	14	14	2	70	319	-6:00 PM
3:00-6:00 TOTAL	231	259	22	218	253	43			1026
3:30-4:30 HOUR	76	94	8	72	110	25			385

APPROACH / DEPARTURE

TIME	AB	JH	MK	AJ	BK	HM
3:00-3:15 PM	42	23	15	23	22	35
-3:30	33	18	25	20	17	39
-3:45	43	19	33	21	34	40
-4:00	40	19	38	19	30	48
-4:15	37	22	35	15	29	50
-4:30	50	20	29	29	26	44
-4:45	41	18	24	22	27	34
-5:00	34	22	27	18	17	48
-5:15	41	22	23	18	26	42
-5:30	30	13	18	19	24	26
-5:45	54	27	13	31	26	37
-6:00 PM	37	17	16	18	24	28
3:00-6:00 TOTAL	490	240	296	253	302	421
3:30-4:30 HOUR	170	80	135	84	119	182

NAME: MAIKOLOA AFFORDABLE HOUSING File Name: MKPO_AM
LOCATION: MAIKOLOA RD/PANIOLO DR/PUA MELIA ST
DATE: AUGUST 8, 1990
BY: PF

COUNT READINGS

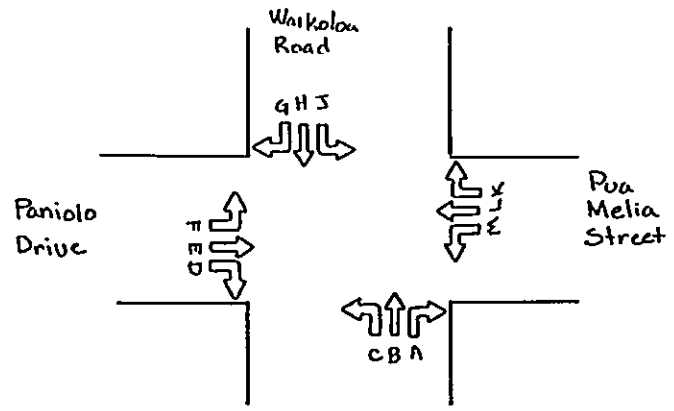
TIME	A	B	C	D	E	F	J	H	G	M	L	K
6:00-6:15 AM	0	3	1	35	4	3	0	7	7	0	0	1
-6:30	0	6	7	90	8	14	1	22	18	0	3	1
-6:45	2	8	14	151	12	31	3	47	23	4	5	5
-7:00	2	11	34	199	17	43	7	73	45	5	8	6
-7:15	3	15	46	240	22	56	11	89	50	8	11	6
-7:30	4	20	62	288	27	68	12	107	56	10	19	6
-7:45	5	26	81	331	32	91	16	117	66	14	23	7
-8:00	6	27	99	378	41	104	17	128	85	16	30	8
-8:15	7	34	114	411	47	119	18	132	94	19	37	8
-8:30	10	38	125	444	52	133	19	137	100	21	41	9
-8:45	12	48	135	477	57	152	20	143	106	23	43	12
-9:00 AM	16	51	145	495	62	165	22	148	112	26	49	17

COUNT VOLUMES

TIME	A	B	C	D	E	F	J	H	G	M	L	K	TOTAL	TOT4
6:00-6:15 AM	0	3	1	39	4	3	0	7	7	0	0	1	65	
-6:30	0	3	6	51	4	11	1	15	3	0	3	0	97	
-6:45	2	2	7	61	4	17	2	25	13	4	2	4	143	
-7:00	0	3	20	48	5	9	4	23	17	1	3	1	134	439
-7:15	1	4	12	41	5	16	4	19	10	3	3	0	118	492
-7:30	1	5	16	48	5	12	1	18	6	2	8	0	122	517
-7:45	1	6	19	43	5	23	4	10	18	4	4	1	138	504
-8:00	1	1	18	47	9	13	1	11	19	2	7	1	130	500
-8:15	1	7	15	33	6	15	1	4	9	3	7	0	101	483
-8:30	3	4	11	33	5	14	1	5	6	2	4	1	89	450
-8:45	2	10	10	33	5	19	1	6	6	2	2	3	99	419
-9:00 AM	4	3	10	18	5	13	2	5	6	3	6	5	80	369
6:00-9:00 TOTAL	16	51	145	495	62	165	22	148	112	26	49	17	1308	
6:30-7:30 HOUR	4	14	55	198	19	54	11	85	46	10	16	5	517	

APPROACH/DEPARTURE VOLUMES

	ABC	DEF	GHJ	KLM	AEJ	BFK	CGL	DHM
6:00-6:15 AM	4	46	14	1	4	7	8	46
-6:30	9	66	15	3	5	14	12	66
-6:45	11	82	40	10	8	23	22	90
-7:00	23	62	44	5	9	13	40	72
-7:15	17	62	33	6	10	20	25	63
-7:30	22	65	25	10	7	17	30	60
-7:45	26	71	24	9	10	30	33	57
-8:00	20	69	31	10	11	15	44	60
-8:15	23	58	14	10	8	22	31	40
-8:30	18	52	12	7	9	19	21	40
-8:45	22	57	13	7	8	32	18	41
-9:00 AM	17	36	13	14	11	21	22	26
6:00-9:00 TOTAL	212	722	282	92	103	233	306	669



DEF9

NAME: WAIKOLOA AFFORDABLE HOUSING File Name: WKPO_PM
LOCATION: WAIKOLOA RD/PANIOLO DR/PUA MELIA RD
DATE: AUGUST 7, 1990
BY: PF

COUNT READINGS

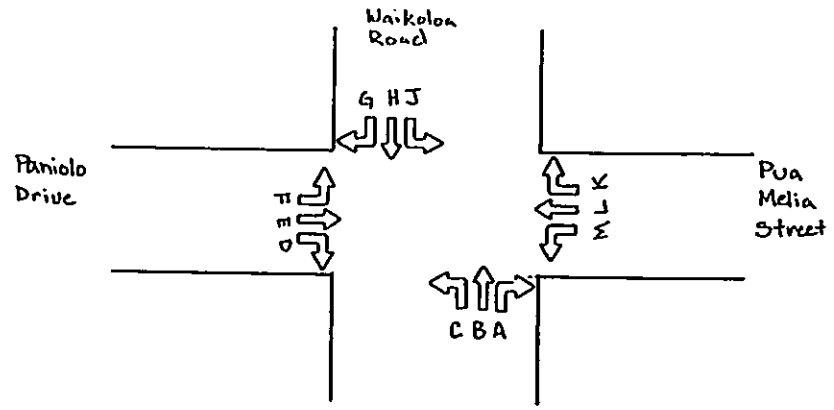
TIME	A	B	C	D	E	F	J	H	G	M	L	K
3:00-3:15 PM	2	7	16	23	19	11	4	5	10	3	26	3
-3:30	7	18	39	48	42	21	11	12	18	7	53	5
-3:45	14	35	76	72	61	41	14	15	28	13	78	10
-4:00	20	44	106	89	80	51	17	20	40	17	107	20
-4:15	25	63	139	101	112	62	23	23	52	22	128	25
-4:30	32	75	173	120	138	80	25	29	63	26	159	30
-4:45	36	84	215	142	146	89	30	34	75	29	175	34
-5:00	40	95	240	152	160	105	34	37	90	33	192	36
-5:15	45	96	276	173	176	116	37	38	104	36	214	37
-5:30	46	101	306	181	187	128	40	41	120	39	231	42
-5:45	46	104	335	197	197	133	41	44	135	40	247	42
-6:00 PM	52	107	360	219	208	139	43	48	159	42	262	46

COUNT VOLUMES

TIME	A	B	C	D	E	F	J	H	G	M	L	K	TOTAL	TOTA
3:00-3:15 PM	2	7	16	23	19	11	4	5	10	3	26	3	129	
-3:30	5	11	23	25	23	10	7	7	8	4	27	3	153	
-3:45	7	17	37	24	19	20	3	3	10	6	25	4	175	
-4:00	6	9	30	17	27	10	3	5	12	4	29	10	162	619
-4:15	5	19	33	12	24	11	6	3	12	5	21	5	156	646
-4:30	7	12	34	27	26	18	2	6	11	4	31	5	183	676
-4:45	4	9	42	14	8	9	5	5	12	3	16	4	131	632
-5:00	4	11	25	10	14	16	4	3	15	4	17	2	125	595
-5:15	5	1	36	21	16	11	3	1	14	3	22	1	134	573
-5:30	1	5	30	8	11	12	3	3	16	3	17	5	114	504
-5:45	0	3	29	16	10	5	1	3	15	1	16	0	99	472
-6:00 PM	6	3	25	22	11	6	2	4	24	2	15	4	124	471
3:00-6:00 TOTAL	52	107	360	219	208	139	43	48	159	42	262	46	1605	
3:30-4:30 HOUR	25	57	134	80	96	59	14	17	45	19	106	24	676	

APPROACH/DEPARTURE VOLUMES

	ABC	DEF	GHJ	KLM	AEJ	BFK	CGL	DHM
3:00-3:15 PM	25	53	19	32	25	21	52	31
-3:30	39	58	22	34	35	24	58	36
-3:45	61	63	16	35	29	41	72	33
-4:00	45	54	20	43	36	29	71	26
-4:15	57	47	21	31	35	35	66	20
-4:30	53	71	19	40	35	35	76	37
-4:45	55	31	22	23	17	22	70	22
-5:00	40	42	22	23	22	29	57	17
-5:15	42	48	18	26	24	13	72	25
-5:30	36	31	22	25	15	22	63	14
-5:45	32	21	16	19	11	9	60	20
-6:00 PM	34	35	20	21	19	13	64	28
3:00-6:00 TOTAL	518	555	250	352	305	292	787	309



APPENDIX B

Six levels of service, A through F, from the best to worst conditions, are defined in the *Highway Capacity Manual*. Characteristics of each level of service for signalized and unsignalized intersections and two-lane highways are described below.

Signalized Intersections

Levels of Service for signalized intersections is measured in terms of delay. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time.

Level of Service A:	Drivers operate in a free-flow situation with easy turning movements and no delays.
Level of Service B:	This level represents stable conditions; drivers may be restricted slightly in movements; however, no delays exceed one cycle.
Level of Service C:	Short backups may occur behind turning vehicles, and drivers may experience delays of more than one cycle. Although movements may be restricted somewhat, the situation is not objectionable as stable operation continues.
Level of Service D:	Drivers experience restrictions approaching instability. Delays may occur during short peaks; however, periodic queues prevent excessive backups.
Level of Service E:	This level represents conditions at full capacity, serving the most vehicles the intersection is able to accommodate. Long queues and substantial delays occur.
Level of Service F:	The capacity of the intersection has been exceeded. Conditions are jammed, and the volumes of traffic that can be handled are unpredictable. Congestion, excessive delays, and very long queues are typical of this service level.

Unsignalized Intersections

For unsignalized intersections, the Highway Capacity Manual evaluates gaps in the major street traffic flow and calculates capacities available for left turns across oncoming traffic and for left and right turns onto the highway from the minor street.

Level of Service A:	Few or no delays
Level of Service B:	Short traffic delays
Level of Service C:	Average traffic delays
Level of Service D:	Long traffic delays

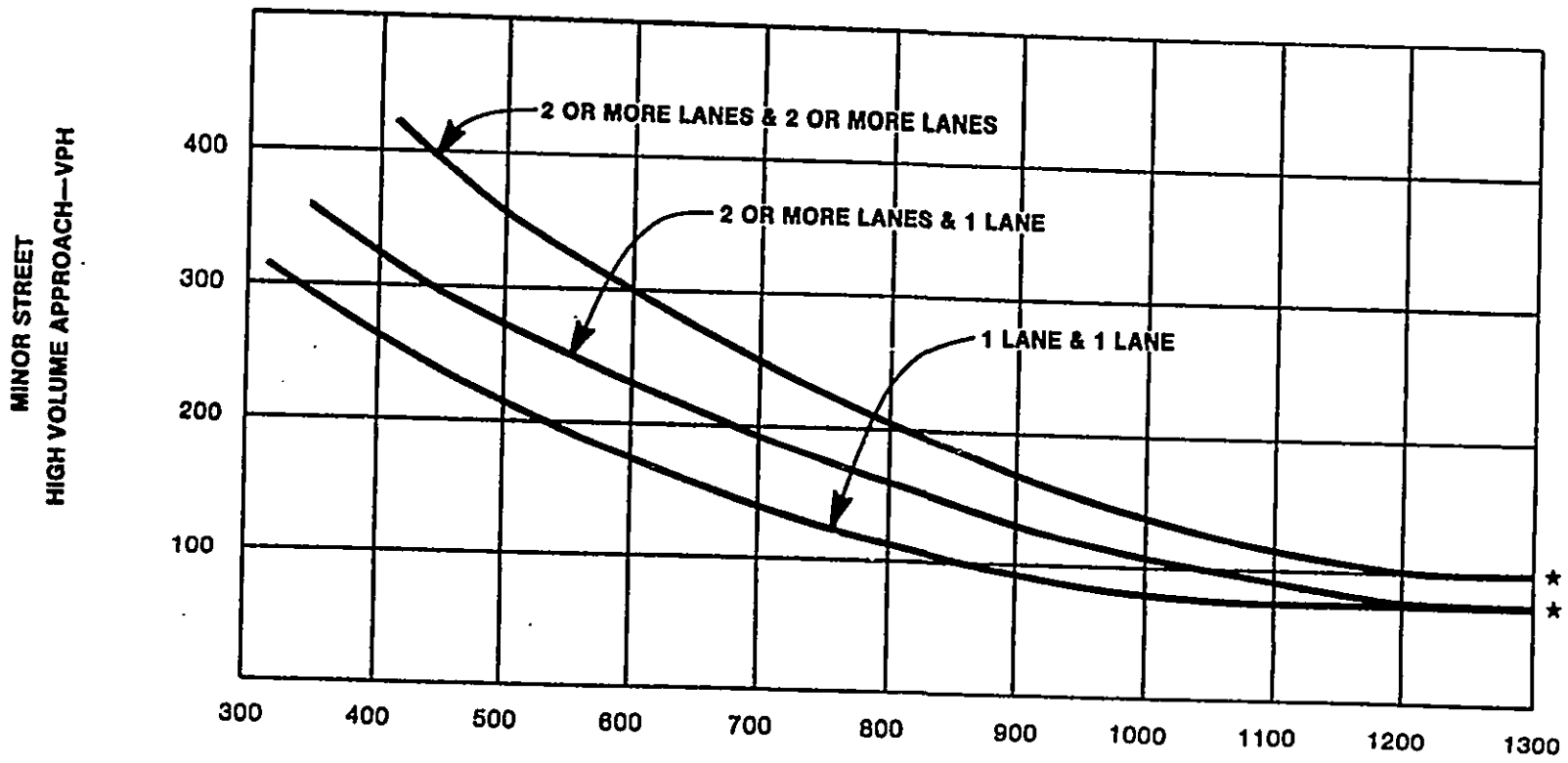
Level of Service E:	Very long traffic delays
Level of Service F:	Capacity exceeded by demand

Two-Lane Highways

The analysis of two-lane highways evaluates percent time delay with speed and capacity utilization serving as secondary measures.

Level of Service A:	Motorists are able to drive desired speeds. Passing demand is well below capacity, and almost no platoons of three or more vehicles are observed. Drives would be delayed no more than 30 percent of the time by slow-moving vehicles.
Level of Service B:	Passing demand approximately equals passing capacity. Drivers may be delayed up to 45 percent of the time, and the number of platoons forming in the traffic stream begins to increase dramatically.
Level of Service C:	Traffic flows increase, resulting in noticeable increases of platoon formation, platoon size, and frequency of passing impediment; chaining of platoon and significant reductions of passing capacity begin to occur. Traffic flows are stable, but is susceptible to congestion caused by turning movements and slow-moving vehicles. Motorists may be delayed up to 60 percent of the time.
Level of Service D:	Traffic flows become unstable. The two opposing traffic streams essentially begin to operated separately as passing becomes extremely difficult. Passing demand is high, while passing capacity approaches zero. Average platoon sizes of 5 to 10 vehicles are common. Turning vehicles and/or roadside distractions causes major shock waves in the traffic stream. Delays for motorists may approach 75 percent of the time. This is the highest flow rate that can be maintained without a high probability of breakdown.
Level of Service E:	Traffic flows experience delays more than 75 percent of the time. Passing is virtually impossible and platooning becomes intense when slower vehicles or other interruptions are encountered. Traffic volumes may reach capacity of the highway. Operating conditions at capacity are unstable and difficult to predict of maintain; Level of Service E is a transient condition and perturbations in traffic flows would cause a rapid transition to Level of Service F.
Level of Service F:	Heavily congested flow with traffic demand exceeding capacity. Volumes are lower than capacity, and speeds are below capacity.

PEAK HOUR VOLUME WARRANT
(RURAL AREAS)



★ NOTE: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.