

*Varona Village Phase II*  
DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT  
**CITY AND COUNTY OF HONOLULU**  
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PHONE: (808) 523-4427 • FAX: (808) 527-5498

JEREMY HARRIS  
MAYOR



November 12, 1996

Mr. Gary Gill, Director  
Office of Environmental Quality Control  
State of Hawaii  
220 South King Street, 4th Floor  
Honolulu, Hawaii 96813

Dear Mr. Gill:

Subject: Final Environmental Assessment/  
Finding of No Significant Impact (FONSI)  
for the Varona Village Phase II Project

The Department of Housing and Community Development (DHCD) has reviewed the comments received during the 30-day public comment period which began on August 23, 1996. DHCD has determined that this project will not have a significant effect and has issued a Finding of No Significant Impact (Negative Declaration). Please publish this notice in the November 23, 1996, Environmental Notice (OEQC Bulletin).

We have enclosed a completed OEQC Bulletin Publication Form and four copies of the Final Environmental Assessment.

Please contact Ms. Avis Kamimura at 523-4437 if you have any questions.

Sincerely,

ROLAND D. LIBBY, JR.  
Director  
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

Enclosures

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'96 NOV 13 09:28  
ROLAND D. LIBBY, JR.  
DIRECTOR

OFFICE OF ENVIRONMENTAL QUALITY CONTROL  
ROBERT AGRES, JR.  
DEPUTY DIRECTOR

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1996-11-23-0A-PEA-Varona Village Phase II

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# **VARONA VILLAGE PHASE II**

**Final Environmental Assessment/  
Finding of No Significant Impact  
(FONSI)**

**Prepared For:  
City and County of Honolulu  
Department of Housing and Community Development**

**Prepared By:  
PBR HAWAII**

**November 1996**

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**November 1996**

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## OVERVIEW

This Environmental Assessment (EA) has been prepared because the proposed project described below involves the use of County lands and funds. This Environmental Assessment is prepared in compliance with the provisions of *Hawaii Revised Statutes (HRS) Chapter 343 and Title 11, Department of Health, Chapter 200, Environmental Impact Statement Rules (Rules)*, Sections 11-200-14 through 11-200-18.

As required by the Rules, this EA describes the following elements of the proposed project: 1) the technical, economic, social, cultural and environmental characteristics of the project; 2) the affected environment; 3) a summary of impacts and alternatives considered that would meet project objectives; 4) the mitigation measures proposed; 5) significance of environmental impacts; and 6) determination. In addition, the relationship of the proposed action to existing public plans, policies, and controls is discussed.

## PROJECT SUMMARY

Project Name:	Varona Village Phase II	
Applicant:	City and County of Honolulu Department of Housing and Community Development	
Area:	<u>Tax Map Key</u>	<u>Approximate Acres</u>
	9-1-17: 68 (por)	9
	9-1-17: 69 (por)	27
	9-1-17: 75 (por)	25
Existing Use:	The subject parcel portions are currently vacant; however, the remaining area within parcels 9-1-17:69 and 75 contain residential dwellings and a golf course	
Proposed Use:	Residential and/or Community-Type Facilities	
State Land Use District:	Agricultural and Urban	
Current Ewa Development Plan Land Use Map:	Agriculture	

Proposed Revised Ewa Development Plan Land Use Map (March 1996):	<u>Tax Map Key</u>	<u>Designation</u>
	9-1-17: 68 (por)	Industrial
	9-1-17: 69 (por)	Low & Medium Density Residential
	9-1-17: 75 (por)	Low & Medium Density Residential
City and County of Honolulu Zoning:	AG-1	
Action Requested:	Use of County lands and funds	
Accepting Authority:	Department of Housing and Community Development, City and County of Honolulu	

**Chapter 205, Hawaii Revised Statutes (HRS)**

Chapter 205, HRS establishes the State Land Use Commission (LUC) and gives this body the authority to designate all lands in the State as Urban, Rural, Agricultural, or Conservation District. Land use decisions within Urban District lands are generally left to the counties to control in accordance with local General Plans and zoning ordinances. Most of the project areas are currently designated Agricultural Districts by the LUC. As such, these portions of the project areas must be reclassified to the State Urban District to permit development of the proposed land uses.

**Environmental Impact Statements (Chapter 343, HRS)**

In accordance with the State of Hawaii's Environmental Impact Statement Law, Chapter 343, HRS, there are Agency actions applicable to new developments which trigger the environmental review process. The use of County lands and funds are the requested actions that apply to this project and are the potential "triggers" that require compliance with Chapter 343, HRS.

Because Chapter 343, HRS is applicable to the project, this Environmental Assessment has been prepared to identify whether "significant environmental effects" will result from project development. According to the Department of Health Rules which implement Chapter 343, if "significant environmental effects" are not identified by an Environmental Assessment, then preparation of a full Environmental Impact Statement is exempted, and a Finding of No Significant Impact, or Negative Declaration of significant environmental effects is issued. Otherwise, a Notice of Preparation is issued and the processing of a full Environmental Impact Statement is required.

## **1.0 IDENTIFICATION OF PROPOSING AGENCY**

The project areas are three areas (see Figure 1) that consist of approximately 61 acres of vacant land and are located in the District of Ewa in the ahupua'a of Honouliuli, Island of Oahu. The project areas as a whole are bordered on the north and east by vacant lands, Ewa Villages, and the Ewa Villages Golf Course; to the west by a 75-foot Hawaiian Electric Company (HECO) easement and vacant lands; and to the south by the Oahu Railway and Land (OR&L) right-of-way.

The project areas are portions of TMK 9-1-17:68, 69, and 75 and are shown in Figures 2 and 3. The subject property is owned by the City and County of Honolulu. To identify the appropriate uses for the property, the Department of Housing and Community Development (the City's lead agency for the project), authorized PBR HAWAII to prepare a Conceptual Master Plan for Varona Village Phase II and environmental documents in compliance with Chapter 343, HRS. Therefore, in accordance with Chapter 343, HRS, the Department of Housing and Community Development (DHCD) is the Proposing Agency for the project.

The mailing address and primary contact person for the proposing agency is:

Mr. Roland Libby, Director  
Department of Housing and Community Development  
City and County of Honolulu  
650 South King Street, 5th Floor  
Honolulu, Hawaii 96813

## **2.0 IDENTIFICATION OF ACCEPTING AUTHORITY**

In accordance with Subchapter 4, Section 11-200-4, Hawaii Administrative Rules, "the mayor, or an authorized representative, of the respective county whenever an action proposed only the use of county lands or county funds" shall be the final authority to accept a statement. Consequently, the Mayor of the City and County of Honolulu has designated the City's Department of Housing and Community Development as the Accepting Authority for the Varona Village Phase II Environmental Assessment.

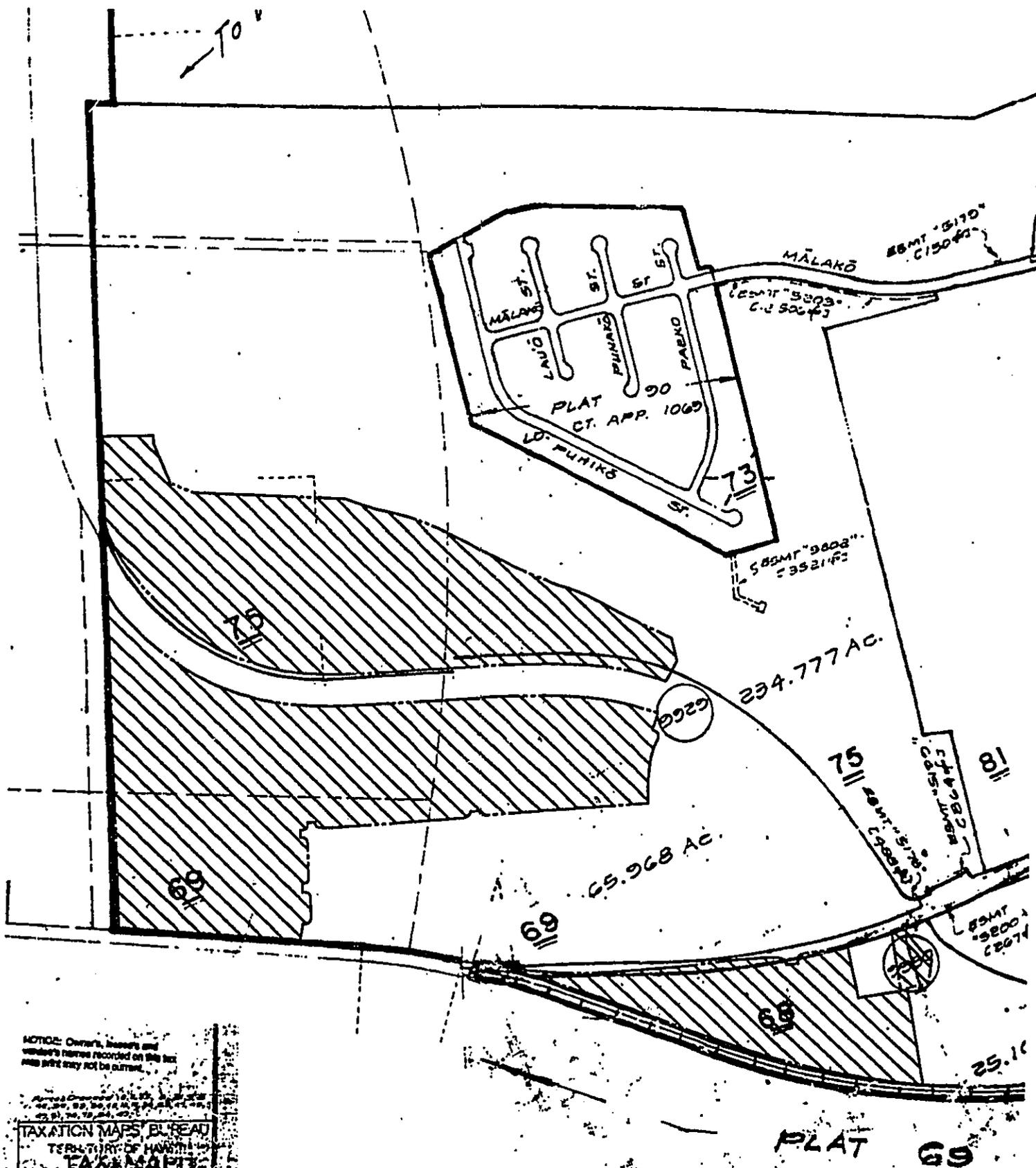
## **3.0 IDENTIFICATION OF AGENCIES CONSULTED**

Consulted agencies or agencies which provided information in the preparation of this environmental assessment include the following:

State  
Department of Transportation  
Land Use Commission

City  
Department of Land Utilization  
Planning Department



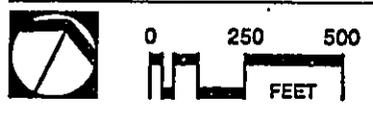


NOTICE: Owners, lessors and vendee's names recorded on this tax map may not be current.

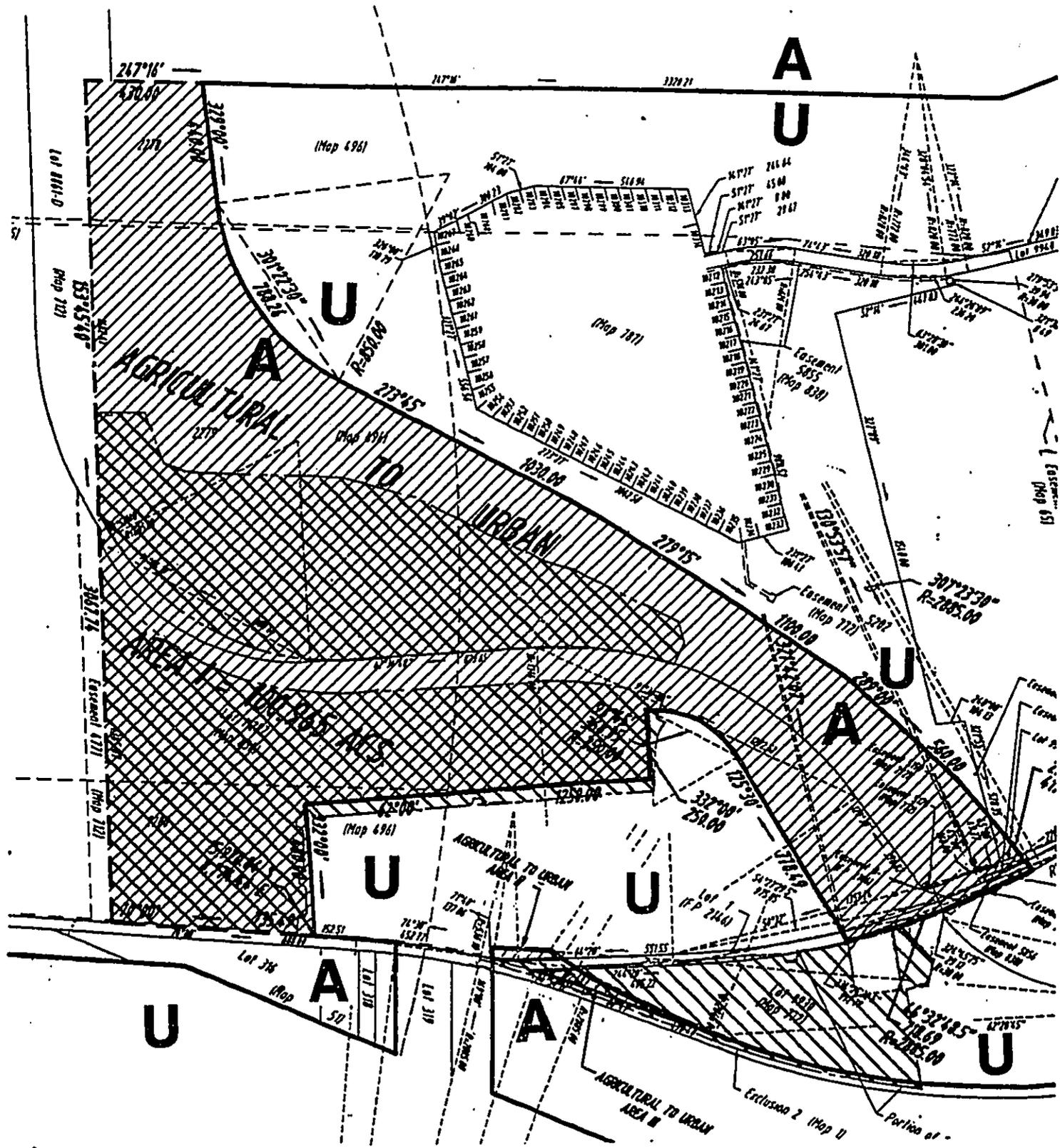
TAXATION MAPS BUREAU  
 TERRITORY OF HAWAII  
 TAX MAPS  
 FIRST DIVISION  
 ZONE 1 SEC. 29 PLAT 69  
 CONTAINING PARCELS  
 SCALE: 1 in. = 600 FT.  
 JUL 5 1995

FIGURE 2  
 TAX MAP/OWNERSHIP  
 VARONA VILLAGE, PHASE II

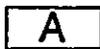
LEGEND  
 Project Area



August, 1996  

**LEGEND**

- |   |               |   |              |
|---|---------------|---|--------------|
|  | Petition Area |  | Urban        |
|  | Project Area  |  | Agricultural |

Source: Land Use Commission  
Community Planning, Inc.

**FIGURE 3  
STATE LAND USE MAP  
VARONA VILLAGE, PHASE II**



0 250 500  
FEET



August, 1998

Department of Transportation Services  
Department of Parks and Recreation  
Department of Public Works  
Board of Water Supply  
Department of Wastewater Management

Federal  
U.S. Navy

Private  
The Estate of James Campbell  
Hawaiian Electric Company  
Hawaiian Telephone Company

#### **4.0 GENERAL DESCRIPTION OF THE ACTION'S TECHNICAL, ECONOMIC, SOCIAL, CULTURAL AND ENVIRONMENTAL CHARACTERISTICS**

##### **4.1 Technical Characteristics**

###### **4.1.1 Description of the Subject Property**

The subject property is adjacent to existing Urban District Lands in Ewa (refer to Figure 3) and is the last major component of the City's Ewa Villages project in Ewa.

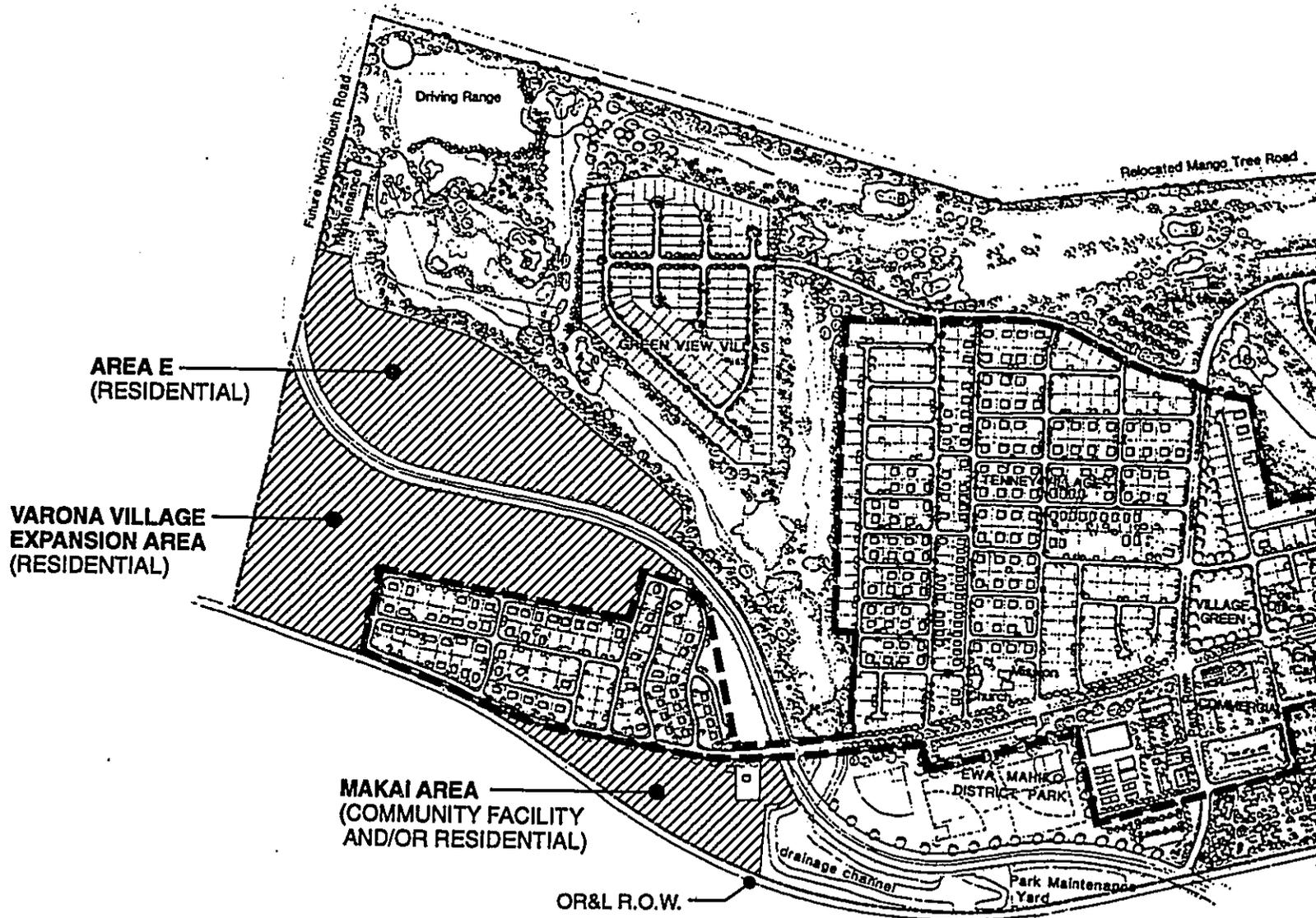
The Varona Village Phase II project areas are located north, west, and south of the existing Varona Village (but does not include the existing Varona Village) and are divided into three areas referred to as Area E (approximately 25 acres), Varona Village Expansion Area (approximately 27 acres), and Makai Area (approximately 9 acres). Refer to Figure 4.

Area E is the northern-most of the project areas. It was previously graded during construction of the Ewa Villages Golf Course. The site slopes slightly, with an elevation of about 60 feet at the golf course maintenance facility (western boundary) to approximately 54 feet at the eastern tip.

The Varona Village Expansion Area, which is south of Area E, also slopes slightly in a west to east direction. Elevations range from about 54 feet at the western corner fronting the proposed North-South Road to about 45 feet at the eastern boundary with the existing Varona Village.

The Makai Area, which is the southern-most of the project areas, is south of the existing Varona Village. Topographic elevations within the Makai Area extend from 48 feet at the western corner to about 41 feet at the eastern end, fronting Kaloi Channel.

The area has been cultivated for sugar cane production for several decades. With the cessation of sugar cane production, the land has since been left vacant and overgrown with weeds. Distant views are of Makakilo and the Waianae Mountains, as well as the Koolau Mountain Range. Because of its relatively flat terrain and low elevation, there are no views of the ocean to the south.

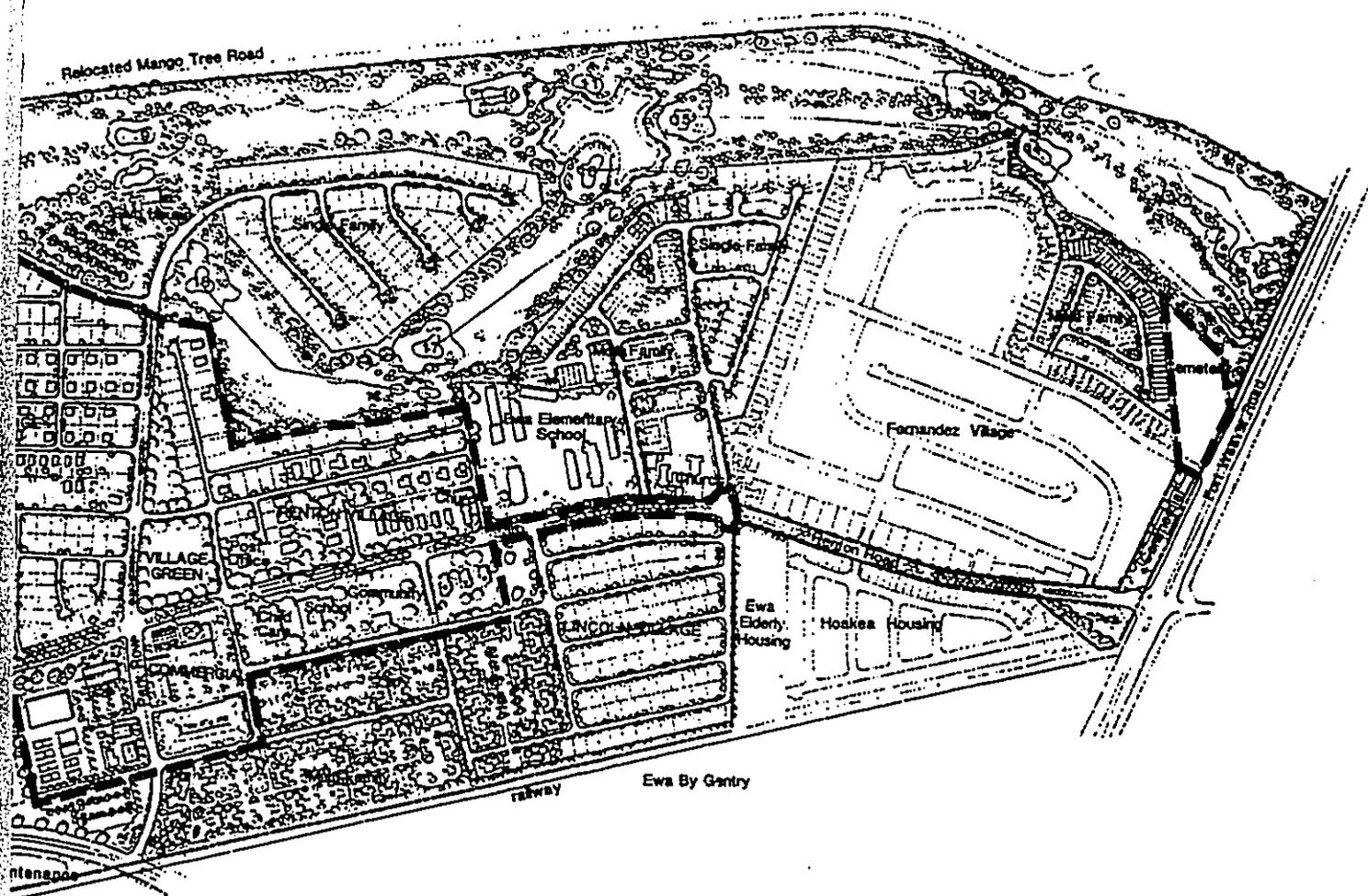


VARONA VILLAGE PHASE II LAND USE SUMMARY			
PROJECT AREA	PROPOSED LAND USE	APPROX. ACREAGE	APPROX. NUMBER OF UNITS
AREA E	RESIDENTIAL	25	252
VARONA VILLAGE EXPANSION AREA	RESIDENTIAL	27	157
MAKAI AREA	COMMUNITY FACILITY/ RESIDENTIAL	9	110

**LEGEND**

-  Project Area
-  Historic District Boundary

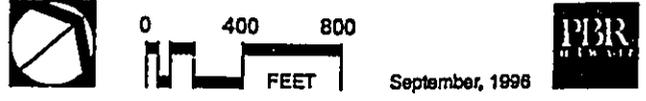
Source: City and County of Honolulu, Department of  
 R. M. Towill Corporation  
 State Historic Preservation Division



istrict Boundary

of Honolulu, Department of Housing and Community Development  
 oration  
 eservation Division

**FIGURE 4**  
**EWA VILLAGE MASTER PLAN**  
**VARONA VILLAGE, PHASE II**



#### 4.1.2 Description of the Planning Area

The project areas abut the future North-South Road and the existing Ewa Villages which are proximate to the future and present employment centers of the City of Kapolei, Ko Olina, Barbers Point Harbor, Campbell Industrial Park, Kapolei Business Park, Barbers Point Naval Air Station, and Ewa Marina. Nearby recreational opportunities include the golf courses of Ewa Villages, West Loch, Ko Olina, Kapolei, Ewa Marina, Hawaii Prince, and Ewa International, as well as the proposed Ko Olina and Ewa Marina recreational boat harbors (refer to Figure 5). Neighboring developments include Ewa By Gentry, West Loch Fairways, Fernandez Village, Ho'akea Housing, and D.E. Thompson Village Elderly Housing project along Renton Road.

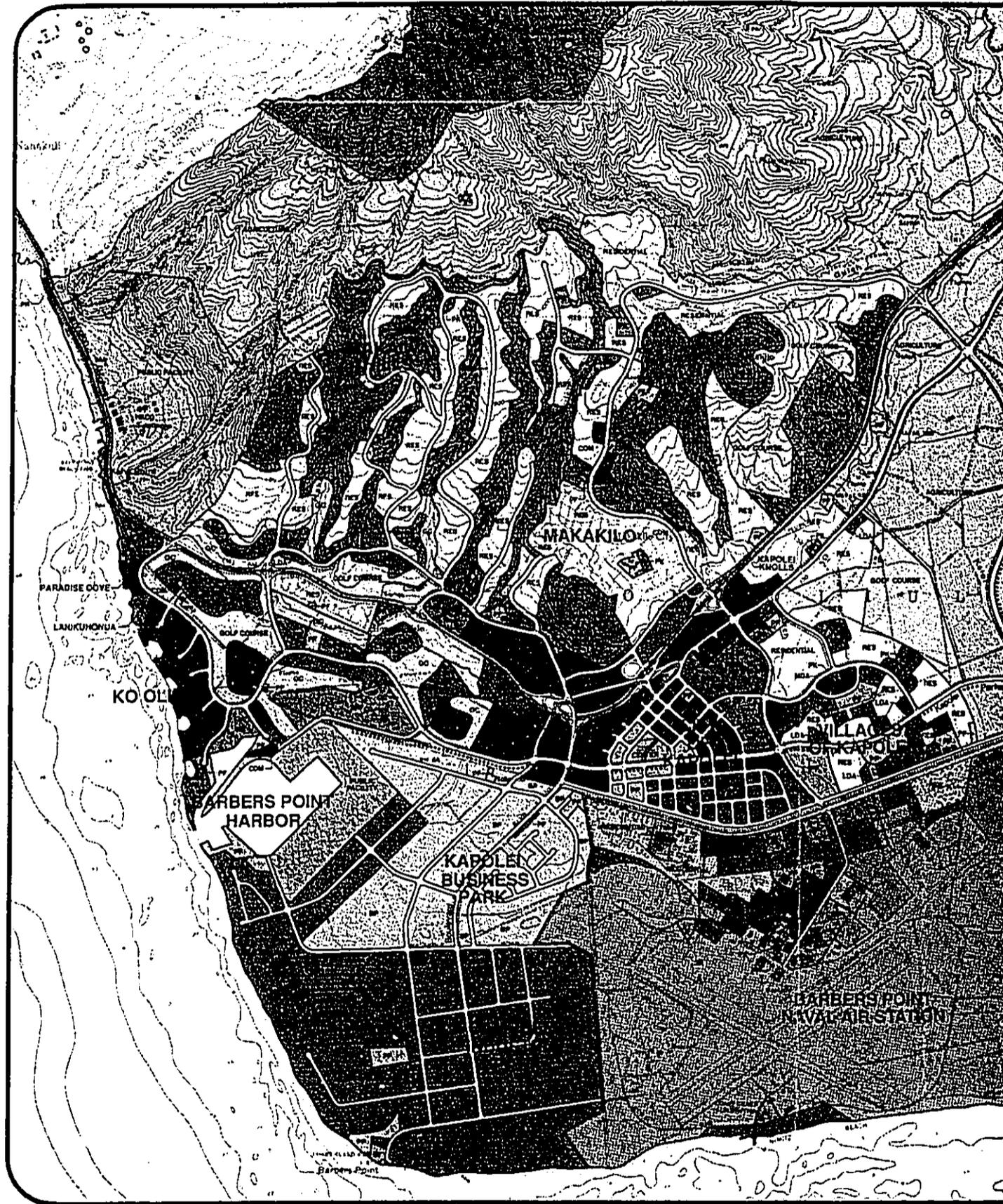
Land uses around the project sites are primarily vacant State lands to the west, Ewa Villages Golf Course to the north, Ewa Villages residential dwellings to the east, and Ewa by Gentry residential dwellings to the south. Public facilities within the Ewa Villages include Ewa Elementary School, Ewa Post Office, Ewa Mahiko Park, Sotoshuji Mission, Lanakila Baptist School, Ewa Community Church, Ewa Hongwanji, Friendship Bible Church and Youth Center, and Ewa Immaculate Conception Church.

The Ewa Villages were built largely by the Ewa Plantation Company to house its employees from about the turn of this century through the late 1950s. According to available records over a period of about 60 years, the plantation built more than 1,200 residential units for its workers. Construction peaked in the first 10 years of the 1900s, as follows:

<u>Dwelling Units Constructed</u>	<u>Timeframe</u>
72	1890s
536	1900 to 1910
132	1911 to 1919
285	1920s
168	1930s
35	1940s

At one time, the Ewa Villages consisted of eight separate villages located in close proximity to the sugar mill and each other. These villages were: 1) Tenney, 2) Renton, 3) Varona, 4) Fernandez, 5) "C", 6) Mill, 7) Middle, and 8) Lower. The latter four villages have since been razed, while the four other villages of Tenney, Renton, Varona, and Fernandez (redeveloped from the late 1970s through early 1980s) still remain relatively intact. Each village was built separately and had its own unique sense of history, culture, and social composition.

Varona Village is isolated from the other villages by former cane fields and Kaloi Channel. The heart of the village was formerly a spacious green with a large board-and-batten community hall that was constructed in 1934 for the Filipino community association. The community hall has since been razed and the open space has been left untended.



LEGEND

 Project Area



Significant non-residential buildings in Ewa Villages include the following:

- Ewa Community Church (1926)
- Ewa Immaculate Conception Catholic Church (1926)
- Ewa Hongwanji Mission (1962)
- Former Ewa "J" Club (1935)
- Ewa Sotoshuji and Ewa Sotoshuji Social Hall (1949)
- Former Plantation Administration Building (1935)
- Former Shopping Basket (1935)

#### State Land Use District Boundaries

Portions of the project site are located within the LUC's Agricultural District boundary. Development of the proposed project will require a reclassification of these areas to the Urban District. The remaining portions of the project site are designated as Urban District (see Figure 3).

#### City and County Development Plan

The planning area falls within the City and County of Honolulu, Ewa Development Plan area. Land use designations in the project vicinity include: Residential, Agriculture, Park, Low Density Apartment, Commercial, and Public Facility. The project area itself is designated Agriculture.

With the recently proposed revisions to the Ewa Development Plan, the land use designations within and adjacent to the project areas are Low and Medium Density Residential, High Density Residential, and Industrial. Within the project area, the land is designated Low and Medium Density Residential (Area E and Varona Village Expansion Area) and Industrial (Makai Area).

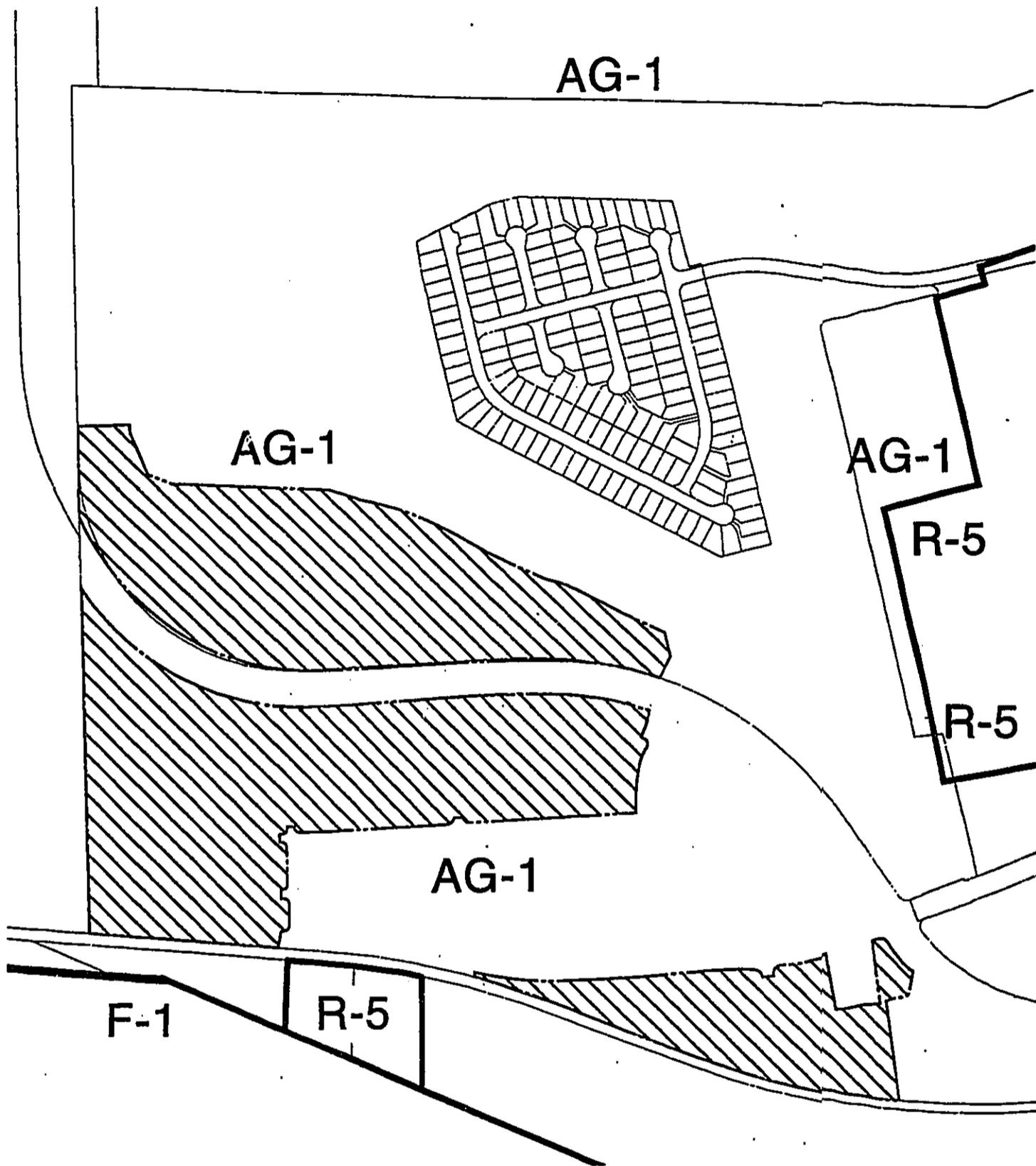
#### City and County Zoning

The project sites are zoned Restricted Agricultural (AG-1) as indicated by Figure 6. Other zoning designations around the project areas include Residential (R-5), Neighborhood Business (B-1), and Apartment (A-1). Future zoning allowing the proposed uses will be accomplished through 201E exemption.

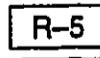
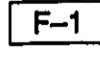
#### 4.1.3 Project Overview, Goals, Objectives

In the Spring of 1990, the City and County of Honolulu embarked on a challenging housing project to provide home ownership opportunities for the tenants that reside in the Ewa plantation villages of Renton, Tenney and Varona. This endeavor has been referred to as the *Ewa Villages Revitalization Project*.

The impetus for the Ewa Villages Revitalization Project was the potential closing of the plantation due to the expiration of the land lease between the Estate of James Campbell and Oahu Sugar Company in 1995. In light of this uncertainty, the City and County, through the DHCD, began exploring alternate means of ensuring continued tenancy for the current residents of the three

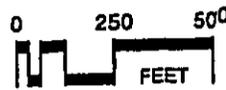


**LEGEND**

- |   |   |
|---|---|
|  Project Area            |  Residential                         |
|  Restricted Agricultural |  Preservation - Military and Federal |

Source: Department of Land Utilization City and County of Honolulu

**FIGURE 6  
ZONING MAP  
VARONA VILLAGE, PHASE II**



August, 1996



plantation villages. A program was developed which provided for the acquisition of the land by the City and County, rehabilitation of existing structures, and the subsequent offer for the purchase of houses and lots to the current residents.

In addition to the rehabilitation of existing villages, the project provided for revitalization of the area with new residential units, development of a district park and other passive community park areas, new recreational and community facilities, a new 18-hole golf course, infrastructure improvements, and a commercial and retail complex. Development controls and guidelines were created to guide the rehabilitation and revitalization efforts, as well as the long term maintenance of the historic character of the area.

Much of the planned additions and improvements have been completed. The development of the remaining area, including the proposed project, is now needed to complete the Ewa Villages Revitalization Project. The remaining area west of Kalo'i Channel is around the existing Varona Village and the development of this area is referred to as the Varona Village Phase II project (which does not include the existing Varona Village).

The Varona Village Phase II Master Plan proposes a land use plan to retain the "plantation" residential character of Varona Village (but it does not include the existing Varona Village) and enhance the cultural resource of the Ewa Villages while providing needed housing in the growing West Oahu region. As a logical completion of the Ewa Villages project, the Master Plan represents compatible uses for an existing and growing urbanized area.

Oahu's major airport, surface transportation, and harbor facilities are all relatively proximate to the property. As a master planned in-fill development, the Varona Village Phase II development will support the shift of Oahu's future population towards West Oahu and Ewa.

As such, the following project objectives have been established for the Varona Village Phase II Master Plan.

Goals and Objectives of the Varona Village Phase II Master Plan

- 1) To develop the Varona Village Phase II property in a manner which addresses the needs of the City and community while maintaining fiscal responsibility.
  - The project must be developed in a fiscally responsible manner.
  - At the same time, the project should address the impacts on its neighboring community and provide social benefits to the community.
  - Varona Village Expansion Area: To provide opportunities for affordable home ownership, especially to existing and past residents and families of Varona Village (and the greater Ewa Villages).

- **Area E:** To create a parcel that would be attractive for market housing development in order to offset the low or non-existent returns from affordable-priced housing
- **Area E:** To utilize golf course frontage (along the existing Ewa Villages Golf Course) by developing desirable golf frontage market lots.
- **Makai Area:** To create an area for public benefit-oriented activities, such as community or youth organizations, YMCA, YWCA, or elderly housing.

The Varona Village Phase II Master Plan is consistent with and supports the General Plan of the City and County of Honolulu, and its vision for future development on the Ewa Plain. The planning and development process has been and continues to be a joint effort of the community, the State of Hawaii, the City & County of Honolulu, area developers, and the Estate of James Campbell.

#### 4.1.4 Project Description

The existing Varona Village is located on the western end of Ewa Villages. The Varona Village Phase II areas are located north, west, and south of the existing Varona Village (but does not include the existing Varona Village) and are divided into three areas referred to as Area E (approximately 25 acres), Varona Village Expansion Area (approximately 27 acres), and Makai Area (approximately 9 acres) (see Figure 4).

Area E is located between the proposed North-South Road and the Ewa Villages Golf Course. It should be noted that the area and boundaries of Area E will not be accurately defined until the North-South Road alignment is finalized. With its golf course frontage, Area E is intended to be developed for market single-family residential and/or up to 252 multi-family residential units.

If developed as single-family residential, units in this project would likely average between 1,200 to 1,400 square feet (SF). The average single-family lot size would be 5,000 SF or 5 units per acre (gross). The estimated sales price of these units would be about \$265,000 to \$500,000 in 1996 dollars. A comparable type of project is Green View Villas, a newly developed single-family subdivision surrounded by the Ewa Villages Golf Course. The sale of housing within Area E will have no City and County imposed restrictions on affordability. No other uses are planned to occur in this area, with the exception of a possible access road to serve the Ewa Villages Golf Course maintenance facility and driving range.

The Varona Village Expansion Area is located immediately north and west of the existing Varona Village (Figure 4). The Varona Village Expansion Area is bounded by the proposed North-South Road, the western boundary of Ewa Villages and the 75-foot wide 138kV Hawaiian Electric Company power line easement, and the OR&L railroad right-of-way. As with Area E, the boundaries of the Varona Village Expansion Area will not be accurately defined until the North-South Road alignment is finalized. Approximately 157 single-family units are planned to be developed in the Varona Village Expansion Area, although many are not currently developable because of restrictions placed by Air Installations Compatible Use Zones (AICUZ) easements in favor of Barbers Point Naval Air Station (scheduled to be closed in 1999). The average size of each house will be approximately 1,000 to 1,100 square feet (SF) on an average lot size of 5,000 SF or

5 units per acre (gross). The approximate sales price of these homes will be about \$175,000 in 1996 dollars. The Varona Village Expansion Area will be comparable to the new housing in Tenney Village, although these latter lots are slightly larger. The sale of housing within the Varona Village Expansion Area will have income qualification restrictions and 10-year buy-back and shared appreciation provisions. Development of the Varona Village Expansion Area is intended to meet the standards to qualify for Hula Mae and FHA financing.

The Makai Area is located south of the existing Varona Village and is bounded by Renton Road, the recently channelized Kaloi Channel, and the OR&L railroad right-of-way. The Makai Area surrounds the Ewa Hongwanji and comprises 9 acres (not including the Hongwanji). This area will be used for community-type facilities and/or residential use. Typically, a community service-type facility such as a YMCA or YWCA would include program, administration and support spaces, a 25-meter pool and parking. What may also be desirable in this area is a gymnasium. Alternative community-type facilities may include facilities to provide service to special needs groups, educational facilities or other community service institutions.

If the Makai Area is developed entirely for residential use, similar to what is proposed for the Varona Village Expansion Area, it would yield approximately 52 single-family units, a gross density of 5.8 units per acre, or 110 multi-family residential units at a gross density of 12 units per acre.

New residents of the Varona Village Expansion Area, Area E and Makai Area (if wholly or partially developed for residential use) developments will be required to join the existing community association who is responsible for the maintenance of common areas. In support of the development, infrastructure facilities to be expanded or improved include access and circulation roadways; bike routes and pedestrian paths; drainage system; and water and wastewater systems.

The proposed uses are summarized in Table 1 below.

**Table 1: Proposed Uses**

<b>Project Areas</b>	<b>Proposed Land Use</b>	<b>Approx. Acreage</b>	<b>Approx. Number of Units</b>
Area E	Residential Multi-family	25	252
Varona Village Expansion Area	Residential Single-family	27	157
Makai Area	Community Facilities and/or Residential Multi-family	9	110
	Total	61	519

The identified project densities are the maximum developable (for conservative analysis in estimating the maximum impact of development).

### Historical Land Uses

Due to decades of former sugar cane cultivation on the property and in the area, no evidence of prehistoric occupation is expected to be found within the subject property. An archaeological survey of the Ewa Villages (including the project area) found no clear evidence of any prehistoric occupation. Traditional sources, such as early maps of the area and early archaeological studies have not documented any archaeological sites in this portion of the Honouliuli ahupua'a.

The Ewa area has been maintained in sugar production and operation for over 110 years, and during those years, numerous events and key characters contributed to the land uses of the region. In 1877, James Campbell, a Scots immigrant, bought 41,000 acres of what was then considered dry ranch land in Ewa from then landowner, John Coney, for the sum of \$95,000. A veteran of the sugar business, Campbell recognized the need for a readily available source of water for sugar to reach full economic potential. Two years later, in 1879, Campbell hired James Ashley to drill for water at Ewa. Ashley's attempts were successful and the first technical problem of the sugar industry was solved, as Ewa's first artesian well flowed for the next 60 years.

The year 1889 was a landmark year in that: 1) Ben Dillingham began leasing lands at Honouliuli from Campbell for \$50,000 per year, for the purposes of large-scale cultivation; 2) Dillingham secured a charter from the Government of Hawaii for the Oahu Railway and Land Company (OR&L), to build Oahu's first railroad; and 3) Dillingham subsequently approached W.R. Castle for his expertise in sugar cultivation. In 1890, with the financial backing from Castle's father, S.N. Castle, and the senior Castle's partner, C.M. Cooke, the Ewa Plantation Company was chartered. Over the next 8 decades, from 1890 to 1971, the plantation underwent many economic and physical transformations, and its overall growth was relatively steady.

### Land Use Summary

The input from the preliminary market analysis prepared for this project (Hallstrom Group, Inc., 1996), shows that a diversity of housing types are in demand (see Appendix B). Therefore, based on the needs expressed by the community and the economic feasibility of potential land uses, the following is the land use program:

<u>Land Use Program</u>	<u>Approx. Acres*</u>
"Affordable" Residential	27
"Market" Residential	25
Community Facilities and/or Affordable Residential	9

*\*The acreages shown here are approximate and are for general planning purposes only.*

The following is an approximate list of major approvals and permits required for the implementation of the Master Plan. From the earliest stages of the planning process, the City has worked with all affected City agencies to obtain their comments and necessary approvals of plans and specifications.

<u>Permit or Approval</u>	<u>Authority</u>
State Land Use District Boundary Amendment	State Land Use Commission
Development Plan Amendment (through DP revisions)	Planning Department/Planning Commission/ City Council/Mayor
201E Exemption	Dept. of Land Utilization, Planning Commission, City Council
Subdivision Approval	Department of Land Utilization
Grading Permit	Department of Public Works
NPDES Permit	Department of Health
Building Permit	Building Department

Construction phasing of the proposed land uses will likely respond to market demand and logical extensions of required infrastructure. Preliminary market indicators project the proposed 252 market-priced units in Area E to be absorbed within 5 years of completion, the 157 affordable units in the Varona Village Expansion Area to be absorbed within 3-4 years of completion, and the 110 affordable units or various community type facilities in the Makai Area to be absorbed within a year of completion. If offered by a single developer, the total sales period could increase marginally due to capital, timing, marketing, and other concerns to a maximum of 5-7 years (refer to Appendix B).

Final determination of land use types, densities, development timetable, and projected costs will be identified during the entitlement review process and as market conditions evolve in the future.

#### 4.1.5 Infrastructure Improvements

Infrastructure improvements required for the Varona Village Phase II Master Plan including roadways, drainage, water, wastewater, electrical, and communication will be funded or arranged for by the City, individual developers, or through joint venture arrangements with the City.

Construction cost estimates for grading and infrastructure found below are based on the three project sites being developed as single family subdivisions. The estimate identifies site preparation and earthwork, and roadway and utilities construction. Site preparation and earthwork includes clearing and grubbing, grading, and temporary dust and erosion control measures. Roadway and utilities construction include costs for roadways and drainage, sewer, water and electrical systems.

<u>Area E</u>	
Site Preparation and Earthwork	\$ 860,000
Roadways	\$ 1,620,000
Storm Drain System	\$ 930,000

Sewer System	\$ 660,000
Water System	\$ 660,000
Electric, Telephone, St. Lighting, & CATV	\$ 1,250,000
Street Trees	\$ 320,000
Buildings (252 units x \$90@SF x 1,300SF)	<u>\$ 29,484,000</u>
Total	\$ 35,784,000
<u>Varona Village Expansion Area</u>	
Site Preparation and Earthwork	\$ 1,330,000
Roadways	\$ 1,600,000
Storm Drain System	\$ 1,720,000
Sewer System	\$ 1,050,000
Water System	\$ 1,100,000
Electric, Telephone, St. Lighting, & CATV	\$ 1,500,000
Street Trees	\$ 500,000
Buildings (157 units x \$85@SF x 1,050SF)	<u>\$ 14,012,250</u>
Total	\$ 22,812,250
<u>Makai Area</u>	
Site Preparation and Earthwork	\$ 510,000
Roadways	\$ 440,000
Storm Drain System	\$ 350,000
Sewer System	\$ 320,000
Water System	\$ 320,000
Electric, Telephone, St. Lighting, & CATV	\$ 410,000
Street Trees	\$ 150,000
Residential Buildings (110 units x \$85@SF x 1,050SF)	<u>\$ 9,817,500</u>
Total	\$ 12,317,500

Preliminary off-site and major on-site infrastructure improvement costs will be determined as comments are received and the plan is finalized.

## 4.2 Economic Characteristics

### 4.2.1 Market

A market study conducted for the project by the Hallstrom Group, Inc. (refer to Appendix B) found that the project areas are appropriate for residential-oriented urban development and are natural in-fill/expansion areas for the Ewa Villages community. The parcels have no other meaningful use potentials apart from urban development. The project sites can support a diversity of residential types that will be competitive in the region in a timely manner, building on existing infrastructure systems, without requiring substantial mitigation efforts or utility development. The Oahu real estate market, generally, and the Ewa/Kapolei area, specifically, have strong long-term growth prospects, and the urbanization of the subject lands is a logical and consistent component of this process.

The absorption of up to 252 market- to upscale-priced homes and condominiums which could be

developed within Area E would require from three to five years to be fully absorbed, dating from the beginning of construction and opening of a presale program in accordance with the development density pursued. The 157 affordable to low market priced homes of the Village Expansion parcel would take three to four years to sell out. The Makai Area parcel, whether developed as directed multi-family units or with a community-oriented institutional use, would achieve full absorption/occupancy within one year of completion. If offered by a single developer, the total sales period for all three project areas could increase marginally due to capital, timing, marketing, and other concerns to a maximum of five to seven years.

Overall, the market study found that there is sufficient market demand to support the proposed Varona Village Phase II project and the sites are highly appropriate for urban development. According to the Hallstrom Group, Inc. the holdings and the planned uses meet the State Land Use redistricting criteria from a market perspective.

#### 4.2.2 Employment

Presently there are no jobs available on the property. The proposed project will generate increased short-term direct and indirect employment during construction.

SMS assessed the economic impact of the project and their findings are appended to this report in their entirety as Appendix C. It is estimated that over the entire three year construction period, about 350 to 400 person-years of direct employment will be created. This translates to an average of about 120 to 130 full-time jobs to be supported each year. However, if the Makai Area is developed for community facilities only, these figures would be a little less. Of those jobs, the large majority will be on-site.

Total construction-related employment, including jobs supported by construction firms' spending and construction workers' spending is in the range of 1,170 to 1,300 jobs (over the entire construction period).

Little new employment will be generated on-site, unless the Makai Area is developed for community facilities only. Employment at the community facility is estimated, based on organizations such as YWCAs or YMCAs, as beginning at about 20 full-time jobs and growing over time to about 25 full-time jobs. (Those figures include many part-time jobs added together.) Exhibit 4 in Appendix C shows direct jobs as ranging from 16 (if the Makai Area is developed as residential only), to 37 (if the Makai Area is developed for community facilities only), after buildout. Total jobs, including indirect and induced jobs associated with the project come to 25 to 55 jobs for the two scenarios. These are long-term jobs, unlike the construction jobs discussed above.

#### 4.2.3 Incomes

Direct construction workers will earn some \$7 million to \$9 million in the year 2000, the peak development year. Total project-related workers' incomes will rise to a total of \$18 million to \$23 million in that year, but stabilize after construction at about \$1 million (refer to Appendix C).

#### 4.2.4 Fiscal

Presently, no significant revenues to the City or State are generated from the site due to the undeveloped nature of the project area.

The implementation of the Varona Village Phase II Master Plan, would dramatically increase assessed land valuations above those currently collected by the City. The new revenues associated with project development are calculated in Exhibits 9 and 10 in Appendix C. Costs to the developer have been estimated at \$17,600,000. Impacts of new development at the site on the cost of providing other government services (e.g., road work) are expected to be minimal or nil.

Increases in Hawaii State revenues as a result of construction of the project are estimated to be a \$4.5 million gain in revenues over the construction period. Inasmuch as this does not include any gain in revenues associated with new operations on-site, it is a conservative estimate.

Once the subject property is privately owned and assessed, it would be subject to real property tax. Increase in property tax revenues associated with project development is estimated in Exhibit 10 of Appendix C. Taxes on residential development will amount to some \$300,000 (if the Makai Area is developed for community facilities) to \$350,000 annually at buildout. After the buy back period ends, the annual tax yield could grow to \$350,000 to \$400,000 (1995 dollars). The cumulative increase in tax revenues would be more than \$700,000 by Fiscal Year 2002. By the year 2010, the cumulative increase in property tax revenues associated with the project would amount to \$3.1 million to \$3.6 million.

### 4.3 Social Characteristics

#### 4.3.1 Housing

According to the 1970 to 1990 census figures, household size on Oahu is approximately three persons per unit. With a growing population, overcrowding of existing housing, and relatively low production of new housing, the demand for housing construction will likely continue to grow in the future.

With a small permanent workforce, the project will not generate significant amounts of new housing demand. Exhibit 7 in Appendix C shows the housing demand associated with project jobs, and Exhibit 8 in turn shows the difference between housing production and the total demand for housing on the part of project-related operations workers. If the Makai Area is developed as residential only, some 519 units would be built, while project related workforce housing demand would amount to only some 13 or 14 units, leaving a surplus of more than 500 units. If the Makai Area is developed for community facilities only, the result would be fewer units and more operations jobs and the surplus would be about 375 housing units.

The social implications of a housing shortfall are usually expressed in crowding from multi-generational households, out-migration, stress on families, and often the need for individuals to work at two jobs to pay for higher housing costs.

#### 4.3.2 Property Values of Existing Homes

According to the Real Property Tax Assessment Office, assessments are primarily based upon two broad factors: 1) the "neighborhood" in which the land is located; and 2) the fair market value of the land. Depending on the value of surrounding homes, development on adjacent properties may have a positive effect over time on surrounding land values relative to the existing vacant land uses.

#### 4.3.3 Population

The urbanization of the subject property will add to the residential population of the Ewa District. Residential population of the Varona Village Phase II area will grow to about 1,350 to 1,650 persons. As these are expected to be island residents, not newcomers to Oahu, the actual population impact on the City and County is nil. However, by locating residents in new homes, the project will address the twin problems of limited housing supply and high housing prices that have affected Oahu residents.

The General Plan population distribution policy (Population Objective B, Policy 4) sets forth the desired percentage range allocation among the eight Development Plan areas. By this policy, Ewa and Central Oahu combined are expected to absorb approximately 55 percent of the island wide population growth between 1990 and 2010. Ewa alone is expected to accommodate nearly one-third of the island's population growth during this period.

The General Plan population distribution policy can be compared to a forecast of the expected population level for each area, using the State of Hawaii's M-K series population projection for 2010. The forecast, which is prepared by the City and County of Honolulu Planning Department based on a set of simulation models referred to collectively as the Land Use Model, involves the detailed identification of projects that may result in additional visitor units, housing units or employment within the framework of the Development Plans, based on past performance and extrapolation of probable trends. When the population forecast for an area is lower than the distribution policy range, it indicates that the capacity for new housing, in terms of vacant land designated for residential development, is not being developed at the rate that was expected. The converse is true for areas where the forecast exceeds the population policy range.

While the forecast for most of Oahu's Development Plan areas falls within or close to the desired range for that area, population growth is expected to outpace the distribution policy for Central Oahu and underachieve the policy for Ewa, as shown below:

Area	2010 Population	
	Forecast	General Plan Population Distribution Policy
Ewa	93,112	119,000 - 132,900
Central Oahu	169,815	148,900 - 164,900

As in Central Oahu, the forecasted 2010 populations of the Koolauloa, North Shore and Waianae Development Plan areas exceed the General Plan distribution policy range for those areas. While this discrepancy has implications for the "slow growth" policy for these rural areas, the gap between the population policy and forecast for Central Oahu has much greater significance because of both the relative and absolute numbers involved and the stated General Plan policy of directed growth toward Ewa. This suggests that the General Plan population distribution policy cannot be achieved solely by designating a sufficient supply of land on which to develop housing. Complementary policies and actions are necessary if this population distribution policy is to be realized.

Even with a forecasted population that is lower than the General Plan distribution policy for the area, Ewa's population is expected to more than double by 2010, a much higher rate of growth than for Central Oahu or any other Development Plan area. The average household size in the region has been trending downward in recent years, as it has on the island as a whole, although households are significantly larger in both areas than throughout the island. This reflects the essentially suburban character of the region, with a relatively high proportion of households with children.

#### **4.4 Cultural Characteristics**

During the agricultural period, the area was extensively modified and altered from its natural condition. As such, the property does not contain plants or animals of traditional Hawaiian gathering value, and is not currently used for cultural or religious practices. Additionally, the site does not contain significant cultural remains or resources. However, the project site is adjacent to historic sites. The OR&L Railway and Land Company Right-of-Way is listed on the National Register of Historic Places. Ewa Plantation Villages has been determined eligible for the National Register and is listed on the Hawaii Register (1996), and has been submitted as a National Historic Landmark (1996). The boundaries of the Ewa Plantation Villages Historic District are shown on Figure 4. The State Historic Preservation Division (SHPD) has confirmed that the proposed Varona Villages Phase II project is adjacent to and not part of the Ewa Plantation Villages Historic District. SHPD believes that the development of the residential area will have "no effect" on the character of the Ewa Plantation Villages Historic District. In accordance with Section 6E-8, HRS, the applicant is continuing its ongoing consultations with SHPD.

#### **4.5 Environmental Characteristics**

In general, the subject property is not located in an environmentally sensitive zone such as a tsunami zone, erosion prone area, geologically hazardous land, estuary, potable groundwater recharge area, coastal water, or area of sensitive flora and fauna habitat.

The primary environmental characteristics of concern is drainage and the impact typically associated with new urban development on lands near existing residential development. During construction, mitigation measures will be necessary to reduce air and noise impacts. New structures will be designed to be compatible with the character of the surrounding historical residential community.

#### 4.5.1 Aesthetics

The Varona Village Phase II Master Plan will be designed to integrate the proposed land uses into the established Ewa Villages community by organizing strong interrelationships with existing land forms and land use patterns. Opportunities exist for the enhancement of visual resources and transitions between land uses with contrasting densities. The exterior design of the development will be guided by the City to ensure appropriate theme, materials, color, site design standards, and landscaping, appropriate for the historical uses associated with the rest of Ewa Villages.

#### 4.5.2 Traffic

The traffic impacts of the proposed project were studied by Parsons Brinckerhoff Quade & Douglas, and their study is attached to this report in its entirety as Appendix D.

##### Existing Conditions

*Renton Road.* Access to Varona Village is provided by Renton Road which connects to Fort Weaver Road as a four-legged signalized intersection. Renton Road has been improved as part of the Ewa Villages project and is a four-lane divided roadway with curb, gutter and sidewalks in both directions, from Fort Weaver Road to Pahika Street. From Pahika Street to the bridge crossing Kaloi Channel, Renton Road continues as a two-lane divided roadway with curb, gutter and sidewalks in both directions. From the bridge over Kaloi Channel to its termination at the existing Varona Village, Renton Road is an undivided two-lane roadway that is poorly paved with unpaved shoulders. The posted speed limit on Renton Road is 25 miles per hour.

*Fort Weaver Road.* Fort Weaver Road is a major arterial which provides regional access to the Ewa area. Fort Weaver Road connects to Farrington Highway at a grade-separated interchange. North of Farrington Highway, Fort Weaver Road becomes Kunia Road which connects to Interstate H-1 at the Kunia Interchange. Fort Weaver Road runs generally in a north south direction from Farrington Highway to North Road in Ewa Beach town where it turns east and continues parallel to the beach until its terminus at Ewa Beach park. Fort Weaver Road is a four-lane divided roadway from Farrington Highway to the intersection with Hanakahi Street in Ewa Beach town. From Hanakahi Street to just east of Kilaha Street, Fort Weaver Road continues as a four-lane undivided road. East of Kilaha Street, Fort Weaver is a two-lane undivided road. The posted speed limit on Fort Weaver Road in the vicinity of Renton Road is 45 miles per hour.

*Park Row.* Park Row is a collector road which provides an access onto Renton Road for the Greenview Villas subdivision, golf course, and clubhouse, and Tenney and Renton Villages. Park Row connects to Renton Road as a four-legged, unsignalized intersection. The Park Row approaches are stop-sign controlled. The southern Park Row leg is currently used only by construction traffic and traffic from existing tenants of the mill area.

Manual traffic counts were conducted on May 14 and 15, 1996 during the commuter peak periods of 5:30 AM to 7:30 AM and 4:15 PM to 6:30 PM. A 24-hour count using a pneumatic tube counter was also conducted on Renton Road at the Kaloi Channel bridge from 4:00 PM May 14, 1996 to

4:00 PM May 15, 1996. The count data is included in Appendix D. The counts indicate that the morning peak hour occurs between 6:30 and 7:30 AM and the afternoon peak hour occurs between 5:15 and 6:15 PM. Observations of substantial construction traffic were also made during the counts. The existing peak hour turning movements are shown in Figure 3 in Appendix D.

The intersection of Renton Road and Park Row was chosen for analysis since it is anticipated to become a significant intersection near the Varona Village Phase II development.

Operating conditions at an intersection are expressed as a qualitative index known as Level of Service (LOS) with letter designations ranging from A through F, with LOS A representing free-flow operating conditions and LOS F representing over-capacity conditions. Levels of Service for unsignalized intersections are evaluated for specific movements at the intersection (all movements of the minor street approaches and the left turns of the major street approaches), while the Level of Service for signalized intersections are evaluated for overall intersection operations. Level of Service criteria and the analysis worksheets are included in Appendix D.

The analysis results indicate that all movements operate very well, with little delays (LOS A) during the peak hours.

In sum, the existing intersection of Renton Road and Park Row currently operate very well (LOS A) even with the presence of construction traffic which will be eliminated when the development is completed. Existing lane configuration and level of service is shown in Appendix D.

#### Base Year 2005 Without the Project

Base year 2005 represents future year conditions **without** the project traffic. This scenario provides a base condition which will be compared to the future year 2005 **with** project traffic scenario described in the following section. This comparison is used to determine the relative traffic impacts of the proposed development. The year 2005 was selected as the comparison year because it represents a future year that will encompass a completed and occupied project.

The base year condition assumes the completion of the North-South Road, which starts from an interchange connection onto the H-1 freeway approximately midway between the Kunia and Makakilo interchanges and extends south to the proposed Ewa Marina development near Ewa Beach, by the year 2005. Along the way, the North-South Road meanders through the Varona Village Phase II, Ewa Villages, and Ewa Gentry developments. This assumption is based on the schedule for the North-South Road Corridor Major Investment Study (MIS) which is currently being conducted by the City and County of Honolulu Department of Transportation Services.

Base year conditions account for growth in traffic due to new developments in the area by year 2005. The development of the traffic volume forecasts for base year conditions incorporated preliminary forecasts from the North-South Road Corridor Study and estimating trips from developments along Park Row.

Base year conditions were based on preliminary travel demand model forecasts for the North-South

Road Corridor Study. The forecasts were primarily used to estimate traffic volumes on North-South Road in the vicinity of the project. The horizon year for the North-South Road study model is year 2020, and these forecasts were, therefore, multiplied by a factor of 80% to estimate year 2005 traffic volumes. Parsons Brinckerhoff Quade & Douglas has estimated that approximately 80% of the land use development in the project area, assumed in the year 2020 forecasts, will be completed by year 2005 based on developers' absorption schedules.

Traffic volumes were also estimated for the developments anticipated along Park Row that would be completed by year 2005. These projects included the Green View Villas subdivision, Ewa Villages golf course, and portions of Tenney and Renton Villages.

The project year 2005 traffic volumes are expected to be very conservative for the following reasons: an 80% buildout of development in the area is probably an optimistic schedule, the addition of traffic from other developments to the North-South Road forecasts results in a "double counting" of traffic volumes since the North-South road forecasts should include the other development trips.

*North-South Road and Renton Road Intersection.* The analysis results indicate that the projected traffic volumes at the intersection will meet the peak hour traffic signal warrant (Warrant 11) outlined in the *Manual on Uniform Traffic Control Devices (MUTCD)* by year 2005. As a signalized intersection, the overall intersection will operate acceptably (LOS C and D) during the morning and afternoon peak hours.

*Renton Road and Park Row Intersection.* The analysis results indicate that the projected traffic volumes at the intersection will also meet the peak hour traffic signal warrant (Warrant 11). As a signalized intersection, it is expected to operate well (LOS C) during the morning and afternoon peak hours.

*Summary of Conditions Without the Project.* The analysis results reveal that the intersections of North-South Road with Renton Road and Renton Road with Park Row will operate acceptably as signalized intersections in year 2005 without the project. The future year 2005 traffic volumes without the project and the corresponding lane configuration and levels of service are shown in Figures 5 and 6 of Appendix D.

#### Future Year 2005 With the Project

Future year 2005 conditions with project traffic is estimated by adding trips generated by the proposed project onto the base year 2005 scenario described in the previous section to determine the relative impact of the development. With the project, three new intersections will be added with project accesses onto the North-South Road (for Area E) and Renton Road (for the Varona Village Expansion Area and Makai Area).

Trip generation estimates the number of vehicular trips that a project generates. To estimate trips generated by the proposed development, trip generation rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation, Fifth Edition* were used. The trip generation is summarized in Table 2.

**Table 2: Trip Generation**

LAND USE	QUANT.	UNIT	AM PEAK HOUR				PM PEAK HOUR			
			RATE	TRIPS (VPH)	IN	OUT	RATE	TRIPS (VPH)	IN	OUT
Area E multi-family	210	units	0.44	92	16	76	0.55	116	77	39
single-family	42	units	0.74	31	8	23	1.01	42	27	15
Varona Village Expansion Area single family	157	units	0.74	116	30	86	1.01	159	103	56
Makai Area multi-family	110	units	0.44	48	8	40	0.55	61	40	21
<b>TOTAL</b>	<b>519</b>	<b>units</b>		<b>287</b>	<b>62</b>	<b>225</b>		<b>378</b>	<b>247</b>	<b>131</b>

Note: VPH = vehicles per hour  
RATE = vehicular trips per hour per unit

Trip distribution estimates where trips generated by the project originate from and are destined to. Trip distribution of the project traffic is based on traffic counts taken at the intersection of Fort Weaver Road and Kolowaka Drive in year 1992 which yielded a distribution of 75% to/from the north (H-1 freeway and Farrington Highway) and 25% to/from the south (Ewa Beach, Iroquois Point). This count was used because it was the only access for a residential community (Ewa by Gentry) and would therefore be representative of the distribution of this project's traffic.

Traffic assignment is the process that estimates which particular roadways project generated traffic are expected to use. Traffic assignment is based on the most probable route to a destination or from an origin.

The project generated traffic was primarily assigned to the North-South Road due to its proximity to the project. A small percentage of the project traffic was assigned to Fort Weaver Road via Renton Road to account for school related trips and a portion of trips to/from Central Oahu. Figure 7 of Appendix D shows the project generated traffic assignment. The project generated traffic was added to the base year 2005 traffic volumes to determine the future year 2005 with project traffic volumes. These volumes are shown in Figure 8 of Appendix D.

*North-South Road and Renton Road Intersection.* The analysis results indicate that the intersection will operate acceptably, at the same level of service as the without project case, (LOS C and D) during the morning and afternoon peak hours.

*Renton Road and Park Row Intersection.* The analysis results indicate that the intersection will

operate well, at the same level of service as the without project case, (LOS C) during the morning and afternoon peak hours.

*North-South Road and Area E.* The analysis results indicate that the projected traffic volumes at the intersection will meet the peak hour traffic signal warrant (Warrant 11) outlined in the MUTCD by year 2005. As a signalized intersection, the overall intersection will operate well, (LOS B) during the morning and afternoon peak hours.

*Renton Road and Varona Village Expansion Area Access Intersection.* The results of the analysis indicate that the intersection will operate very well, with little or no delays, (LOS A) for all approaches as an unsignalized intersection during both peak hours.

*Renton Road and Makai Area Access Intersection.* The results of the analysis indicate that the intersection will operate very well, with little or no delays, (LOS A) for all approaches as an unsignalized intersection during both peak hours.

*Summary of Conditions With the Project.* The analysis results reveal that the intersections of the North-South Road with Renton Road and Renton Road with Park Row will operate at the same level of service with the project as without the project in year 2005. The intersections of the project accesses onto the North-South Road and Renton Road are also expected to operate very well (LOS A and B). The levels of service for future conditions with the project along with the lane configurations are shown in Figure 9 of Appendix D. A comparison of levels of service for existing, base year, and future year with project conditions are summarized in Table 3.

**Table 3: Level of Service Summary**

Intersection	Existing		Future Year 2005 Without Project		Future Year 2005 Without Project	
	AM	PM	AM	PM	AM	PM
Renton Rd. and Park Row						
Renton Rd. EB L	A	A	n/a	n/a	n/a	n/a
Renton Rd. WB L	A	A	n/a	n/a	n/a	n/a
Park Row NB LTR	A	A	n/a	n/a	n/a	n/a
Park Row SB L	A	A	n/a	n/a	n/a	n/a
Park Row SB T	A	A	n/a	n/a	n/a	n/a
Park Row SB R	A	A	n/a	n/a	n/a	n/a
overall intersection (signalized)	n/a	n/a	C	C	C	C
North-South Rd. and Renton Rd overall intersection (signalized)	n/a	n/a	C	D	C	D

	Existing		Future Year 2005 Without Project		Future Year 2005 Without Project	
North-South Rd. and Area E Access overall intersection (signalized)	n/a	n/a	n/a	n/a	B	B
Renton Rd. and Varona Vill. Exp. Area Access Renton Rd. EB L/T Acc. Rd. SB L/R	n/a n/a	n/a n/a	n/a n/a	n/a n/a	A A	A A
Renton Rd. and Makai Area Access Renton Rd. WB L/T Acc. Rd. NB L/R	n/a n/a	n/a n/a	n/a n/a	n/a n/a	A A	A A
NB - northbound    WB - westbound    L - left turn    R - right turn SB - southbound    EB - eastbound    T - through    n/a - not applicable						

Overall, traffic due to the Varona Village Phase II project will have a small impact to traffic operations at the adjacent intersections. The vehicular traffic generated by the project is expected to comprise less than 3% of the forecasted traffic along Renton Road east of the North-South Road, and less than 5% of the forecasted traffic along the North-South Road north of Renton Road. The anticipated levels of service with the project will be the same as the levels of service without the project.

**Recommendations**

**Renton Road Intersections.** The intersections of the North-South Road with Renton Road and Renton Road with Park Row are projected to meet traffic signal warrants even without the project. These intersections should be monitored for signalization as the North-South Road and its interchange with the H-1 freeway are completed and the Ewa and Kapolei areas develop further. The North-South Road will be a major north/south arterial and its intersection with Renton Road is anticipated to be a major intersection. Based on the traffic projections, provisions for a six-lane divided roadway, with double left-turn lanes should be planned for the North-South Road. Provisions for separate left and right turn lanes should be planned for the Renton Road eastbound approach. The westbound approach is recommended to be configured with a separate left-turn lane, a shared through/right-turn lane, and an exclusive right-turn lane. The double right-turn lanes are needed to handle the large projected westbound to northbound right-turn movement at this intersection.

At this time, it appears difficult to provide the proper number of receiving lanes on eastbound Renton Road to accommodate the proposed double left-turn lanes from the southbound North-South Road. Because the traffic projections used in this study are being reviewed in light of the relocation

of the University of Hawaii West Oahu Campus site, it is recommended that a single southbound to eastbound left-turn lane be implemented for now. The intersection should be monitored, and if necessary, modifications to the eastbound Renton Road be made in the future.

*Varona Village Expansion and Makai Areas.* The Varona Village Expansion Area and Makai Area accesses onto Renton Road will operate very well as single lane, stop-sign controlled approaches. Since Renton Road will be terminated at the Varona Village Phase II development, the existing 56-foot right-of-way (ROW) will be adequate to accommodate the traffic along Renton Road.

*Area E Intersection.* It is also projected that the access to Area E/North-South Road intersection will warrant signalization in the future. The intersection should be monitored and signalized when warranted. In the interim, prior to signalization, the following are recommended: provide a median left-turn lane within the North-South Road at the Area E access intersection, and install conduits and pullboxes in anticipation of the future traffic signal. DHCD will coordinate with the State Department of Transportation and the Department of Transportation Services on the above improvements.

In general, a 201E exemption will allow the roads to be of a non-standard design with surface flow directed toward drain inlets aligned along the middle of the road instead of the standard crowned design. This non-standard design, which also does not incorporate the use of curbs, will help maintain the rural historic character of Varona Village and will match the road design of the Tenney Village project.

#### 4.5.3 Water Quality

According to the State Department of Health, the areas of application are located above the State's Underground Injection Control line similar to most of the recent and planned development on the Ewa Plain. As such, the underlying groundwater could be considered as a potential source of potable water.

Surface water quality will be maintained through a program of soil erosion control measures and implementation of best management practices during project construction.

## 5.0 SUMMARY DESCRIPTION OF THE AFFECTED ENVIRONMENT

### 5.1 Climate

The most representative long-term wind data available for the subject property are collected at the Barbers Point Naval Air Station (BPNAS), located southwest of the subject property. Wind frequency data for BPNAS show the annual prevailing wind direction for this area of Oahu is east northeast. The climate of the subject property is constant and relatively dry, with prevailing winds blowing from the northeast about 40 percent of the time, at approximately 10 knots (12 miles per hour). Winds from the south are infrequent occurring only a few days during the year and mostly in winter in association with Kona storms. According to the University of Hawaii Environmental

Center, the climate is further affected by land and sea breezes. These wind patterns affect the potential for salt spray and smoke drift. The Ewa Plain experiences light rainfall of about 23 inches per year, most of which occurs between the months of November and April.

Based on more than 50 years of data collected at Ewa Plantation, average annual daily minimum and maximum temperatures in the subject property are 65°F and 85°F, respectively. The extreme minimum temperature on record is 47°F, and the extreme maximum is 93°F. According to the Environmental Center, as paved surfaces replace former sugarcane land and evaporation rates fall, air temperatures will rise.

The average annual rainfall of the area is less than 30 inches. Monthly rainfall measured at the nearest rain gauge station, which is in Waipahu, generally ranges between 2 to 5 inches. Average monthly temperature ranges from 60 to 90 degrees Fahrenheit<sup>1</sup>. As noted by the Environmental Center, the area's high evaporation rate may affect the potential water need for lawns and landscaping (for the relatively small lots) and pools (possibly in a community facility in the Makai Area).

## 5.2 Geology/Topography

The island of Oahu is of volcanic origin and is characterized by underlying basaltic flows. The Ewa Plain is an emerged coral reef formed during the Pleistocene Period when the ocean level was at a higher elevation. For the most part, the Ewa Plain is flat with a few isolated bluffs eroded by Honouliuli Stream. It is underlain by calcareous material which has been modified over the millennia so that it is hard but extremely permeable.

In general, the Ewa Plain above an elevation of approximately 100 feet below mean sea level consists of caprock comprising sedimentary deposits that form a wedge which retards the seaward movement of fresh groundwater from the inland basaltic aquifer. At higher elevations the ground surface is made of alluvium and sedimentary deposits washed downslope over the millennia.

Area E was previously graded during construction of the Ewa Villages Golf Course. The site slopes slightly, with an elevation of about 60 feet at the golf course maintenance facility (western boundary) to approximately 54 feet at the eastern tip.

The Varona Village Expansion Area also slopes slightly in a west to east direction. Elevations range from about 54 feet at the western corner fronting the proposed North-South Road to about 45 feet at the eastern boundary with the existing Varona Village.

Topographic elevations within the Makai Area extend from 48 feet at the western corner to about 41 feet at the eastern end, fronting Kalo Channel.

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<sup>1</sup> University of Hawaii, Department of Geography, *Atlas of Hawaii*, Second Edition, Honolulu: University of Hawaii Press, 1983

### 5.3 Soils

There have been three soil suitability studies prepared for Hawaii whose principal focus has been on describing the physical attributes of soils for development and the relative agricultural productivity. These three soil suitability studies are: the Detailed Land Classification, the Soil Conservation Service Soil Survey, and the Agricultural Lands of Importance to the State of Hawaii.

#### 5.3.1 Detailed Land Classification

The *Detailed Land Classification* (1965 through 1972) series was produced by the Land Study Bureau (LSB) of the University of Hawaii for each island. This series of reports were produced with the intention of developing a land inventory and productivity evaluation based on statewide "standards" of crop yields and levels of management.

The LSB land classification is a synthesis of the information found in the 1955 Soil Survey for the Territory of Hawaii as well as several other sources for data on geology, topography, climate, water resources and crops. The LSB classification system groups lands into homogeneous units called Land Types, describes their condition and environment, delineates the areas on aerial photo base maps, rates the lands on their overall quality (productivity) in relation to other land, and appraises their performance under selected alternative agricultural crops. A five-class productivity rating is applied using the letters A, B, C, D and E, with A representing the class of highest productivity and E the lowest. The productivity evaluations were based on statewide standards of crop yields and levels of management at the time the classification was made.

The non-urban soils on the project areas are rated "A" and "B" which reflects its past use for sugar cultivation under irrigated conditions (refer to Figure 7).

#### 5.3.2 Soil Conservation Service Soil Survey

The Soil Conservation Service Report of 1972<sup>2</sup> series for each island was prepared by the U.S. Department of Agriculture Soil Conservation Service (SCS) and the University of Hawaii Agricultural Experiment Station. These reports are patterned after a soil classification procedure adapted for nationwide, uniform application. Soil types are ranked according to their suitability for most kinds of crops and characteristics applicable to development.

The soils on site are either classified as of the Honouliuli Series or the Mamala Series (refer to Figure 8). Both of these series consist of well-drained soil on coastal plains. The Honouliuli Series developed in alluvium derived from basic igneous material. Mamala Series formed in alluvium deposited over coral limestone and consolidated calcareous sand. Both are characterized as nearly level to moderately sloping.

They are nearly level and gently sloping. Permeability is moderately slow (Honouliuli Clay, 0 to

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<sup>2</sup>

U.S. Department of Agriculture, Soil Conservation Service and University of Hawaii, *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai*, State of Hawaii, August 1972



**LEGEND**

 Project Area

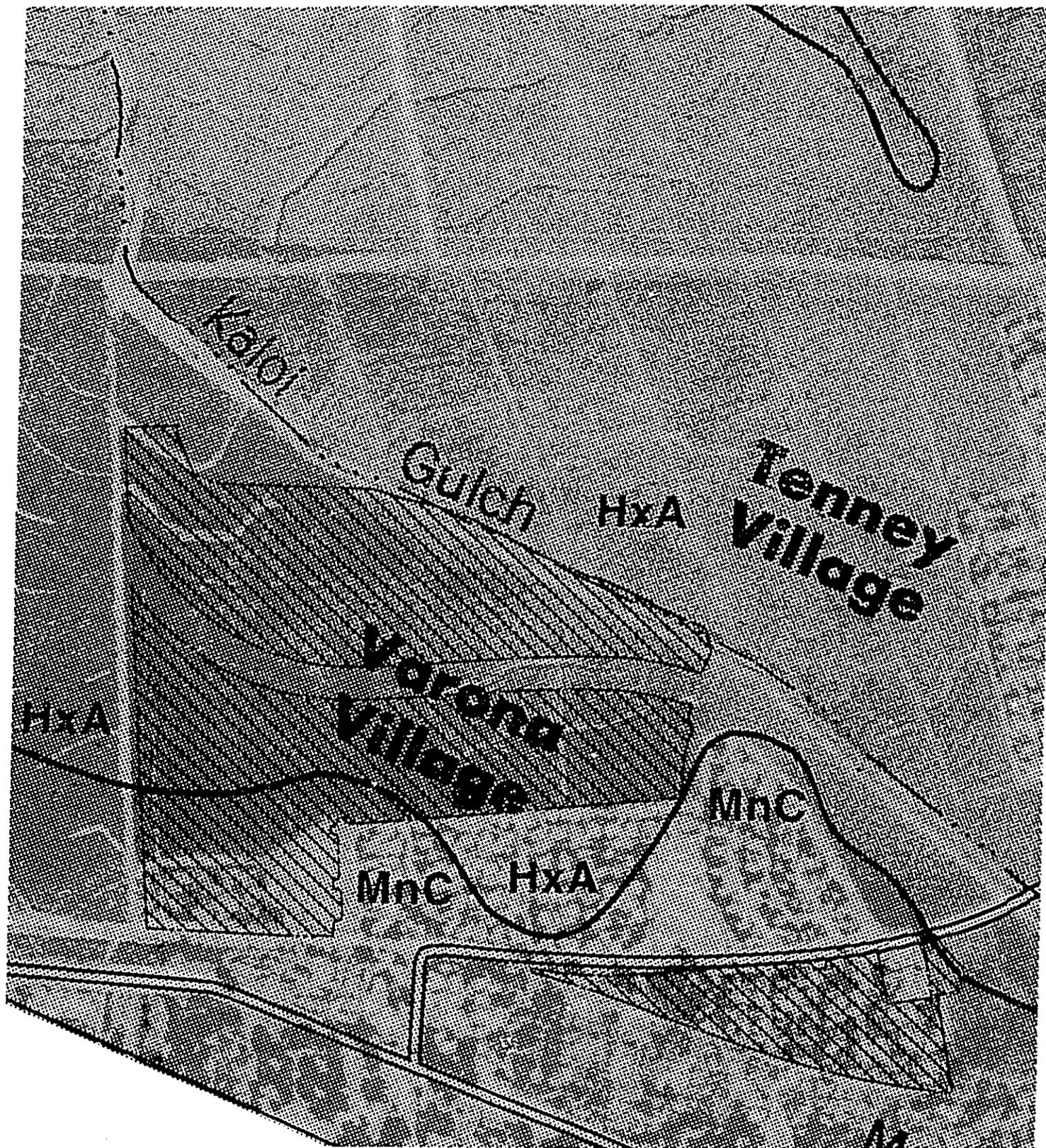
Source: Land Study Bureau, University of Hawaii - State of Hawaii,  
December 1972

**FIGURE 7**  
**LSB DETAILED LAND**  
**CLASSIFICATIONS**  
**VARONA VILLAGE, PHASE II**

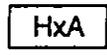
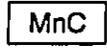


August, 1996



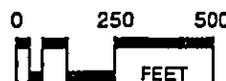


**LEGEND**

-  Project Area
-  HxA Honouliuli Stony silty clay, 0 to 2 % slopes
-  MnC Mamala Stony silty clay, 0 to 12 % slopes

Source: US Department of Agriculture Soil Conservation Service/  
The University of Hawaii Agricultural Experiment Station

**FIGURE 8**  
**US SOIL CONSERVATION SERVICE**  
**SOIL SURVEY**  
**VARONA VILLAGE, PHASE II**



August, 1998



2 percent slopes [HxA], capability classification I if irrigated) and the erosion hazard is no more than slight. Honouliuli soils are geographically associated with Mamala (Mamala Stony Silty Clay Loam, 0 to 12 percent slopes [MnC], capability classification IIIs if irrigated) soils which are also found within the subject property. The erosion hazard for the Mamala series is slight to moderate.

In terms of capability classifications, Class I soils have few limitations that restrict their use; Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices; and Class III soils have severe limitations that reduce the choice of plants, require special conservation practices or both.

### 5.3.3 Agricultural Lands of Importance to the State of Hawaii

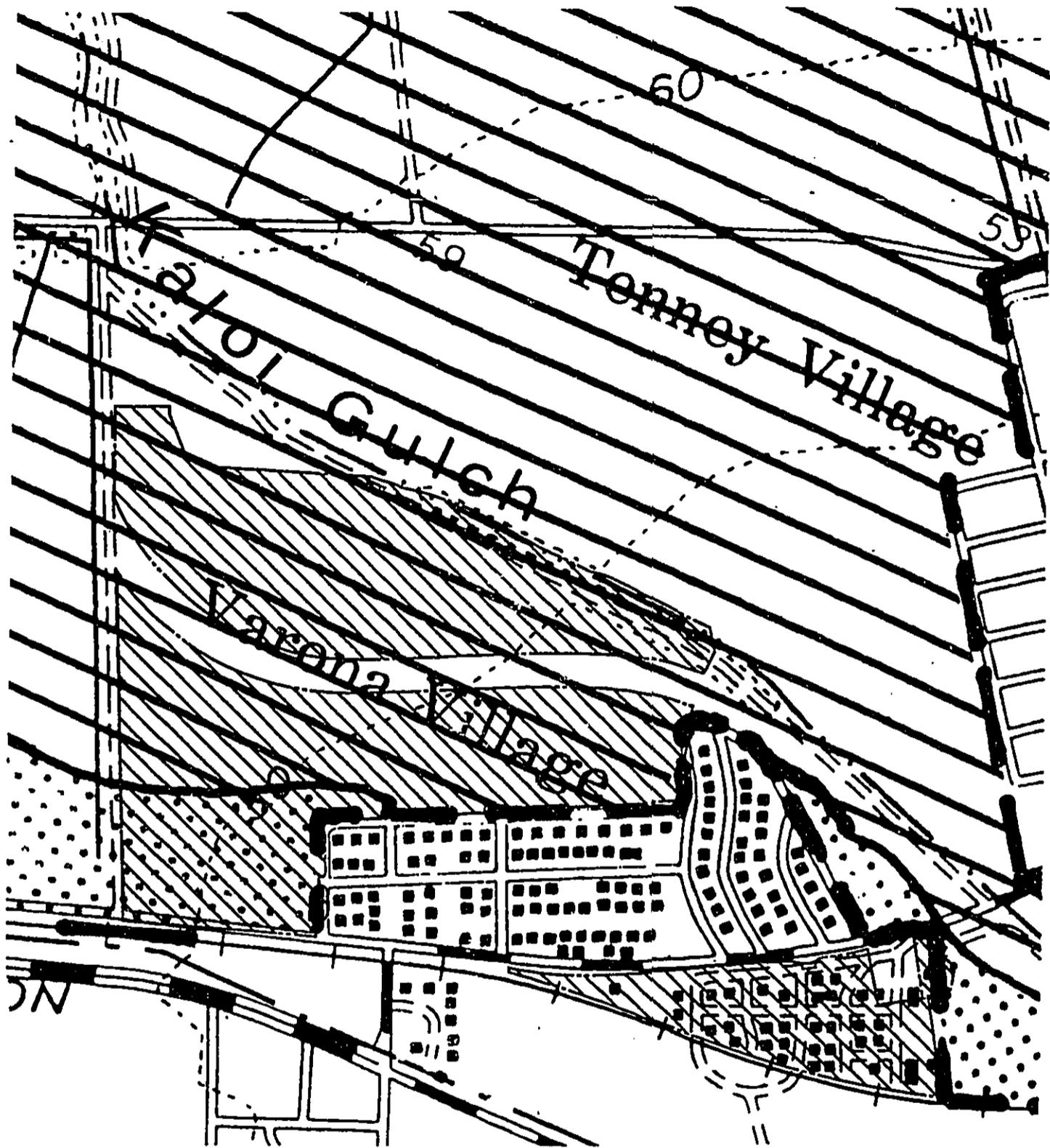
The *Agricultural Lands of Importance to the State of Hawaii* (ALISH) (1977) system was also prepared for the entire state, based on criteria established by the Soil Conservation Service. *Prime Agricultural Land* is defined as "...land best suited for the production of food, feed, forage, and fiber crops." Two other classes of land used by the ALISH system are *Unique Agricultural Land* and *Other Important Agricultural Land*. Both describe successively less productive soils. As shown on Figure 9, most of the Varona Village Expansion Area is designated as Prime Agricultural Land. A small portion is designated Other Important Agricultural Land. Area E is all designated as Prime Agricultural Land, while Makai Area has one small portion designated as Other Important Agricultural Land.

### 5.3.4 Grading and Soil Erosion

The impact of grading and potential soil erosion was studied by Engineering Concepts, Inc. Their study is attached to this report as Appendix E.

Grading within the three project sites will be required to provide pads for houses that facilitate drainage to the roadways. It appears that most of Area E has been mass graded as part of the golf course construction, however, additional grading for the roadways and house pads will be required. The Varona Village Expansion Area remains in a natural state, requiring mass and fine grading to accommodate roadways and house pads. This is also true for the Makai Area, a very small portion of which remains in the flood plain adjacent to temporary Basin No. 13. It is anticipated that additional grading of the Makai Area will be required to build up the low lying areas to allow for removal of this area from the floodplain. All grading operations will be in conformance with the applicable ordinances of the City and County of Honolulu and all construction activities must comply with the provisions of Chapter 11-60.1, Hawaii Administrative Rules, section 11-60.1-33 on Fugitive Dust.

The U.S. Department of Agriculture, Soil Conservation Service uses the Universal Soil Loss Equation (USLE) to estimate long term average annual soil erosion losses from sheet and rill erosion. It is used to estimate erosion on forest land, farm fields, construction/development sites, and other areas. Soil losses can be estimated for present conditions or for a future condition. The calculated soil loss under existing conditions for the project area is 92.4 tons/year. This breaks down to 43.0 tons/year for Area E, 34.3 tons/year for Expansion Area, and 15.1 tons/year for Makai Area



**LEGEND**

-  Project Area
-  Prime Agricultural Lands
-  Other Important Agricultural lands
-  Urban

Source: Department of Agriculture-State of Hawaii, January 1977

**FIGURE 9**  
**AGRICULTURAL LANDS OF**  
**IMPORTANCE TO STATE OF HAWAII**  
**VARONA VILLAGE, PHASE II**



August, 1998 

(see Appendix E for more detail).

### Impacts and Recommendations

Estimated soil loss under developed conditions for the three areas is expected to decrease from existing conditions. Soil erosion potential under developed conditions are estimated to be 4.6 tons/year. This breaks down to 2.0 tons/year for Area E, 1.6 tons/year for Expansion Area, and 1.0 ton/year for Makai Area. (see Appendix E for the soil loss equation and calculations).

Based on the USLE, soil erosion potential at the project sites should decrease substantially after development of the proposed residential improvements. This decrease in soil erosion is attributed to the reduction of erodible surfaces (increase in buildings and pavement), reduction of length and slope of overland flow due to site grading and construction of an underground storm drainage system, and increase in landscaped area (reduction of bare ground).

The construction of the proposed project will involve temporary land disturbing activities that result in soil erosion. These land disturbing activities include removal of existing vegetation (clearing and grubbing) and leveling, removing and replacing soil.

Mitigation measures can be implemented to reduce short-term soil erosion. For example, limiting grading to not more than fifteen contiguous acres at a time and seeding half of the area can reduce short-term erosion potential by almost 50 percent.

Additional erosion control measures would lessen construction impacts even further. These are:

1. Minimize time of construction.
2. Retain existing ground cover until the latest date before construction.
3. Early construction of drainage control features.
4. Use of temporary sprinklers in nonactive construction areas when ground cover is removed.
5. Station water truck on site during construction period to provide for immediate sprinkling, as needed, in active construction zones (weekends and holidays included).
6. Use temporary berms and cut-off ditches, where needed, for control of erosion.
7. Thorough watering of graded areas after construction activity has ceased for the day and on weekends.
8. Sod or plant all cut and fill slopes immediately after grading work has been completed.

Grading and erosion control plans for the project sites will be prepared in compliance with Chapter 23, Revised Ordinances of Honolulu, and will be designed to avoid any discharge of dredged or fill material into the waterway of Kalo Gulch.

Short-term impacts from fugitive dust will likely occur during the project construction phase. Fugitive dust emissions can be controlled by:

1. planning the different phases of construction, focusing on minimizing the amount of dust-generating materials and activities, centralizing material transfer points and onsite vehicular traffic routes, and locating potentially dusty equipment in areas of the least impact;
2. providing an adequate water source at the site prior to the startup of construction activities;
3. landscaping and rapid covering of bare areas, including slopes, starting from the initial grading phase;
4. control of dust from shoulders, project entrances, and access roads;
5. providing adequate dust control measures during weekends, after hours, and prior to daily startup of construction activities; and
6. control of dust from debris being hauled away from the project site.

#### **5.4 Flood and Drainage**

The impacts of flooding and drainage from the project were studied by Engineering Concepts, Inc. Their study is included in this report as Appendix E.

##### **Existing Conditions**

The project site falls within the Kaloi watershed, a drainage basin encompassing approximately 11 square miles. The watershed extends from the crest of the Waianae mountain range to the ocean (see Figure 4 in Appendix E). All of Ewa Villages, except the eastern-most portion adjacent to Fort Weaver Road, falls within Kaloi watershed.

There are no existing drainage improvements within the project sites. However, drainage improvements have been or will be installed in the adjacent developments that will also benefit this project (Figure 5 in Appendix E). The Ewa Villages golf course serves as the major drainage component of the Villages, intercepting runoff from lands mauka of the Villages. Onsite runoff from portions of the Villages is also routed by underground drainage systems to the golf course for disposal. The portion of the golf course immediately adjacent to Area E is designated as Kaloi Channel, conveying onsite runoff and runoff from the mauka areas through the Villages. Kaloi Channel continues below Ewa Villages in the form of the Ewa by Gentry golf course.

Construction plans are currently being processed for the Ewa Villages Revitalization, Phase 9 - Varona Village Infrastructure Improvements project. This project will install an underground drainage system that is sized to serve both the existing Varona Village and the proposed Varona Village Expansion Area. Elements of the Varona Village drainage system include catch basins, manholes, and drainpipes within the Varona Village roadways, and a box culvert along Renton Road.

An existing detention basin, Basin No. 13, is found adjacent to the Makai Area, below Renton Road. This detention basin is a temporary feature, necessary until downstream restrictions are removed. Downstream restrictions include the culvert crossing of the railroad tracks, and the lack of adequate conveyance capacity through Ewa Marina. Haseko, developer of Ewa Marina, has objected to the discharge of runoff on to its property at a rate exceeding existing conditions. Until the culvert crossing the railroad tracks is fully improved, and until such time that Ewa Marina accepts additional runoff above existing conditions rates, full improvement of Kaloi Channel through the Villages cannot be completed. Ultimately, Basin No. 13 will be converted to the lower portion of Kaloi Channel.

Flood Hazard

Prior to the recent golf course improvements, a significant portion of Ewa Villages was subject to inundation during moderate to heavy rainstorms. Most of the Varona Village Expansion Area and Makai Area, and all of Area E were identified as being within a flood plain by the Flood Insurance Rate Maps (FIRM) prepared by the Federal Emergency Management Administration (FEMA).

Subsequent to construction of the golf course, the FIRM has been revised resulting in only the golf course and a very small portion of the Makai Area remaining in the flood plain. The portion of the Makai Area that still remains in the flood plain is immediately adjacent to temporary Basin No. 13. The remaining areas of the Villages have been removed from the flood plain, relieving the existing neighborhood of flooding and allowing development of the remaining vacant sites. Although the flood plain boundaries have been revised by FEMA, a new map showing the revision is not yet available. The above information has been confirmed by the Army Corps of Engineers and the State Department of Land and Natural Resources.

Runoff

Runoff for the three sites, as well as runoff from an offsite area west of the Varona Village Expansion Area were calculated for existing conditions for both the 10-year and 50-year storms and are listed in the table below. Calculations were based on a rainfall duration of one hour, and rainfall intensities of 1.75 inch/hour for the 10-year storm and 2.25 inch/hour for the 50-year storm.

<u>Parcel</u>	<u>Acres</u>	<u>10-yr Runoff</u>	<u>50-yr Runoff</u>
Area E	25	26.3 cfs	33.9 cfs
Expansion Area	27	25.9 cfs	33.3 cfs
Makai Area	9	8.8 cfs	11.3 cfs
Offsite Runoff	52	39.4 cfs	50.6 cfs

Area E, having already been mass graded, generally sheet flows in a northeasterly direction into the western portion of the golf course. Existing runoff from the Varona Village Expansion Area and the offsite areas flows overland in an easterly direction around and through the existing Varona Village. The proposed drainage system to be constructed under the Ewa Villages Revitalization, Phase 9 -

Varona Village Infrastructure Improvements project is designed to collect runoff from the undeveloped expansion area and convey it to Detention Basin No. 13. Runoff from the Makai area also flows generally in an easterly direction towards Basin No. 13, collecting in small sumps and depressions along the way.

Impacts and Recommendations

The proposed Varona Village Phase II project will alter the character of the project's 61 acres. The vegetative cover (weeds and scrub brush) currently established on the site will be replaced with pavement, buildings, and landscaped yards typical of residential developments.

As a result of the proposed improvements, the rate of peak runoff for the 10-year and 50-year storms will increase. Estimated peak runoff for the developed condition is given in the table below.

<u>Parcel</u>	<u>Acres</u>	<u>10-yr Runoff</u>	<u>50-yr Runoff</u>
Area E	25	77.9 cfs	99.2 cfs
Expansion Area	27	72.1 cfs	103.5 cfs
Makai Area	9	24.8 cfs	31.9 cfs
Offsite Runoff	52	101.9 cfs	131.0 cfs

Peak runoff rates generated onsite is expected to increase by 2.5 to 3 times for the 10- and 50-year storms after development of the project sites. This is due to the loss of open space, creation of impervious surfaces, and the effects of a more efficient drainage system. Peak runoff from the site will increase with the development of this project due to the increase in impervious surfaces and reduced time of concentration; however, peak runoff will be dampened by routing the runoff through the golf course. The impact of runoff from this project has been incorporated in the mitigative measures of the overall drainage master plan for Ewa Villages.

Drainage patterns in the onsite areas proposed for development may be altered slightly from the existing conditions due to the alignment of the proposed roads and culverts. Also, runoff from the Expansion Area will need to be distributed to match the collection points to be constructed with the Varona Village Infrastructure Improvements project.

In general, consideration has been given to future development of Varona Village Phase II in planning of downstream drainage facilities. Impacts on developments downstream of the project sites should be mitigated by drainage improvements within their projects. The project sites have been included in a drainage master plan prepared for the entire Ewa Villages. Use of the golf course as the major drainage way helps to dampen peak flows and promotes infiltration, in accordance with the intent of Ordinance 96-34. The master plan has been reviewed and accepted by the City and County of Honolulu Department of Public Works.

The onsite drainage improvements required to handle runoff from the development will consist of catch basins, manholes, drain pipes, and culverts within the roadway system. The drainage systems will be designed in accordance with the City and County Storm Drainage Standards and will follow the criteria identified in the approved drainage master plan.

The onsite underground drainage system for a large portion of Area E will discharge directly into the golf course. A smaller drainage area will connect to the drainage system within the North-South Road.

Drainage systems designed for the Varona Village Expansion Area will connect to the proposed drainage system for the existing Varona Village. The main drainage component in Varona Village is a box culvert in Renton Road that conveys collected runoff to Kalo Channel discharging in the vicinity of the North-South Road.

The Makai Area drainage system discharges into Basin No. 13 in the interim while downstream restrictions still exist. When the downstream restrictions are removed and Kalo Channel is fully constructed, the Makai Area drainage system will discharge directly into the channel.

### 5.5 Water Source Hydrology

Groundwater in the vicinity of the subject property occurs in two aquifers, the deeper (and higher quality) Waianae volcanic aquifer and the overlying (mostly brackish to salt water) coral aquifer. Materials of low permeability including marine clay and silt sediments, alluvium and weathered volcanics, separate the two aquifers and form a "caprock". Because of its low permeability, the caprock retards the flow of water between the two aquifers. This barrier may be described as an "aquitard" since these soils and clays are permeable, and there is hydraulic continuity between the Waianae aquifer and the coral aquifer. The light density, high head Waianae aquifer water flows through the aquitard into the coral aquifer to be mixed with the high salinity salt water. Discharge to the sea from the coral aquifer is unrestricted by an aquiclude or aquitard.

The subject property lies within the Ewa Caprock Ground Water Management Area (GWMA), withdrawals from which are regulated by the State Commission on Water Resource Management (CWRM). In 1993, the CWRM officially adopted the boundaries of the Ewa Caprock Aquifer, formerly under Chapter 177, HRS, under Chapter 174C. No sustainable yield for the aquifer has been established by the CWRM to date. The current guideline used for the sustainable yield is 16-21 MGD. However, in the future, this estimate is expected to decrease with the cessation of Oahu Sugar Company operations and the resultant decrease in imported basal water and return irrigation recharge.

Because of the uncertainty regarding the future water supply, the CWRM has issued water use permits for new uses subject to annual review. Current allocations for non-salt water uses in the caprock area are about 23.19 MGD. Of this total, about 16.19 MGD was allocated to Oahu Sugar Company, which no longer requires irrigation water for sugarcane.

The average daily demand for potable water for the proposed Varona Village Phase II Master Plan at full development is estimated by Engineering Concepts, Inc. to be approximately 0.173 to 0.23 MGD.

Because the subject property is located mauka of the Underground Injection Control Line, groundwater contamination from surface activities could occur, but is not expected. Since no

common areas are proposed, it is expected that irrigation will be limited to the watering of lawns within the single-family residences. If treated wastewater effluent is used for non-potable irrigation purposes in the immediate area of the Ewa caprock aquifer, the Commission on Water Resource Management will grant Water Use Permits from the aquifer only if no other alternative source is available, and only until treated effluent is available to the applicant. Once the effluent is available, DOH has indicated that the applicant should be given a reasonable time to connect to the effluent water system and that the Water Use Permit should be withdrawn.

## 5.6 Flora

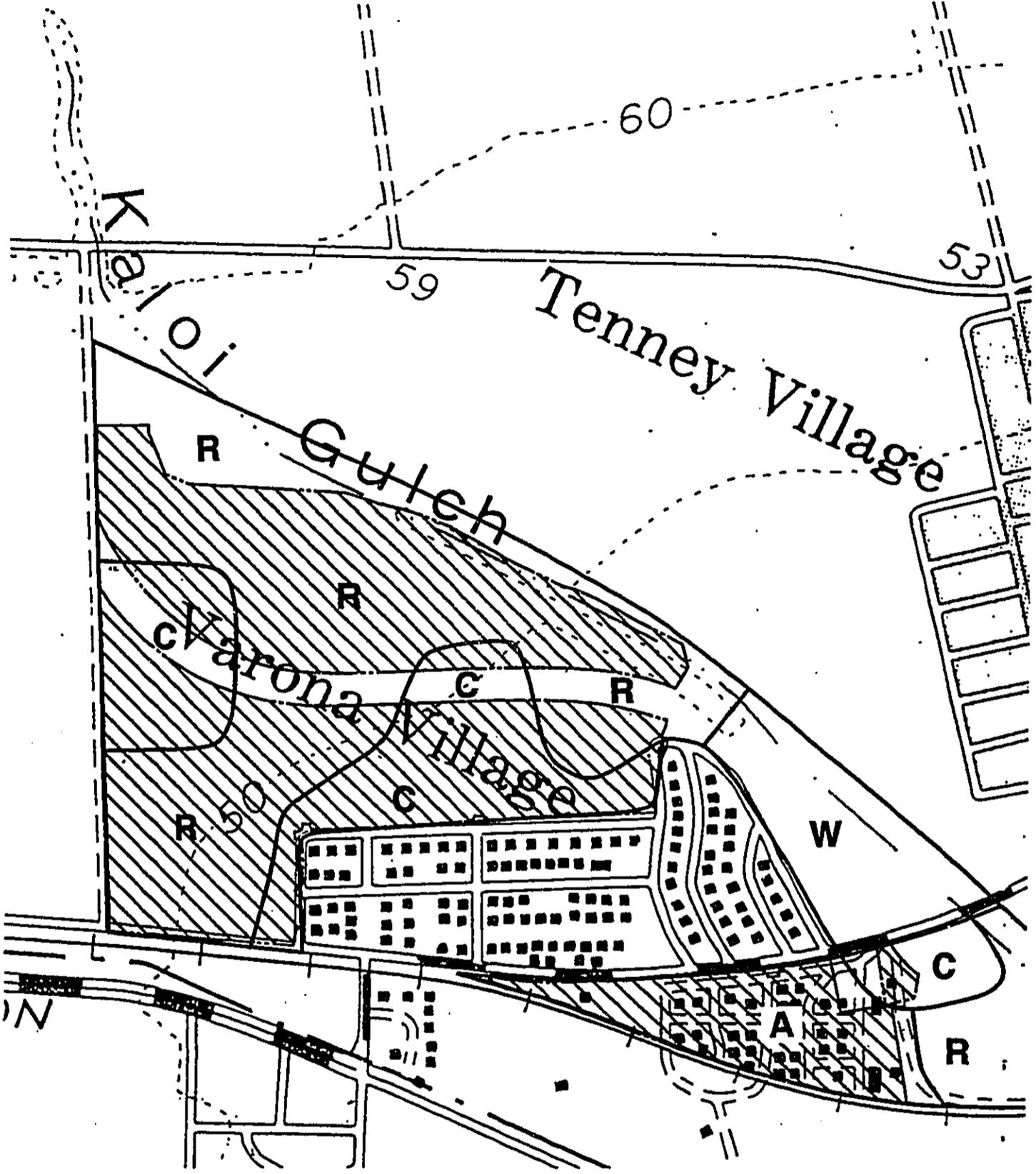
The subject property has historically been used for sugar cane (*saccharum officinarum*) cultivation. In general, the weedy species associated with sugar cane cultivation include nutgrass (*Cyperus rotundus*), swollen fingergrass (*Chloris inflata*), red pualele (*Emilia fosbergii*), snowthistle (*Sonchus oleraceus*), and hairy spurge (*Euphorbia hirta*).

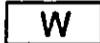
A biological survey conducted by Kenneth M. Nagata in May 1996 found the project site to consist almost exclusively of alien (non-native) species (see Appendix F). Four vegetation types were found in the area. These were given category names of: 1) Abandoned Lots, 2) Waste Area, 3) Ruderal Fields, and 4) Cultivated Land. Refer to Figure 10.

Abandoned Lots is the area south of the existing Varona Village where homes once stood. This area corresponds to the Makai Area except for the portion near the intersection of Renton Road and the future North-South Road (refer to Figure 10). Presently, old dilapidated structures, foundation slabs and rubbish heaps are found throughout the area. It is overgrown with buffelgrass (*Cenchrus ciliaris*), Chinese violet (*Asystasia gangetica*), Spanish needle (*Bidens pilosa*) and false mallow (*Calvastrum coromandelianum*). Spiny amaranth and koa-haole are also common. Landscape plants such as 'opiuma (*Pithecellobium dulce*), monkeypod (*Samanea saman*), *Bougainvillea* and *Carmona microphylla* can still be found as well as fruit trees such as tamarind (*Tamarindus indica*), mango (*Mangifera indica*), papaya (*Carica papaya*), pummelo (*Citrus grandis*) and star apple (*Chrysophyllum cainito*).

Waste Area is the area east of the existing Varona Village, between Varona Village and Kaloi Channel (refer to Figure 10). In this area, the vegetation has been grubbed, leaving mostly bare ground. Buffelgrass, Spanish needle, Guinea grass (*Panicum maximum*) and Castor bean (*Ricinus communis*) are resprouting in the grubbed area. Vegetation at the periphery consist mostly of Guinea grass, Castor bean and koa-haole.

Ruderal Fields is the area north and west of the existing Varona Village. It overlaps Area E and the Varona Village Expansion Area (refer to Figure 10). It contains a mosaic of different species, some of which are dominant over small areas. Rubbish heaps, compost heaps, junk piles, dirt piles, and abandoned vegetable plots contribute to the complexity of this community. Much of this land has been used for vegetable gardening. Because of cultivation, much of the soil has been tilled and enriched, resulting in a great abundance of residual vegetables and weeds. In certain areas, Guinea grass forms dense, five foot tall stands. Most of the vegetation, however, consists of a combination of bristly foxtail, spiny amaranth, Spanish needle, false mallow, 'uhaloa, *Emilia fosbergii*, cheese



LEGEND	
	Project Area
	Abandoned Lots
	Waste Areas
	Ruderal Fields
	Cultivated Lands

Source: Kenneth Nagata

**FIGURE 10**  
**VEGETATION MAP**  
**VARONA VILLAGE, PHASE II**

0 250 500  
 FEET

August, 1996



weed (*Malva parviflora*), golden crown-beard (*Verbesina encelioides*) and nut grass (*Cyperus rotundus*). Vegetables such as eggplant (*Solanum melongena*), okra (*Hibiscus manihot*), sweet potato (*Ipomoea batatas*) and cassava (*Manihot esculenta*) can be found persisting in old garden plots which have been completely overgrown by weedy species. Feral species such as balsam pear (*Momordica charantia* var. *abbreviata*) and currant tomato (*Lycopersicon pimpinellifolium*) are also common in this community.

Cultivated Land are three areas throughout the project area. One is located west near the HECO easement where the proposed North-South Road enters the project area from the west, the second is located immediately north and west of the existing Varona Village, and the third is located south of Renton Road where it intersects with the future North-South Road. This third area contains the Ewa Hongwanji Mission and an adjacent construction yard.

The first (westernmost) Cultivated Land area contains a tree nursery and a construction yard. Mounds of coral covered with plastic constitute the construction yard, while coconut trees (*Cocos nucifera*), *Erythrina* sp., areca palms and other palms are planted in the nursery. Swollen fingergrass, radiate gingergrass (*Chloris radiata*), golden crown-beard, and spiny amaranth provide a 90-100 percent cover that is 2-3 feet tall. In portions where the soil is shallow or poor, the cover may be less than fifty percent.

The second Cultivated Land area (north of Varona Village) contains most of the prominent species found in the Ruderal Fields, as well as vegetables such as green onion, cassava, sweet potato, Chinese cabbage (*Brassica chinensis*), daikon (*Raphanus sativus* var. *longipinnatus*) and *Corchorus olitorius*. Plots of land are currently being fallowed frequently while new land is cleared for cultivation. Consequently, the boundary between the Cultivated Land and the Ruderal Fields is dynamic.

Within the third Cultivated Land areas, numerous landscape species including *Bougainvillea*; *Juniperus*; areca palm (*Chrysalidocarpus lutescens*); fish geranium (*Pelargonium hortorum*); marigold (*Tagetes* x); potted cacti and succulents; and vegetables such as bush beans (*Phaseolus vulgaris*), tomato (*Lycopersicon esculentum*), green onion (*Allium fistulosum*) and eggplant are cultivated on the Hongwanji grounds. Common weedy species characterize the construction yard.

Overall, a total of 167 plant species was recorded. Of these species, only one, the 'ilima, is native. In addition, three other plants are considered "possibly indigenous"; these are hoary abutilon (*Abutilon incanum*), black nightshade (*Solanum americanum*), and 'uhaloa. All are found in small to moderate numbers in the project area. 'Ilima is common to the lowlands and foothills on all the main islands of Hawaii. Thus, native plants represent a negligible component of the vegetation in the area. There are no rare and endangered plants in the site nor are there any native plant communities.

## 5.7 Fauna

For many years, the subject property has been under sugar cane cultivation, which is not a suitable habitat for native birds. Various surveys of the Ewa area conclude that the entire region has been

disturbed for over a hundred years, resulting in severe alteration of the native ecosystem. The only mammals known to inhabit this altered ecosystem are introduced species such as feral cats, dogs, rats, mice, and mongooses.

During the biological survey conducted May 1996 (Appendix F), the most widespread species were the barred dove (*Geopelia striata*) and the red-vented bulbul (*Pycnonotus cafer*), which were present in all plant communities except the Waste Area (refer to previous section). By far, the most abundant species, however, was cattle egret (*Bubulcus ibid*). At least a dozen were observed in the Ruderal Fields (refer to previous section). Two Pacific golden-plovers (*Pluvialis fulva*) were observed on the ground in the Ruderal Fields.

## 5.8 Air Quality

The impact of the project on air quality was studied by Barry D. Neal; his study in its entirety is included in this report as Appendix A.

### Existing Conditions

Regional and local climate together with the amount and type of human activity generally dictate the air quality of a given location. The climate of the project area is very much affected by its leeward and only slightly inland situation. Winds are predominantly trade winds which are deviated somewhat from the northeast toward the east by the local terrain. During winter, occasional storms may generate strong winds from the south (Kona winds) for brief periods. When the trade winds or Kona winds are weak or absent, landbreeze-seabreeze circulations may develop. Wind speeds typically vary between about 5 and 15 miles per hour providing relatively good ventilation much of the time. Temperatures in the leeward Oahu area are generally very moderate with average daily temperatures ranging from about 65°F to 85°F. Extreme temperatures recorded for this area are a minimum of 47°F and a maximum of 93°F. Rainfall is relatively low with an average of about 21 inches per year.

The present air quality of the project area is relatively good and has probably improved recently with the discontinuation of sugar cane growing and burning in the Ewa Plain area. Air quality data from the nearest monitoring stations operated by the state Department of Health at Makaiwa Gulch, Kapolei, West Beach, Sand Island, and Downtown Honolulu suggest that all national air quality standards are currently being met, although occasional exceedance of the more stringent state standards for ozone and for carbon monoxide may occur.

### Impacts and Recommendations

With the proposed project, some short- and long-term impacts on air quality will unavoidably occur either directly or indirectly as a consequence of project construction and use. Short-term impacts from fugitive dust will likely occur during the project construction phase. To a lesser extent, exhaust emissions from stationary and mobile construction equipment and from workers' vehicles may also affect air quality during the period of construction.

State air pollution control regulations require that there be no visible fugitive dust emissions at the property line. Hence, an effective dust control plan should be implemented to ensure compliance with Chapter 11-60.1, Hawaii Administrative Rules, section 11-60.1-33 on Fugitive Dust, and to avoid complaints from residents and businesses adjacent to construction areas. Dust should be controlled at the project entrances, access roads, and with debris being hauled away from the project site. Fugitive dust emissions can be controlled to a large extent by planning the different phases of construction with a focus on minimizing the amount of dust-generating materials and activities. It can be controlled by centralizing material transfer points and onsite vehicular traffic routes, locating potentially dusty equipment in areas of the least impact, providing an adequate water source at the site prior to startup of construction activities, watering active work areas, using wind screens, landscaping and covering bare areas as soon as possible, keeping adjacent paved roads clean, and covering open-bodied trucks. Fugitive dust control measures should be effective during non-activity time as well. Weekends, after hours, and prior to daily start up should be included. Other dust control measures could include limiting the area that can be disturbed at any given time and/or mulching or chemically stabilizing inactive areas that have been worked. Paving and landscaping of project areas early in the construction schedule will also reduce dust emissions. Monitoring of dust emissions along the project boundary could be considered to evaluate the effectiveness of dust control measures. Exhaust emissions from traffic disruption can be mitigated by moving construction equipment and workers to and from the project site during off-peak traffic hours.

After construction, vehicles coming to and from the proposed project will result in a long-term increase in air pollution emissions in the project area, particularly along Renton Road. To assess the impact of emissions from these vehicles, an air quality modeling study was undertaken to estimate current ambient concentrations of carbon monoxide at the intersection of Renton Road and Park Row and to predict future levels both with and without the proposed project at this and two other intersections in the project area (Renton Road/North-South Road intersection and access to Area E from North-South Road). During worst-case conditions, the model results indicate that present 1-hour carbon monoxide concentrations are within the state and national ambient air quality standards. Model results also indicate that presently the state and national 8-hour carbon monoxide standards are being met.

In the year 2005 without the project, worst-case 1-hour concentrations were predicted to increase at the intersection of Renton Road and Park Row to a level exceeding the state standard during the morning peak hour. The Renton Road at North-South Road intersection also produced predicted concentrations in excess of the state standard. Both locations, however, were predicted to remain within the less stringent national 1-hour standard. State and national 8-hour carbon monoxide standards were predicted to be exceeded at the Renton Road/North-South Road intersection while Renton Road at Park Row exceeded only the state standard.

With the project worst-case concentration levels, the project area would increase only slightly or remain the same at the two Renton Road intersections studied. A third intersection, Area E Access Road at North-South Road, which exists only in the future with the project, was also predicted to exceed the state 1-hour standard. All three locations were found to produce predicted concentrations in excess of the state 8-hour standard and one intersection, Renton Road/North-South Road, exceeded the national 8-hour standard.

It should be noted here that, because the state standards are set at such stringent levels, it is likely that they are currently exceeded at many locations in the state that have even moderate traffic volumes. Although potential exceedance of the national 8-hour standard is also indicated either with or without the project at the Renton Road/North-South Road intersection, the projected 8-hour concentrations are probably less reliable than the 1-hour estimates due to the prediction methodologies involved.

Options available to mitigate long-term, traffic-related air pollution are generally to further improve roadways, to reduce traffic or to reduce individual vehicular emissions. Based on the air quality modeling results, it may be appropriate to consider the feasibility of further improving some intersections in the project area, particularly the intersection of Renton Road and North-South Road. Aside from providing added roadway improvements, air pollution impacts from vehicular emissions could conceivably be additionally mitigated by reducing traffic volumes through the promotion of bus service and car pooling and/or by adjusting local school and business hours to begin and end during off-peak times. This mitigation measure, however, is generally considered only partially successful. Reduction of emissions from individual vehicles is generally beyond the control of any single development and would have to be achieved through the promulgation of county, state or federal air pollution control regulations. For example, Hawaii currently does not require annual inspections of motor vehicle air pollution control equipment. Although this has been proposed in past legislative sessions, there currently is no indication that the state is contemplating the adoption of such rules.

Another potential mitigation measure might be to provide added buffer zones between walkways and roadways where space is available. Technically, however, the public would have to somehow be excluded from the buffer zones. The predicted worst-case concentrations in this report are based on a separation distance of 3 meters (10 feet) between walkways and roadways. Doubling this distance to about 6 meters (20 feet) would reduce maximum concentrations in some cases by about 10 to 15 percent.

## 5.9 Noise

A Noise Assessment Study was prepared by Darby & Associates, Inc. to assess the impact of the project on surrounding areas (see Appendix G).

### Existing Conditions

The ambient noise levels throughout the project area range from approximately 47 to 57 dBA (A-weighted decibels), which is typical for an urban residential area. Night-time ambient noise levels at the project site are estimated to be at least 10 dB (decibels) lower than daytime ambient noise levels (refer to Appendix G).

The project area is located just beyond the northeast corner of the Barbers Point Naval Air Station (BPNAS) boundary and approximately 6 miles west of the Honolulu International Airport (HIA). According to Figure 9 of Appendix G, most of the project area is exposed to aircraft related noise levels in the range of 55 to 60 Ldn (Day-Night Equivalent Sound Level), with the remaining area

exposed to average noise levels in the range of 60 to 65 Ldn. However, the Department of the Navy is in the process of disposing of the BPNAS under the Defense Base Closure and Realignment Act of 1990, which is scheduled to be completed by July, 1999. Without BPNAS activity, all portions of the project site would be exposed to an aircraft Ldn less than 55.

Also nearby is the Honouliuli Wastewater Treatment Plant (WWTP), located several hundred feet southeast of the Makai Area parcel. This facility most likely contains pumps, scrubbers, compressors, fans, and other noisy equipment. However, when ambient noise level measurements were conducted at the project site, no noise from the WWTP was audible at the nearest measurement location. During night-time hours, however, it is not unusual for ambient noise levels to be as much as 10 dB less than daytime levels and, thus, noise from the WWTP may be audible to the future residents of the Makai Area, if it is developed for residential use, during the night-time. The Department of Health considers 70 dBA at the property line as allowable during daytime and night-time hours for properties zoned for Industrial uses such as the WWTP.

### Impacts and Recommendations

#### *Short-term*

During project construction, the dominant noise source is anticipated to be earth moving equipment. Construction noise may significantly impact nearby existing residential areas, but will be confined to daytime only and should be relatively short-term.

The various construction phases of the project may generate significant amounts of noise, which may impact nearby residential areas. The actual noise is dependent upon the methods employed during each stage of the construction process. Earthmoving equipment, such as bulldozers and diesel-powered trucks, will probably be the loudest equipment used during construction.

When construction noise exceeds, or is expected to exceed, the DOH's allowable property line limits, a permit must be obtained from the DOH to allow the operation of vehicles, construction equipment, power tools, etc. which emit noise levels in excess of the allowable limits. Required permit conditions for construction activities are:

No permit shall allow construction activities creating excessive noise...before 7:00 am and after 6:00 pm of the same day.

No permit shall allow construction activities which emit noise in excess of ninety-five dB(A)...except between 9:00 am and 5:00 pm of the same day.

No permit shall allow construction activities which exceed the allowable noise levels on Sundays and on...[certain] holidays. Activities exceeding ninety-five dB(A) shall [also] be prohibited on Saturdays.

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

DOH's vehicle noise requirements (refer to Appendix G).

*Long-term*

The predicted future peak hour traffic noise levels with and without the project, at 50 feet from the proposed North-South Road ROW and Renton Road ROW are summarized in the two tables below:

**Table 4: Estimated Future Ldn Due to Traffic  
At 50 Feet From Proposed North-South Road ROW**

Location*	Future (2005) Ldn w/o Project	Future (2005) Ldn with Project	Increase Due to Project
1	67.8	68.0	0.2
2	67.8	67.9	0.1
3	67.5	67.7	0.2
4	67.5	67.7	0.2
5	66.6	66.7	0.1
6	67.0	67.1	0.1

\* As shown in Figure 7 in Appendix G.

The increase in traffic noise levels due to the project occurs at locations along Renton Road west of the proposed North-South Road. The minimum change in noise levels perceptible to the average listener is generally taken to be 3 dB; therefore, the increases at these locations will be perceptible to most people along Renton Road. Although the increase in traffic noise levels may be significant, the peak hour traffic noise levels (less than 58 dBA at 50 feet from the ROW) should not be excessive for residential uses.

Residences located within 95 to 100 feet of the proposed North-South Road ROW will likely experience peak-hour traffic noise levels above the U.S. Department of Housing and Urban Development (HUD) recommended limit for acceptable sites of Ldn 65 if the noise is not mitigated. However, feasible noise mitigation measures such as special building constructions to reduce the exterior-to-interior noise, or noise barriers such as walls or earthen berms along the roadway will be used as appropriate.

**Table 5: Estimated Existing and Future Ldn Due to Traffic  
At 50 Feet From Renton Road ROW**

Location*	Existing (1996) Ldn	Future (2005) Ldn w/o Project	Future (2005) Ldn with Project	Increase Due to Project
7	54.0	63.3	63.3	0
8	53.2	63.2	63.2	0

Location*	Existing (1996) Ldn	Future (2005) Ldn w/o Project	Future (2005) Ldn with Project	Increase Due to Project
9	53.2	53.3	57.5	4.2
10	54.0	54.6	57.3	2.7
11	54.0	54.6	56.8	2.2
12	53.2	53.3	56.6	3.3

\* As shown in Figure 7 in Appendix G.

Residences associated with the project along Renton Road, should not be significantly impacted by traffic noise if located beyond 25 feet of the ROW.

If the Makai Area is developed for community facilities, noise mitigation may be needed to control noise from the facilities' exterior mechanical equipment.

Effective long-term noise mitigation for future residences along North-South Road might include the following:

1. Constructing barrier walls and/or earthen berms along roadways;
2. Providing air-conditioning in buildings instead of relying on natural ventilation;
3. Acoustically softening interior spaces by the addition of thick carpeting with padding, an acoustical tile ceiling, louvered closet doors, etc.; or
4. Using exterior wall constructions which exhibit high noise reductions.

#### 5.10 Visual Attributes

The subject property is relatively flat and has been cultivated for sugar cane production for several decades by the Oahu Sugar Company. The average slope throughout the subject property is approximately one percent (1%). All of these adjoining lands are also flat. Because of these conditions, there are no ocean views. Distant views are of Makakilo and the Waianae Mountains, as well as the Koolau Mountain Range.

The visual appearance of the subject property will change from weeds to a built environment, similar to what has occurred elsewhere the Ewa region. The visual appearance of the proposed development will reflect the region's plantation heritage to be controlled during the design and review process, and by covenants, conditions, and restrictions.

#### 5.11 Historical/Archaeological and Cultural Sites

An archaeological survey of the entire Ewa Villages, including the proposed project was conducted

in 1990 by Hallet H. Hammatt, David W. Shideler, and William H. Folk. The results of this survey is included in this report as Appendix H.

Due to the extensive grading and other modifications conducted on the property, no significant archaeological or cultural sites are known to exist on the subject property. The presence of any archaeological sites of any significance on the surface or subsurface of the subject property is unlikely because of the prior continuous cane cultivation.

The earliest detailed map of the area shows no habitation closer than the western edge of West Loch in the vicinity of Papapahu Point. The Monsarrat survey map of 1878 documents substantial settlement at the "Honolulu Taro Lands" in the Papapahu Point area, which was the focus of the population of Honouliuli ahupua'a. The amenities of that area, such as fishponds, taro lo'i, shellfish collecting, and salt drying would have focused population there in prehistoric times, and the name of that place must have secondarily come to apply to the entire ahupua'a.

A search for Hawaiian Land Commission Awards (LCA) in the vicinity of the subject property similarly showed no evidence of small private land holdings in the vicinity. The only land commission award in the vicinity is Royal Patent 6071, LCA 11216, Apana 8 to Miriam Ke'ahi-Kuni Kekau'onohi who was granted the ahupua'a of Honouliuli, Ewa, O'ahu by Kamehameha II on January 28, 1848.

The earliest archaeological study in Honouliuli by McAllister (1933) documented Site 146. "The Ewa coral plains contain many sites throughout the area. The greatest extent of old stone walls, particularly near the Pu'uloa Salt Works, belongs to the ranching period of about 75 years ago [circa 1858]." The only other early documented site in the vicinity was a heiau on Pu'u Kapolei.

In brief, while very little is known about the prehistory of the immediate vicinity of the subject property, there is no indication of occupation or any other utilization. Review of historical records indicate the past presence of a number of historical features which were once present in the Makai Area (Appendix H). However, the only feature left is the Ewa Hongwanji, which is not part of the present project.

The proposed project is adjacent to and not part of the Ewa Plantation Villages Historic District (Figure 4). The State Historic Preservation Division (SHPD) has stated that the proposed project will have "no effect" on the character of the Historic District. In accordance with Section 6E-8, HRS, DHCD is continuing its ongoing consultations.

Should any human burials or historic sites such as artifacts, charcoal deposits, or stone platforms, pavings or walls be found, the developer and/or landowner of the subject property shall stop work in the immediate vicinity and contact the State's Historic Preservation Division. The significance of these finds shall then be determined and approved by the Division, and an acceptable mitigation plan shall be approved by the Division (if needed). The Division must verify that the fieldwork portion of the mitigation plan has been successfully executed prior to work proceeding in the immediate vicinity of the find. Burials must be treated under specific provisions of Chapter 6E, Hawaii Revised Statutes.

## 5.12 Agricultural Impacts

Until very recently, the Oahu Sugar Company was the island's largest sugar producer and cultivated about 10,562 acres of sugar cane land, approximately 8,000 acres of which are located near the project area. After harvesting the cane, it was hauled from the fields to the Oahu Sugar Company mill in Waipahu for processing. Nearly all of the land which Oahu Sugar Company cultivated near the project area was leased from the Estate of James Campbell. The lease expired in 1995.

Because of favorable growing conditions, good farming practices, and drip irrigation, the sugar yield at Oahu Sugar Company was 13.95 tons per acre, the highest in the State. However, even with high yields and very efficient operations, Oahu Sugar Company was only marginally profitable and operations were ceased in the summer of 1995.

The subject property is located near markets and support services, and fully improved for crop production. However, the Ewa area has been designated by the County General Plan as the Secondary Urban Center of Oahu. As such, a significant portion of the Ewa Plain has been redesignated from agricultural to urban uses.

While Oahu Sugar Company was a major employer, the economic impact of its closure on the County and the State of Hawaii was relatively small. Oahu Sugar Company employed 410 people in 1990. In addition to 410 jobs, an estimated 463 indirect jobs were lost (using the State employment multiplier of 1.13). Over the past 10 years, Oahu's job count has increased an average of nearly 7,000 jobs per year, indicating that the County's economy is large and strong enough to absorb a plantation closure. Additionally, the island has experienced relatively low unemployment. With appropriate skills and/or training, workers directly and indirectly impacted by the Oahu Sugar Company closure could be absorbed elsewhere in the economy. The Department of Agriculture notes that the Agribusiness Development Corporation can develop programs to promote and facilitate the absorption of displaced agricultural workers into alternative agricultural enterprises, elsewhere on Oahu Sugar Company's former fields.

## 5.13 Public Services and Facilities

### 5.13.1 Potable Water

Engineering Concepts, Inc. has studied the impact of the potential potable water demand of the project. The results of its study is attached to this report as Appendix E.

#### Existing Conditions

The Board of Water Supply (BWS) provides potable water to the Ewa Villages area from the 228' service system. Pressure to sustain the system is planned to be maintained by the Honouliuli and Kunia 228' tanks. Source for this system is from the BWS wells in Waipahu and Honouliuli.

Maximum day demand storage for Ewa Villages is planned to be obtained from reservoirs in Honouliuli and Kunia. A 5.0 million gallon (mg) storage reservoir and a 1.0 mg breaker reservoir

in Honouliuli, with spillway elevations of 228' and 440', respectively, currently serve the system. Additional storage and transmission facilities for this system have been planned and will be implemented as demand requires.

There are no existing water system facilities within the project sites, however, an existing 12-inch waterline is located in the proposed North-South Road corridor that runs between Area E and the Varona Village Expansion Area. In addition, construction plans for the *Ewa Villages Revitalization, Phase 9 - Varona Village Infrastructure Improvements* project include water system improvements to the existing Varona Village, including points of connection for the Varona Village Expansion Area and Makai Area (see Figure 6 in Appendix E)

#### Projected Water Demand

Additional water demands will be generated from the three development areas within the proposed Varona Village Phase II development. The water demands of the project area were estimated based on the Water System Standards of the Board of Water Supply. A range of estimated demands from the proposed development areas are listed below. The lower values presented for Area E and the Makai Area are based on development of single family homes while the higher values are based on multi-family units. If a combination of single family and multi-family homes are developed, the estimated water demands will fall between the minimum and maximum values. Only single family homes are proposed for the Varona Village Expansion Area. The Ewa Villages Water Master Plan prepared in January 1996 identified unit demands for single family developments in the Ewa Villages at 500 gals/unit and 400 gals/unit for multi-family developments. Based on these unit demands, the ranges of Average Daily Demands for the three sites are:

<u>Parcel</u>	<u>Min</u>	<u>Max</u>
Area E	0.062 mgd	0.101 mgd
Varona Village Expansion Area	0.085	0.085
Makai Area	0.026	0.044
Total	0.173 mgd	0.230 mgd

Based on the above average daily demands, a maximum daily demand ranging from 0.260 mgd to 0.345 mgd is expected. Corresponding peak hour demands will range from 0.520 mgd to 0.690 mgd.

#### Impacts and Recommendations

Development of Area E will require additional water lines to be constructed. Connection to the existing 12-inch waterline in the North-South Road will provide Area E with its water service. Twelve-inch and 8-inch lines will be installed within the roadways to serve the subdivision.

The Varona Village Expansion Area and the Makai Area will be served by water systems connecting to the stubouts from the existing Varona Village. The stubouts are planned to be installed as part of the Ewa Villages Revitalization, Phase 9 - Varona Village Infrastructure Improvements project. Eight-inch waterlines in the Expansion and Makai Areas will also be installed in roadways serving

the projects. However, 12-inch lines may be required in the Makai Area if multi-family units are developed.

All water system improvements will be designed in accordance with the Water System Standards and Approved Materials List and Standard Details for Water System Construction of the Board of Water Supply.

Development of the Varona Village Phase II project will result in additional demands being placed on the existing water system. However, consideration has been given to future development of the project in the planning of adjacent water system facilities. The project has been included in the Ewa Villages Water Master Plan, dated January 1996 by R.M. Towill Corp., allowing the required demands to be incorporated in the overall planning of major infrastructure components. The aforementioned Water Master Plan has been reviewed and approved by the Board of Water Supply and the Board of Water Supply has stated that "the proposed development conforms to the approved Water Master Plan." As indicated in the master plan, offsite water facilities required by the entire Ewa Villages project are being planned and coordinated by the Department of Housing and Community Development.

#### 5.13.2 Wastewater

The projected wastewater generated from the project and the collection and treatment of the effluent has been studied by Engineering Concepts, Inc. and is attached to this report as Appendix E.

#### Existing Conditions

Wastewater generated from the Ewa Villages is conveyed by gravity sewer through the Ewa by Gentry development to Geiger Road and the Honouliuli Wastewater Treatment Plant (WWTP).

The Honouliuli WWTP is located approximately one-half mile southeast of the proposed Makai Area development. The WWTP presently operates as a primary treatment facility with design capacity of 38 MGD. The plant was recently upgraded to the design capacity and to achieve secondary treatment. The present wastewater flows to the WWTP are in excess of 25 MGD, but well below the 38 MGD design capacity.

#### Projected Wastewater Flows

Wastewater will be generated from the three development areas within the proposed Varona Village Phase II development. The estimated average wastewater design flow is based on the City and County Department of Wastewater Management (DWWM) Design Standards. A range of estimated contributions from the proposed development areas are listed below. The lower values presented for Area E and the Makai Area are based on development of single family homes while the higher values are based on multi-family units. If a combination of single family and multi-family homes are developed, the estimated wastewater flow will fall between the minimum and maximum values. Only single family homes are proposed for the Varona Village Expansion Area.

<u>Parcel</u>	<u>Minimum</u>	<u>Maximum</u>
Area E	42,160 gpd	61,488 gpd
Varona Village Expansion Area	57,800	57,800
Makai Area	17,680	26,180
 Total	 117,640 gpd	 145,468 gpd

For planning purposes, the total average wastewater design flow rate for Varona Village Phase II is 0.118 to 0.146 MGD. Wastewater generated at the project site is expected to be of typical domestic composition.

Impacts and Recommendations

Varona Village Phase II was addressed in the *Ewa Villages Sewerage Master Plan*, prepared by R.M. Towill Corp. in November 1995. The sewerage master plan identified the following offsite improvements in the vicinity of Varona Village Phase II development areas:

- Construction of an 8-inch gravity sewer along the proposed North-South Road, extending from the golf course maintenance building to Renton Road. This sewer would serve Area E.
- Construction of 8-, 10-, and 12-inch gravity sewers along Renton Road fronting the existing Varona Village and extending to the intersection with the proposed North-South Road. This sewer would serve the Makai Area and the Varona Village Expansion Area.
- Construction of 8-inch gravity sewers within the existing Varona Village extending from the Varona Village Expansion Area to Renton Road to convey wastewater from the expansion area to the proposed Renton Road sewer.

In addition, the following sewers would be constructed to serve other phases of the Ewa Villages development, including Varona Village Phase II.

- Construction of 12-, 18-, and 21-inch gravity sewers along Renton Road extending from the North-South Road intersection, fronting Tenney Village, to Park Row Extension.
- Construction of a 24-inch gravity sewer along Park Row Extension from Renton Road to North-South Road.
- Construction of a 36-inch gravity sewer along North-South Road from Park Row Extension to an existing sewer manhole in Ewa by Gentry.

The proposed wastewater collection system for the project is illustrated in Figure 7 of Appendix E.

The proposed wastewater system improvements will be designed and constructed in accordance with DWWM Design Standards.

The *Ewa Villages Sewerage Master Plan* references the *Ewa by Gentry-West, Utilities Master Plan* which indicates excess capacity in the receiving sewer. Therefore, negative impacts to the existing collection system are not anticipated.

Due to the excess capacity at the Honouliuli WWTP and Barbers Point Ocean Outfall, it is anticipated that wastewater generated by Varona Village Phase II can be accommodated by the existing City and County treatment and disposal facilities.

### 5.13.3 Power and Communication Systems

Electric power to the Ewa Plain area, including the vicinity of the subject property, is provided by Hawaiian Electric Company (HECO). The Kahe and Waiau power plants service the area surrounding the project site.

Communications facilities for the area surrounding the project site is provided by GTE Hawaiian Telephone Company (HTCo).

#### Existing Conditions

There is no existing electrical, telephone or CATV service within the project site. However, the surrounding subdivisions and golf course are served by HECO and HTCo.

#### Impacts and Recommendations

Area E will derive electric, telephone and CATV service from an underground duct system to be constructed in North-South Road. Utility improvements within this development area will be underground. The City and County anticipates constructing those portions of the North-South Road required to provide access and to extend utilities from the end of the improved portion of Renton Road to the subdivision. HECO has determined that the existing 12.47 kV distribution system has sufficient capacity to provide underground service to the development area. One auto-transfer switching site will be required. In addition, HTCo has indicated that the existing duct system appears adequately sized to serve the development area; however, a cross-connect site will be required.

It has been proposed that electric and telephone service for residential units in the Varona Village Expansion Area be derived from the underground duct system in Renton Road, to be constructed as part of the Ewa Villages, Phase 9 - Varona Village Improvements project (HECO request P214752). HECO has determined that the proposed 12.47 kV overhead system will have sufficient capacity to provide service to the lots, and that an auto-transfer switching vault site will not be required. In addition, HTCo has determined that the existing duct system has sufficient capacity to provide service to the lots. To maintain the historical character of Varona Village, a 201E exemption to permit overhead electric and communication utilities within the subdivision has been obtained by

the City and County. However, should the Expansion Area be served underground rather than overhead, the required switch gear for Area E has the capability to service both subdivisions.

It is anticipated that the Makai Area will also be provided with electrical and communication facilities by HECO and HTCO, with service connections from Renton Road.

The proposed Varona Village Phase II development will place additional demands on the utility systems. Discussions with HECO and HTCO are ongoing to determine the necessary infrastructure improvements required to service the project. According to HTCO, they do not foresee any problems in providing telecommunication services to the proposed facilities. These electrical and communication system improvements will be constructed and maintained in accordance with current utility standards.

#### 5.13.4 Drainage

Total off-site runoff will be similar to the current condition through the development of on-site and/or off-site improvements as applicable. A detailed description is provided in Section 5.4.

#### 5.13.5 Police, Fire and Emergency Services

##### Police

The subject property is located in the Police Department's District 8, which covers the Waianae Coast and the Ewa Plain. Response time for the entire district fluctuates between five and seven minutes. In order to meet the growing needs of the Ewa Plain communities, the police department plans to add a new regional station in nearby Kapolei. Some new positions for Ewa have just been approved in the fiscal year 1996-1997 budget, which will be implemented in the field in two years.

##### Fire

Fire services in the Ewa area are provided from an engine company and a ladder company from the Waipahu Fire Station, with support from the Ewa Beach Fire Station engine company. The Makakilo Fire Station is also available for support. The Kapolei Fire Station opened in 1995. It houses an engine company and a ladder company.

New facilities being planned for the Ewa area include a Ko Olina engine and ladder company, and the relocation of the existing Ewa Beach Fire Station into a new facility within the Ewa Marina Project.

##### Emergency Services

St. Francis Medical Center - West is the nearest hospital facility to the subject property. Ambulance service is coordinated with the City and County, and the hospital has a helipad. The medical center offers general hospital services including emergency care, outpatient care, lab and imaging services, and medical offices. The hospital has 100 licensed beds available and is operating at about 80%

occupancy (Space for a total of 136 beds is available in the hospital).

Nearby emergency medical and surgical services can also be provided by Pali Momi Medical Center (116 beds) in Aiea and Wahiawa General Hospital (162 beds of which 93 are for long-term care). Non-emergency medical services are offered at Kaiser Permanente's Punawai Clinic in Waipahu. In addition, medical services can be obtained at major hospital facilities in urban Honolulu, about a 20-minute drive away.

#### 5.13.6 Schools and Libraries

Public schools in the vicinity of the subject property are Ewa Beach Elementary, Ewa Elementary, Pohakea Elementary, Ilima Intermediate and Campbell High School. Another elementary school is currently being built in Ewa Gentry. Other schools in the Ewa District include Barbers Point, Mauka Lani Elementary, Makakilo, and Kapolei Elementary.

Based on already anticipated residential growth, two elementary schools are proposed for Kapolei Village and one each at Ewa Marina, and in the Laulani development. In addition, an intermediate school is proposed for Kapolei Village and a high school is proposed to occupy a site in the HFDC Kapolei property.

It is estimated that this project will require the accommodation of an additional 104 elementary school, 39 intermediate school, and 49 high school students<sup>3</sup>. Depending upon the number of residential units ultimately developed in the subject property, expansion of elementary, intermediate, and high school(s) may be needed. A regional library is planned at the City of Kapolei.

To mitigate the impact of housing development on schools, DHCD or the project's future developers will make a fair-share contribution for needed school facilities for those schools impacted by the proposed project.

#### 5.13.7 Recreational Facilities

Recreational facilities in the Ewa area are designated as regional parks, community parks, neighborhood parks, and beach/shoreline parks. Regional parks are large recreational complexes. Community parks serve an approximate population of 10,000 people and normally include play fields, courts, and a recreation building. Neighborhood parks serve an approximately population of 5,000 people and normally include play fields, courts, and a comfort station. Beach/shoreline parks are day use parks primarily for swimming, sunbathing, and picnicking.

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<sup>3</sup>Based on percentages used in letter: State of Hawaii, Department of Education to Helber Hastert & Fee, Planners, January 8, 1996.

The existing parks in the Ewa area are as follows:

Existing Parks in the Ewa Area

<u>Name</u>	<u>Type</u>	<u>Size (acres)</u>
Ewa Mahiko Park	neighborhood	6.00
Barbers Point Beach Park	beach	11.73
Ewa Beach Community Park	community	13.253
Ewa Beach Park	beach	4.88
Kahe Point Beach Park	beach	4.47
Kamokila Park	community	5.888
Kapolei Park	regional	28.024
Makakilo Community Park	beach	18.26
Makakilo Park	neighborhood	4.013
Mauna Lani Neighborhood Park	neighborhood	4.013
Oneula Beach Park	beach	30.00
Puuloa Playground	neighborhood	4.34
West Beach Shoreline Park, north	beach	10.00
West Beach Shoreline Park, south	beach	18.26

Population growth in the subject property will create new demands on recreation facilities. However, a number of parks are planned and proposed for the Ewa area, as follows:

Proposed for the Ewa Area  
(Sites Undetermined)

- Makakilo Neighborhood Park #1
- Makakilo Neighborhood Park #2
- Honokai Hale District Park
- Makakilo District Park
- Ewa Beach District Park
- Ewa Beach Neighborhood Park
- Nanikai Gardens Neighborhood Park

Parks Planned for the Ewa Area

- Ewa Mahiko District Park
- West Beach Neighborhood Park
- Kapolei Regional Park
- Asing Community Park

City Park dedication requirements require new residential developments provide land or paying for their *pro-rata* share of park facilities to ensure that the long-term recreational needs of the community are satisfied. According to the Department of Parks and Recreation, the proposed project

is in compliance with the City's Park Dedication Ordinance No. 4621.

#### 5.13.8 Solid Waste Disposal

Currently, the site is undeveloped and does not generate solid wastes. The proposed project will result in the generation of solid waste during construction and after development. Construction wastes will primarily consist of vegetation, rocks and debris resulting from clearing and grubbing the site at the onset of construction.

Engineering Concepts, Inc. estimated the solid waste that may be generated by the project in its civil engineering report (Appendix E). The typical range of per capita solid waste generation from a municipal source (residential and commercial) is 2.0 to 5.0 pounds per capita per day (lb/capita/day). Municipal solid waste generation from the proposed development is estimated to be 3 to 5 tons/day based on an average per capita generation rate of 4.0 lb/capita/day. The lower generation rate would be associated with development of only single family residential units, while the higher rate would be associated with development of higher density multi-family residential units in Area E and the Makai Area. The solid waste composition is expected to be typical for a municipal source. Most of these wastes will be combustible.

#### Impacts and Recommendations

It is anticipated that refuse generated by the single family residential developments will be collected by the City and County Department of Public Works Division of Refuse Collection and Disposal. Refuse generated from multi-family residential developments and the community facilities which may be developed in the Makai Area would be serviced by private and/or public refuse collection companies.

It is estimated that municipal refuse collection from the site will necessitate 2 to 4 truck trips per collection day. This estimate is based on a manually loaded, 20 cubic yard compactor truck capable of achieving a typical compaction density of 500 pounds per cubic yard and twice a week collection service. The lower number of trips is associated with development of only single-family residential units, while development of multi-family units at Area E and the Makai Area would result in the higher number of trips.

The proposed development will be a new generator of solid waste. Generation of construction wastes will be a short term impact. The contractor will be required to remove all debris from the project site to mitigate the environmental impact.

Refuse generated from the proposed Varona Village Phase II development is not expected to have a significant impact on the leeward Oahu solid waste disposal facilities. The City and County currently operates the H-POWER waste energy recovery facility and a landfill site at Waimanalo Gulch in leeward Oahu.

## 5.14 Hazards

There are no known topographic features on the project site that could result in natural hazards such as geologic faults, or volcanic activity. As previously mentioned, the Flood Insurance Rate Maps (FIRM) shows only a small portion of the Makai Area remaining in the flood plain.

### 5.14.1 Tsunami

The project area is not located within a tsunami inundation zone.

### 5.14.2 Nuisances and Site Safety

Volcanic hazards in the area are considered minimal due to the extinct status of former volcanoes. Seismic hazards in the area are no greater than other locations on Oahu and are accounted for in the City building codes.

Due to drainage improvements installed by the City, only a small portion of the Makai Area is shown as remaining in the flood plain, but storm runoff on this portion of the Makai Area can be accommodated by the adjoining Temporary Basin No.13. The proposed project is not expected to either effect or be effected by tsunamis or seismic hazards.

### 5.14.3 Air Installations Compatible Use Zones

Portions of the Varona Village Expansion Area and Area E are located within the Air Installation Compatible Use Zones (AICUZ) emanating from Barbers Point Naval Air Station (BPNAS). The AICUZ places restrictions on the density of residential development in certain areas of the Varona Village Phase II project areas. The AICUZ is maintained by restrictive easements which run with the land. BPNAS is scheduled to close in 1999. As allowed for in the easements documents, in the event that the Navy determines that methods of aviation or the use of BPNAS has so changed as to eliminate the need for the easements and issues a written declaration to that effect, or if BPNAS ceases to be used as a military air station, the restrictive easements shall terminate.

## 6.0 IDENTIFICATION AND SUMMARY OF IMPACTS AND ALTERNATIVES CONSIDERED

In compliance with the provisions of Title 11, Department of Health, Chapter 200, Environmental Impact Statement Rules, Section 11-200-17(f), the "known feasible" alternatives to the proposed Master Plan are limited to those that would allow the objectives of the Master Plan to be met, while minimizing potential adverse environmental impacts. To summarize, the Department of Housing and Community Development objectives that guided the master planning of the various project areas are as follows:

### Varona Village Expansion Area:

- 1) To provide opportunities for affordable home ownership, especially to existing and past

residents and families of Varona Village (and the greater Ewa Villages).

Area E:

- 1) To create a parcel that would be attractive for market housing development in order to subsidize affordable-priced housing; and
- 2) To utilize golf course frontage (along the existing Ewa Villages Golf Course) by developing desirable golf frontage market lots.

Makai Area:

- 1) To create an area for public benefit-oriented activities, such as a YMCA or elderly housing.

### **6.1 The Selected Alternative**

Although the final layout and configuration of the proposed project master plan for the project areas will be refined through review by the State Historic Preservation Office, the engineering design process, and by private developers (possibly one or more of the three project areas) development of each project area will ensure that the long range use of the property will contribute to both increased property tax revenues and/or income from the sale of improved property. These potential values will be enhanced by the careful assessment of interrelationships between differing land uses as identified by the master plan.

The selected alternative will provide affordable housing opportunities in the Varona Village Expansion Area similar to the rehabilitated Tenney Village, market housing similar to Green View Villas in Area E, and community-oriented and/or residential facilities in the Makai Area. Those environmental impacts that do occur can be mitigated by the installation of appropriate infrastructure improvements and implementation of best management practices during project construction. Use of appropriate architectural design and physical buffers (i.e. landscaping, roadways, topography, etc.) will also integrate the project into the surrounding community's land uses.

### **6.2 "No-Action Alternative"**

The "no-action" alternative would not be consistent with stated governmental policies of establishing new housing opportunities for the residents of the area, City, and State that the selected alternative would provide.

The "no-action" alternative would maintain the site as primarily vacant. Consequently, the overall negative environmental impacts to the area, although primarily aesthetic (overgrown weeds and rubbish) and soil erosion, would also continue. In addition, the site would remain under-utilized in terms of meeting the demand for additional residential development and as a limited employment center.

### **6.3 More Intensive Development Alternative**

An alternative to the Selected Alternative is more intensive development. Present plans call for single-family use in the Varona Village Expansion Area, single-family or multi-family use in Area

E, and community facility and/or residential use (single-family or multi-family) in the Makai Area. A more intensive development alternative would involve higher density residential uses in each of these areas. In all probability, multi-family or apartment use would not be possible in the Varona Village Expansion Area because it would not be compatible with the historical character of Varona Village which will be undergoing rehabilitation shortly. Area E could undergo higher intensity development (up to three or four stories), but the trade-off may be decreasing desirability by potential buyers despite its golf course frontage. Other trade-offs of more intensive development in Area E would be increased traffic, noise (construction and long-term), and air pollution. Depending upon market conditions, more intensive development will result in a large inventory to supply a heated market/strong demand (which would be beneficial to the City and County of Honolulu) or too large an inventory that will take longer to absorb than the selected alternative, adding to the City's debt service. Similarly, the Makai Area could be more intensively developed than the selected alternative, adding to a larger inventory of units that may or may not be beneficial depending on market conditions. More intensive development of the Makai Area would also result in increased traffic, noise, and air pollution. In general, this alternative was not selected because it is the least in keeping with the character of Ewa Villages.

#### 6.4 Summary of Impacts

The impacts associated with development of the Varona Village Phase II Master Plan are not unique to this project, but are typical of most residential development. Higher intensity land uses will likely result in impacts requiring mitigative measures. Traffic patterns will be altered, air and noise impacts will occur, and additional demands on existing water and wastewater infrastructure systems within this area will result.

Project development will also impact use of public facilities in the area, and police and fire protection services. Additionally, new property tax revenues and sale of real estate will generate funds to mitigate the costs of government services. Consequently, the net fiscal impact of the Varona Village Phase II Master Plan is expected to be positive. Additionally, development will provide employment during construction and operation of the project.

It should be noted that the major environmental impacts related to the Varona Village Phase II Master Plan can be mitigated by the implementation of best management practices during construction, through the development of new infrastructure and public service facilities and proper attention to design. The necessary improvements will likely be provided by project developers and/or through joint ventures with the City. Consequently, no significant environmental effects will result from the development of the subject property provided appropriate mitigation measures are employed throughout the development period and during project operation.

The completion of the Varona Village Phase II project will also complete the master planned Ewa Villages Revitalization Project. Also, the project helps to achieve the State and County land use goals of creating the Second City in Ewa.

## 7.0 PROPOSED MITIGATION MEASURES

As indicated above, few potential adverse impacts to the area are expected to result from implementation of the proposed project. Short-term impacts will result in the initial construction phase which will require on-site grading and movement of vehicles within the project site. These activities will generate localized noise and dust during construction periods. Mitigation measures to minimize adverse air quality would include minimizing the amount of dust-generating materials and activities, providing an adequate water source at the site prior to startup of construction activities, frequent watering of unpaved roads and construction areas, dust screens, and mulching and planting of ground cover and other vegetation as soon as possible after construction. Construction activities would comply with all applicable noise control regulations of the City and Department of Health.

Long-term impacts from the development of the Varona Village Phase II Master Plan is expected to produce minimal impacts to the adjacent residential property owners. The proposed project is not expected to have any impact on the micro climate of the project area or region. Planned structures would not be tall enough to significantly affect existing wind patterns; and new landscaping will not significantly effect temperature, although some localized cooling can be expected to result from the establishment of landscaping. No specific or predominate natural feature is visually associated with the project site.

Recommended mitigation measures include the following:

### *Short term:*

- Removal of existing remnant house foundations and waste in accordance with applicable State and Federal requirements.
- Frequent watering during construction and demolition activities to maintain dust control.
- Controlling dust from the shoulders, project entrances, and access roads.
- Centralizing material transfer points and onsite vehicular traffic routes.
- Grassing of swales and sodding as soon as practicable once grading has been completed.
- Wind screening as appropriate to limit fugitive dust.
- Development of public facilities appropriate to the early phases of development.
- Restrict use of construction equipment to daylight hours.
- Providing adequate dust control measures during weekends, after hours, and prior to daily startup of construction activities.
- Locating potentially dusty equipment in areas of the least impact.

- Controlling dust from debris being hauled away from the project site.
- Establishment of on-site drainage retention basins during construction to mitigate soil erosion and off-site runoff.

*Long term:*

- Establishment of extensive landscaping to maintain long-term air quality and aesthetically integrate the Varona Village Phase II development into the surrounding neighborhood.
- Where appropriate, create landscape buffers between areas of high and low intensity land uses to reduce noise and glare within residential areas.
- Use of appropriate engineering, design and construction measures to ensure adequate drainage and irrigation of the site.
- Construct transportation improvements to mitigate traffic generated by the project, including:
  - DHCD or the project's future developers will contribute their fair share of the costs of the construction of North-South Road.
  - DHCD or the project's future developers will make a fair-share contribution for needed school facilities for those schools impacted by the proposed project.
  - The developer of each project area shall be required to install traffic signals at the time signals are warranted.

All future construction activity in the subject property will maintain strict compliance with State of Hawaii Air Pollution Control regulations. A combination of such measures as dust-watering, disturbed area limitation and wind screens should be implemented as appropriate. Impacts from exhaust emissions of construction vehicles will usually be mitigated by the dissipative effect of the winds, especially as most construction will be remote from existing residences or other sensitive land uses. Particular care in implementing dust control should be taken when construction activities take place near existing homes, businesses, highways or other sensitive uses.

## 8.0 SIGNIFICANCE CRITERIA

According to the Department of Health Rules (11-200-12), an applicant or agency must determine whether an action may have a significant impact on the environment, including all phases of the project, its expected consequences both primary and secondary, its cumulative impact with other projects, and its short-term and long-term effects. In making the determination, the Rules establish "Significance Criteria" to be used as a basis for identifying whether significant environmental impact. According to the Rules, an action shall be determined to have a significant impact on the environment if it meets any one of the following criteria:

- **Involves an irrevocable commitment to loss or destruction of any natural or cultural resource**

Comment: The proposed project will not impact scenic views of the ocean or any ridgelines from the H-1 Freeway or other heavily traveled roadways in the area. The visual character of the area of application will change from vacant unkept land to landscaped residential uses compatible with surrounding residential land uses. Presently, the subject property is not landscaped or otherwise improved for aesthetic purposes. The current vegetation consists almost exclusively of weedy wayside species and non-native cultivated species.

The property is not subject to coastal-related flooding. Development of drainage systems will follow design standards of the City to ensure the safe conveyance and discharge of storm runoff. In addition, the subject property is located outside of the City's Special Management Area (SMA).

As previously noted, no significant archaeological or historical sites are known to exist on the subject property. The State Historic Preservation Division has stated, "We believe that the development of the residential area will have 'no effect' on the character of the [Ewa Plantation Villages] historic district." Should any archaeologically significant artifacts, bones, or other indicators of previous sugar cultivation activity be uncovered during the construction phases of development, their treatment will be conducted in strict compliance with the requirements of the Department of Land and Natural Resources.

- **Curtails the range of beneficial uses of the environment**

Comment: Because the subject property has been significantly altered by previous sugar cultivation, the beneficial use of the natural environment have already been curtailed. To return the site to a natural environmental condition is not practical from both an environmental and economic perspective.

- **Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS**

Comment: The proposed Varona Village Phase II Master Plan is consistent with the Environmental Policies established in Chapter 344, HRS.

- **Substantially affects the economic or social welfare of the community or state**

Comment: The proposed project will contribute to the community by providing quality homes and community facilities. Surrounding land use patterns will not be negatively or significantly altered, nor will unplanned population growth or its distribution be stimulated. All of the community's existing residents will be given first priority for home ownership.

- **Substantially affects public health**

Comment: Although the public health may be impacted by air, noise, and water quality impacts, any impacts will be insignificant or not detectable when mitigated, especially when weighed against the positive economic, social, and quality of life implications associated with the project.

- **Involves substantial secondary effects, such as population changes or effects on public facilities**

Comment: Existing and planned large-scale housing development projects within the Ewa Development Plan area, will contribute to a future population growth rate that will require expansion of public and private facilities and services. These improvements will become necessary as the overall population of Oahu grows and settlement patterns shift to Ewa. However, the proposed project will not in itself generate new population growth, but respond to the Development Plan area's present and future population growth which would occur with or without the project, as a result of implementing State and County policies to direct growth to Ewa.

Infrastructure improvements will include water distribution, collection of wastewater and solid waste, and management of storm runoff from the project site. Needed infrastructure will not burden existing city systems, yet residents of Oahu will benefit from the expanded economic and housing opportunities afforded by the proposed project.

In addition, higher property values and expansion of employment opportunities will generate new sources of direct and indirect revenue for individuals and the City and County of Honolulu. Property tax revenues created by the project will be placed into the City's General Fund. The City government can then utilize these funds for capital improvements as appropriate to "meet the needs of Oahu's anticipated future population" on an island-wide basis "in order to meet the needs of Oahu's anticipated future population."

The proposed project will provide both temporary and long-term employment opportunities during the construction period. Indirect employment in a wide range of service related industries will also be created from construction.

- **Involves a substantial degradation of environmental quality**

Comment: The proposed development will replace the vacant uses of the property which results in ongoing soil erosion, with the addition of urban landscaping resulting in reduced soil erosion. This will mitigate the visual impact of the development as viewed from outside the site while the overall design will complement background vistas and plantation lifestyles of the past.

- **Is individually limited but cumulatively has considerable effect on the environment, or involves a commitment for larger actions**

Comment: By planning now to meet the future needs of the community, the Varona Village Phase II Master Plan is compatible with the existing residential character of the larger Ewa Villages Revitalization project. None of the proposed uses will obstruct existing views of the mountain ranges or be visually incompatible with the surrounding low-rise character of existing development. Cumulative impacts on the Ewa Plain have been addressed by the Kapolei Area Long-Range Master Plan, and other regional infrastructural studies.

- **Substantially affects a rare, threatened or endangered species or its habitat**

Comment: There are no known rare, threatened or endangered species or its habitats associated with the subject property or that would be affected by the implementation of the proposed master plan.

- **Detrimentially affects air or water quality or ambient noise levels**

Comment Any possible impact to near-shore ecosystems resulting from surface runoff, will be mitigated by the establishment of on-site retention basins during the construction phases of development. While there will be an increase in ambient noise levels from traffic from North-South Road, much of it will be generated from off-site traffic and will be mitigated through the installation of noise attenuation berms and walls. State air quality standards may be exceeded due to future traffic, but to a lesser degree than experienced by other areas on Oahu.

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

Comment: Development of the property is compatible with the above criteria by establishing a master planned development well within an existing urban area and away from an environmentally sensitive zone. The physical character of the subject property has been previously disturbed by agricultural activities. As such, the property no longer reflects a "natural environment."

- **Substantially affects scenic vistas and viewplanes identified in county or state plans or studies**

Comment: Development of the proposed project would not substantially affect any viewplanes identified in county or state plans or studies. Shoreline, valleys, or ridges will not be impacted by the Varona Village Phase II Master Plan.

- **Requires substantial energy consumption**

Comment: The annual electrical demand of the project when fully developed is expected to reach approximately 5 million kilowatt-hours. This is based on an average estimated electrical power demand of 800 kilowatt-hours per month per unit. Electrical power for the project will most probably be provided mainly by oil-fired generating facilities located on Oahu. However, with H-Power and the AES coal-fired power plant now online at Campbell Industrial Park, some of the project power could also come from sources burning other fuels.

## **9.0 RELATIONSHIP OF THE PROPOSED ACTION TO EXISTING PUBLIC PLANS, POLICIES AND CONTROLS**

### **9.1 Hawaii State Plan**

The Hawaii State Plan was adopted in 1978 and was revised in 1986 and again in 1991 (Hawaii Revised Statutes, Chapter 226, as amended). The Plan establishes a set of themes, goals, objectives and policies that are meant to guide the State's long-run growth and development activities.

The three themes that express the basic purpose of the Hawaii State Plan are *individual and family self-sufficiency, social and economic mobility and community or social well-being*. Reclassification of the subject property will enable development of the subject property in a manner that will ultimately help fulfill these goals for the residents of Hawaii.

The following sections analyze the relationship of the proposed project to relevant State Plan goals, objectives, policies and priority guidelines.

#### **Objectives and Policies for Population**

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

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

*Section 226-5(b)(7): Plan the development and availability of water resources in a coordinated manner so as to provide for the desired levels of growth in each geographic areas.*

**Discussion:** The urbanization of the subject property would provide lands for future housing, educational and economic opportunities for the residents of the State, in conformance with other existing State and County land use policies. Water resource development will be required and

developed to support urbanization in the subject property.

#### **Objectives and Policies for the Economy - in General**

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

*Section 226-6(a)(2): A steadily growing and diversified economic base that is not overly dependent on a few industries.*

*Discussion:* The addition of new housing at Varona Villages, will help to diversify the economy of the Ewa region by providing increased employment opportunities to an area that has been identified as the secondary urban center in the Oahu General Plan. The future residents of Varona Village will likely also work within the region as new business and service facilities are established.

#### **Objectives and Policies for the Economy - Agriculture**

*Section 226-7(b)(6): Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.*

*Discussion:* The urbanization of these lands would cause loss of Land Study Bureau A- and B-rated lands as well as Prime and Other Important agricultural land (see Section 5.3.3). While the subject property is suited for agricultural use, these lands represent a logical infill of urban land uses within Ewa Villages because of the proximity to existing and planned urban areas and the proximity of necessary infrastructure. Given the strong demand for urban lands with existing or available infrastructure, the potential benefits from the urbanization of the subject property outweigh the loss of potential agricultural production, especially given the availability of agricultural land elsewhere on the island.

#### **Objectives and Policies for the Physical Environment - Land-based, Shoreline and Marine Resources**

*Section 226-11(a)(2): Effective protection of Hawaii's unique and fragile environmental resources.*

*Section 226-11(b)(3): Take into account the physical attributes of areas when planning and designing activities and facilities.*

*Discussion:* The long history of sugar cane cultivation over nearly all of the subject property means that little in the way of natural biological communities remain and require protection. It is preferable to seek lands proximate to existing urban development rather than on other agricultural lands that cover much of the Central Oahu area.

**Objectives and Policies for the Physical Environment - Scenic, Natural Beauty, and Historic Resources**

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

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

*Discussion:* According to an archaeological survey conducted for the Ewa Villages master plan, urbanization will have "no effect" on archaeological resources (see Appendix H). Since the majority of the subject property has been under sugar cultivation for many years, it is highly unlikely that there are any historical resources remaining.

**Objects and Policies for the Physical Environment - Land, Air and Water Quality**

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

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

*Discussion:* Development and urban use of the subject property, is estimated to result in reduced soil erosion than its current vacant condition and especially compared to its previous condition during sugar cultivation. As a result, air pollution from wind driven dust and water pollution from soil erosion should lessen with future urbanization. Air quality has also improved with the end of sugar cane burning. Best management practices will be implemented during construction to mitigate the potential for significant soil erosion.

**Objectives and Policies for Facility Systems - Solid and Liquid Wastes**

*Section 226-15(b)(1): Encourage the adequate development of sewerage facilities that complement planned growth.*

*Section 226-15(b)(2): Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic.*

*Discussion:* Provision for adequate wastewater treatment facilities and the development of recycling and solid waste reduction programs can be effectively coordinated with appropriate state and county agencies as the proposed uses for the subject property are developed.

**Objectives and Policies for Facility Systems - Water**

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

*Discussion:* The development of the Varona Village Phase II Master Plan has long been considered in the planning and development of regional water facility systems. As detailed proposals for the subject property are developed, water source commitments from the applicable agencies will be obtained and applicable fees paid to the Board of Water Supply.

#### **Objectives and Policies for Facility Systems - Transportation**

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

*Discussion:* The *Oahu Regional Transportation Plan* is a planning process already in place which addresses transportation impacts of proposed developments within the Second City. Refinements and additions to this plan are expected as a result of coordination between state and county agencies. Such efforts are attempts to provide for long-range transportation improvements that will be needed in the region to accommodate anticipated growth. Varona Villages is also located adjacent to the old railroad ROW which has been retained intact by the City of Honolulu as a potential transportation corridor (rapid transit and bicycle) in the future.

#### **Objectives and Policies for Socio-Cultural Advancement - Housing**

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

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

*Discussion:* Although specific land uses for particular areas of the subject property have not been finalized, residential uses will be the primary component of the development plan. Affordable, renovated, and market-priced housing units would be constructed, providing additional housing opportunities for residents of the City and County of Honolulu in an area identified as the Second City. Affordable housing, renovated housing, and market-price housing will ensure a range of housing opportunities available to the residents of Oahu.

#### **Objectives and Policies for Socio-Cultural Advancement - Education**

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

*Discussion:* Development in the subject property may increase the need for new or expanded school facilities to serve the requirements of future residents.

##### **9.1.1 Hawaii Water Plan**

The Hawaii Water Plan addresses the need for comprehensive water resource planning through four components: a water resource protection plan; water use and development plan for each county; a

water projects plan; and a water quality plan. Coordination with the City and County of Honolulu Planning Department will be needed to incorporate the water demand projections for this project into the Oahu Water Management Plan component of the Hawaii Water Plan.

## 9.2 State Functional Plans

The Hawaii State Plan provides for the preparation of Functional Plans by the state agencies responsible for certain program areas. There are twelve Functional Plans dealing with specific areas of concern and each contains objectives, policies, and implementing actions necessary to accomplish the goals of the plan. State Functional Plans cover the program areas of agriculture, transportation, conservation lands, housing tourism, historic preservation, energy, recreation, education, health, human services and employment. The following sections describe the aspects of the Functional Plans relevant to the proposed project and discuss the relationship of the proposed action to the goals, objectives and policies of the State.

### 9.2.1 State Housing Functional Plan

The State Housing Functional Plan identifies and proposes solutions for major issues concerning the availability, affordability, quality and development of housing in the State of Hawaii.

*Objective A: Home ownership for at least sixty percent, or roughly 248,500 households, by the year 2000.*

*Policy A(3): Ensure that (1) housing project and (2) projects which impact housing provide a fair share/adequate amount of affordable home ownership opportunities.*

*Discussion:* The proposed development of the subject property would provide for future housing needs and support home ownership for residents of Hawaii. Affordable housing requirements will be met according to State and County guidelines.

### 9.2.2 State Education Functional Plan

Fulfilling a broadened and strengthened educational system that enriches all of Hawaii's residents, regardless of age, race, place of residence or special needs, is the basic issue addressed in the State Educational Functional Plan.

*Objective A: Service and Facilities.*

*Policy: Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.*

*Discussion:* The Varona Villages Phase II project will meet any requirements of the State Department of Education in order to ensure that adequate and accessible educational services and facilities are available for project residents. The subject property is near existing schools and the

future site for a new campus for UH West Oahu.

### 9.2.3 State Agriculture Functional Plan

The State Agriculture Functional Plan defines and addresses areas of statewide concern to agriculture including preservation of agricultural lands, water resources and commodity marketing.

*Objective H: Achievement of productive agricultural use of lands most suitable and needed for agriculture.*

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

*Action (H(2)(c): Administer land use district boundary amendments, permitted land uses, infrastructure standards, and other planning and regulatory functions on important agricultural lands and land in agricultural use, so as to ensure availability of agriculturally suitable lands and promote diversified agriculture.*

*Discussion:* The urbanization of these lands would cause loss of Land Study Bureau A and B-rated lands as well as "Prime" and "Other Important" agricultural land. However, given the strong demand for urban lands with existing or developable infrastructure, the potential benefits from the urbanization of the subject property are considered to outweigh the loss of the potential agricultural production, especially given State and County plans to urbanize Ewa. These lands represent a logical infill of residential land uses, because of their proximity to existing and planned urban areas and the proximity of infrastructure.

### 9.2.4 State Recreation Functional Plan

The State Recreation Functional Plan addresses improving the quality and quantity of recreational activities in Hawaii. Particular areas of concern include land acquisition and management, shoreline and mountain access, accessibility for physically challenged citizens, and recreation program development and management.

*Policy 11-A (1): Involve the public in the planning, development, and operation of recreational facilities and programs.*

*Objective 11-C: Improve and expand the provision of recreational facilities in urban areas and local communities.*

*Objective V-C: Assure adequate support for priority outdoor recreational programs and facilities.*

*Policy V-C (1): Explore alternative funding strategies and sources.*

*Policy V-C (2): Explore alternative land acquisition strategies.*

*Discussion:* Park dedication requirements for the proposed project will be met through Ewa Mahiko Park and the provision of additional park lands, if required. Extensive development of recreational facilities in Ewa are either in place or planned by other major landowners in the area.

#### 9.2.5 State Transportation Functional Plan

The State Transportation Functional Plan focuses on expanding and improving efficiency of the State's network of highways, airports, and shipping facilities. Special attention is paid to indirect means of reducing traffic congestion.

*Objective 1.A: Expansion of the transportation system.*

*Policy 1.A.2: Improve regional mobility in areas of the State experiencing rapid urban growth and road congestion.*

*Objective 1.B: Reduction of travel demand through zoning and decentralization initiatives.*

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

*Objective 1.D: Identification and reservation of lands and right-of-way required for future transportation improvements.*

*Policy 111.A.2: Pursue private sector participation in the financing of transportation systems, developments, and projects.*

*Discussion:* The proposed development will have the net effect of reducing overall traffic congestion in the Honolulu-Kapolei region by: 1) providing new housing proximate to employment centers, 2) providing additional employment opportunities during project development; and 3) providing employment and residential opportunities accessible to the regional transportation system. The roadway system planned for Varona Village Phase II will be coordinated with State and County agencies to ensure optimum practicable linkage between the internal and external road systems. The Master Plan also includes the provision of land for a bikeway along the mauka edge of North-South Road.

#### 9.3 **State Land Use Law**

All land in the State of Hawaii is classified into one of four land use categories -- Urban, Rural, Agricultural, or Conservation -- by the State Land Use Commission, pursuant to Chapter 205, HRS. The proposed project involves 61 acres of which 50.7 acres are located within the State Agricultural District. The applicant will be seeking a State Land Use Boundary Amendment for the 50.7 acres and an additional 50.8 acres within the Ewa Villages project which has not yet been amended to the

State Urban land use district.

One of the key concerns regarding the criteria for determining lands suitable for the Urban District, as expressed in Section 205-2, HRS, is to include a sufficient reserve area for urban growth.

The State Land Use Commission Rules, adopted October 1986, require that an application for a boundary amendment show that it is "reasonable, not violative of Section 205-2 [HRS] and consistent with the policies and criteria established pursuant to Section 205-16, 205-17 and 205A-2 HRS" (Hawaii Land Use Commission Rules, Section 15-15-77). In reviewing petitions for reclassification of district boundaries, the Commission must specifically consider four criteria. The criteria presented are from Section 205-17, HRS, and are listed below, followed by a brief discussion of each criterion.

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

*Discussion:* The future reclassification will conform to all applicable goals, objectives, policies and guidelines of the Hawaii State Plan and the Functional Plans (See Sections 10.1 and 10.2).

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

*Discussion:* Section 15-15-18 of the Land Use Commission rules specifies consideration of eight factors for reclassification to Urban. These are listed and discussed below.

- 1) *It shall include lands characterized by a "city-like" concentration of structures, streets, urban level of services and other related land uses;*
- 2) *It shall take into consideration the following specific factors:*
  - A. *Proximity to centers of trading and employment except where the development would generate new centers of trading and employment;*
  - B. *Substantiation of economic feasibility by the petitioner;*
  - C. *Proximity to basic services such as sewers, transportation systems, water, sanitation, schools, parks and police and fire protection; and*
  - D. *Sufficient reserve areas for urban growth in appropriate locations based on a ten-year projection;*
- 3) *It shall include lands with satisfactory topography and drainage and reasonably free from the danger of floods, tsunami, unstable soil conditions,*

*and other adverse environmental effects;*

- 4) *In determining urban growth for the next ten years, or in amending the boundary, land contiguous with existing urban areas shall be given more consideration than non-contiguous land, and particularly when indicated for future urban use on State or County general plans;*
- 5) *It may include lands in appropriate location for new urban concentrations and shall give consideration to areas of urban growth as shown on State and County general plans;*
- 6) *It may include lands which do not conform to the standards in paragraph (1) to (5):*
  - A. *When surrounded by or adjacent to existing urban development; and*
  - B. *Only when those lands represent a minor portion of this district;*
- 7) *It shall not include lands, the urbanization of which will contribute toward scattered spot urban/development, necessitating unreasonable investment in public infrastructure or support services;*
- 8) *It may include lands with a general slope of twenty percent or more which do not provide open space amenities or scenic values if the Commission finds that such lands are desirable and suitable for urban purposes and that official design and construction controls are adequate to protect the public's health, welfare and safety, and the public's interests in the aesthetic quality of the landscape.*

**Discussion:** The proposed project is planned within the context of existing State and County land use policies that are applicable to the subject property and the region. Specifically, the *Oahu General Plan* identifies the Kapolei area as the secondary Urban Center for the City and County of Honolulu, necessary to accommodate the future population of Oahu.

A future reclassification of the subject property to Urban will meet the above-listed criteria. The subject property is part of the Ewa Development Plan area, where a large proportion of future residents will work and shop. The project is also near existing Urban District lands which are significant employment generators at Ewa Marina, Campbell Industrial Park, Kapolei Business Park, Barbers Point Harbor, Ko Olina and the City of Kapolei. All lands in the subject property are reasonably free from environmental hazards such as flooding, unstable soil, and other adverse environmental effects.

Although the subject property does not presently include land characterized by "city-like" concentration of people, structures, streets, urban level of services and other uses, the subject property is adjacent to urban lands having these "city-like" characteristics. The subject property also

has in-place infrastructure or the ability to easily extend and develop infrastructure required for quality growth, unlike other areas of Oahu. A future reclassification will favorably impact the provision for employment opportunities, educational opportunities, economic development, and housing opportunities for all income groups.

In summary, reclassification of agricultural lands within the Ewa Villages would make it easier for the State and County to meet its objectives of creating a secondary urban center in Ewa.

3. *"Impact on Areas of Statewide Concern"*

A. *Preservation or maintenance of important natural systems or habitats.*

*Discussion:* No listed, proposed, or candidate endangered species has been identified within the subject property. Nearly all of the surface is significantly disturbed and offers little habitat for native biota.

B. *Maintenance of valued cultural, historical, or natural resources.*

*Discussion:* A future reclassification will have "no effect" on archaeological resources (see Appendix H). Since the majority of the subject property has been under sugar cultivation for many years, it is highly unlikely that there are any historical resources remaining.

C. *Maintenance of other natural resources relevant to Hawaii's economy, including, but not limited to, agricultural resources.*

*Discussion:* The urbanization of these lands would cause loss of agricultural lands that are classified as "Prime" agricultural land. However, the potential benefits from the urbanization of the subject property are considered to outweigh the loss of the potential agricultural production.

D. *Commitment of state funds and resources.*

*Discussion:* The future development of this site will involve some commitment of City funds and resources for the provision of infrastructure and public facilities and services, but some or all of these costs will be offset by the sale of lands and/or homes developed as part of the project.

E. *Provision for employment opportunities and economic development.*

*Discussion:* The urbanization of the area is expected to provide a number of direct, indirect and induced jobs in the construction and service sectors.

F. *Provision for housing opportunities for all income groups, particularly the low, low-moderate, and gap groups.*

*Discussion:* Residential uses are a significant component of the proposed urbanized area. The proposed development on the subject property would increase the supply of housing in both

affordable and market range categories.

4. *"In establishing the boundaries of the district in each County, the Commission shall give consideration to the General Plan of the County in which the land is located." LUC Rule § 15-15-77(b)(4)*

*Discussion:* The County General Plan identifies the subject property for Urban Expansion.

#### **9.4 City and County of Honolulu General Plan**

The uses planned for the subject property will implement the objectives and policies of the City's General Plan in the areas of population, economic activity, natural environment and culture and recreation. The specific General Plan objectives and policies and their applicability to the proposed uses within the subject property are discussed below.

*Population Objective C - To Establish a Pattern of Population Distribution that Will Allow the People of Oahu to Live and Work in Harmony.*

*Policy 2: Encourage development within the secondary urban center at Kapolei and the Ewa and Central Oahu urban-fringe areas to relieve developmental pressures in the remaining urban-fringe and rural areas and to meet housing needs not readily provided in the primary urban center.*

*Discussion:* A future reclassification of the subject property from the Agricultural to the Urban District will be consistent with this policy as it will provide additional urban lands to encourage development in Ewa, while meeting future housing needs.

*Economic Activity Objective A - To promote employment opportunities that will enable all the people of Oahu to attain a decent standard of living.*

*Policy 1: Encourage the growth and diversification of Oahu's economic base.*

*Discussion:* The development of the subject property will directly provide expanded economic and employment opportunities to many Oahu residents related primarily to construction related employment.

*Natural Environment Objective B - To preserve and enhance the natural monuments and scenic views of Oahu for the benefit of both residents and visitors.*

*Policy 2: Protect Oahu's scenic views, especially those seen from highly developed and heavily traveled areas.*

*Discussion:* The subject property will be visible from Renton and North-South Roads, however, the overall visual impact will be changing the current view of vacant land with overgrown weeds and rubbish to a master planned development, reflecting plantation lifestyles and culture.

*Policy 4: Provide opportunities for recreational and educational use and physical contact with Oahu's natural environment.*

*Discussion:* The subject property will provide additional recreational opportunities as applicable to City and County of Honolulu requirements. Currently, the site is not accessible with little or no recreational value in its present vacant and overgrown state. No on-site recreational opportunities currently exist.

*Physical Development and Urban Design. Objective A - To coordinate changes in the physical environment of Oahu to ensure that all new developments are timely, well-designed and appropriate for the areas in which they will be located.*

*Discussion:* Considering the critical need for affordable housing and the need to maintain Hawaii's cultural heritage, the timely approval of the project is appropriate and will achieve this objective of the General Plan. The subject property will be designed to utilize existing site features to locate internal roadways, building pads, and drainage areas.

*Policy 2: Coordinate the location and timing of new development with the availability of adequate water supply, sewage treatment, drainage, transportation and public safety facilities.*

*Discussion:* Existing drainage improvements of surrounding developments such as the golf course, as well as proposed drainage structures for the project area, which includes catch basins, manholes, drain pipes, and box culverts, will better manage both on-site and off-site runoff. Transportation facilities and systems have been proposed to partially mitigate future population growth in the area and increased traffic levels that may be generated.

*Policy 4: Require new developments to provide or pay the cost of all essential community services, including roads, utilities, schools, parks and emergency facilities that are intended to directly serve the development.*

*Discussion:* The developers and/or landowners will contribute their fair-share of infrastructure improvement costs that are directly required resulting from development within the subject property.

#### **9.5 City and County of Honolulu Development Plan**

The subject property is designated as Agriculture on the current Ewa Development Plan Land Use Map. According to the proposed revised Ewa Development Plan Land Use Map, the parcels are designated as Low and Medium Density Residential (Area E and Varona Village Expansion Area) and Industrial (Makai Area). It is our understanding that the Industrial designation for the Makai Area will be revised to Residential. According to the Planning Department, "the proposed project is consistent with the vision of the revised Ewa Development Plan (DP) which is presently under review by the Honolulu City Council."

## 9.6 City and County of Honolulu Land Use Ordinance

The Land Use Ordinance (LUO) of the City and County of Honolulu is intended to regulate the use of land in a manner that will encourage orderly development in accordance with adopted land use policies. Permitted land uses are classified as "Principal", "Special Accessory", and "Conditional" which restrict the various uses for the existing zoning classification. The subject property is zoned AG-1 Restricted Agricultural District.

If a future reclassification to Urban is approved, the City and County of Honolulu Department of Housing and Community Development will apply its current 201E exemption for the entire Ewa Villages to the proposed project. This will ensure compatible densities, land use restrictions, heights, setbacks, and other standards and controls.

## 9.7 Coastal Zone Management/Special Management Area

The objectives and policies of the Hawaii Coastal Zone Management (CZM) Program are included in Chapter 205A, HRS. All of the island of Oahu lies within the CZM. The subject property does not lie within the Special Management Area as defined by the City and County of Honolulu, and therefore does not require a Special Management Area Use Permit.

The relevant objectives and policies of Chapter 205A are presented below, followed by a brief discussion of the relation of the objectives to the proposed project.

*Objective 1: Provide coastal recreational opportunities accessible to the public.*

*Discussion:* Not applicable to the subject property, since it is located away from the coastline.

*Objective 2: Protect, preserve and where desirable, restore those natural and man-made historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.*

*Policy 2a: Identify and analyze significant archaeological resources.*

*Discussion:* The Department of Housing and Community Development coordinates closely with the State Historic Preservation Division to ensure that man-made historic and prehistoric resources are adequately addressed.

*Objective 3: Protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources.*

*Policy 3a: Identify valued and scenic resources in the coastal zone management area.*

*Policy 3b: Ensure that new developments are compatible with their visual*

*environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline.*

**Policy 3d:** *Encourage those developments which are not coastal dependent to locate in inland areas.*

**Discussion:** The subject property, located several miles from the coastline, will not affect views towards or from the coastline and thus helps preserve the scenic values of the coastal zone.

**Objective 4:** *Protect valuable coastal ecosystems, including reefs from disruption and minimize adverse impacts on all coastal ecosystems.*

**Policy 4b:** *Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance.*

**Discussion:** The location of the proposed development area remote from the coast will preserve coastal ecosystems from adverse impacts.

**Objective 5:** *Provide public or private facilities and improvements important to the State's economy in suitable locations.*

**Discussion:** Development of the project will provide needed housing facilities in a location suitable for this kind of development. Architectural controls will ensure that new housing reflects the plantation lifestyle and culture of the Ewa Villages.

**Objective 6:** *Reduce hazard to life and property from tsunami, storm waves, stream flooding erosion and subsidence and pollution.*

**Policy 6b:** *Control development in areas subject to storm wave, tsunami, flood, erosion, subsidence, and point and non-point source pollution hazard.*

**Policy 6c:** *Ensure that developments comply with requirements of the Federal Flood Insurance Program.*

**Discussion:** No coastal hazards will impact the subject property. All requirements of the Federal Flood Insurance Program will be complied with.

**Objective 7:** *Improve the development review process, communication, and public participation in the management of coastal resources and hazards.*

**Policy 7a:** *Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development.*

*Discussion:* The proposed development will be subject to extensive permitting procedures encompassing public, state and county involvement. This process ensures a comprehensive review of potential impacts.

*Objective 8:* *Stimulate public awareness, education, and participation in coastal management.*

*Discussion:* Not applicable to the subject property.

*Objective 9:* *Protect beaches for public use and recreation.*

*Discussion:* The subject property, located several miles from the coastline, should not affect beaches used by the public for recreation.

## 10.0 FINDINGS AND DETERMINATION

The Varona Village Phase II Master Plan is a logical completion for the Ewa Villages project. The proposed project is consistent with the existing infrastructure and intensity of land uses of the surrounding neighborhood. Because the size, scale, and location of the project adjacent to existing residential land uses will not significantly impact the surrounding community, appropriate consideration to potential environmental impacts is not considered significant.

Based on the scale of the proposed Varona Village Phase II Master Plan, its potential environmental impacts, analysis of significance criteria (Section 8.0), and review of comments received during the public comment period, DHCD has reached a Finding of No Significant Impact, and has determined that an Environmental Impact Statement (EIS) is not required.

## 11.0 LIST OF REQUIRED PERMITS AND APPROVALS

The following is an approximate list of major approvals and permits required for the proposed project:

<u>Permit or Approval</u>	<u>Authority</u>
State Land Use District Boundary Amendment	State Land Use Commission
Development Plan Amendment (through DP revisions)	Planning Department/Planning Commission/ City Council/Mayor
201E Exemption	Dept. of Land Utilization, Planning Commission, City Council
Subdivision Approval	Department of Land Utilization

Grading Permit	Department of Public Works
NPDES Permit	Department of Health
Building Permit	Building Department

## 12.0 WRITTEN COMMENTS TO THE DRAFT EA AND RESPONSES

The following agencies and organizations have reviewed the Varona Village Phase II Draft EA. Those that responded with written comments are marked with an asterisk \*, those that responded with no comment are marked with a tilde ~. Copies of the agency/organization letters and responses to these letters are included in the following pages.

### State Agencies

Department of Agriculture  
 Department of Business, Economic Development, and Tourism\*  
 Department of Education\*  
 Department of Health\*  
 Department of Land and Natural Resources\*  
 Department of Transportation\*  
 University of Hawaii Environmental Center\*  
 Housing Finance & Development Corporation\*  
 Land Use Commission\*  
 Office of Environmental Quality Control\*  
 State Historic Preservation Division\*  
 Senator Brian Kanno  
 Representative Annette Amaral  
 Ewa Beach Community School Library

### City and County Agencies

Board of Water Supply\*  
 Building Department\*~  
 Department of Finance  
 Fire Department\*  
 Department of Human Resources  
 Department of Land Utilization  
 Department of Parks and Recreation\*  
 Planning Department\*  
 Police Department\*  
 Department of Public Works\*  
 Department of Transportation Services\*  
 Department of Wastewater Management\*  
 Councilmember John DeSoto

### Federal Agencies

U.S. Army Corps of Engineers\*  
 Department of Housing and Urban Development  
 Naval Air Station, Barbers Point

Soil Conservation Service\*~  
U.S. Geological Survey\*~

**Other**

The Estate of James Campbell  
Ewa Beach Community Association  
Ewa Neighborhood Board No. 23  
Ewa Village Community Association  
Ewa Village Non-Profit Development Corporation  
Friends of Ewa  
GTE Hawaiian Tel\*  
Gasco, Inc.  
Hawaiian Electric Company, Inc.  
Hawaiian Railway Society  
Historic Hawaii Foundation  
ILWU  
Makakilo/Kapolei/Honokai Hale Neighborhood Board No. 34  
Oahu Sugar Company  
Waipahu Business Association  
Waipahu Community Association  
Waipahu Neighborhood Board No. 22

\*Provided written replies  
~Had no comment

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**DEPARTMENT OF BUSINESS,  
ECONOMIC DEVELOPMENT & TOURISM**

BENJAMIN J. CAYENNE  
GOVERNOR  
EDU F. HANA  
DIRECTOR  
NICK EGGED  
DIRECTOR, OFFICE OF PLANNING

**OFFICE OF PLANNING**

No. 1 Capitol District Building, 250 South Hotel Street, 4th Floor, Honolulu, Hawaii 96813  
Mailing Address: P.O. Box 3540, Honolulu, Hawaii 96811-3540

Telephone: (808) 587-2846  
Fax: (808) 587-2848

Ref. No. P-6286

September 13, 1996

Mr. Roland D. Libby, Jr.  
Director  
Department of Housing and Community  
Development  
City and County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

SEP 19

Attn: Avis Kamimura

Dear Mr. Libby:

Subject: Draft Environmental Assessment (DEA) for Varona Village,  
Phase II, Ewa, Oahu

We have the following comment on the subject project.

We note that the alignment of the North/South Road near Varona Village, as appears in Figure 5, Kapolei Area Master Plan, and Appendix D, Traffic Study, is different from the alignment that is shown on the latest Public Facilities Map of the proposed Ewa Development Plan.

If there are any questions, please contact Charles Carole of our CZM Program at 587-2804.

Sincerely,

*Rick Egged*  
Rick Egged  
Director  
Office of Planning

cc: Vincent Shigekuni, PBR Hawaii



LAND PLANNING  
LANDSCAPE ARCHITECTURE  
ENVIRONMENTAL STUDIOS

September 25, 1996

Mr. Rick Egged, Director  
State of Hawaii  
Department of Business, Economic Development & Tourism  
Office of Planning  
P.O. Box 3540  
Honolulu, Hawaii 96813

Dear Mr. Egged:

SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT

Thank you for your review of the environmental assessment for the proposed Varona Village Phase II project. In regards to the North-South Road alignment, it is currently the subject of a Major Investment Study (MIS) which is being conducted by the City and County of Honolulu Department of Transportation Services. It is assumed that once the MIS is completed, the Kapolei Area Long Range Master Plan and the Ewa Development Plan Public Facilities Map will be revised accordingly.

If you have any further questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

*Vincent R. Shigekuni*

Vincent R. Shigekuni  
Associate

cc: Avis Kamimura, Department of Housing and Community Development w/enc1.  
Office of Environmental Quality Control w/enc1.

1941098-11-w61

VE Frank Reardi • Thomas S. Wiener • R. Sean Thurman • Kenneth J. Cheng  
PACIFIC TOWER, SUITE 600 300 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5633 FAX: (808) 523-3102  
BRANCH OFFICE: 1100 LAGOON CENTER IN ALUPONO STREET, SUITE 300 HILTI, HAWAII 96731 TELEPHONE: (808) 944-3313 FAX: (808) 944-0888



STATE OF HAWAII  
DEPARTMENT OF EDUCATION  
P. O. BOX 2344  
HONOLULU, HAWAII 96810

OFFICE OF THE SUPERINTENDENT

September 11, 1996

96 SEP 18 08:31

Department of Housing  
and Community Development  
City and County of Honolulu  
650 South King Street, 5th Floor  
Honolulu, Hawaii 96813

DEPT. OF HOUSING  
& COMM. DEVELOPMENT

Attn: Avis Kamimura

Dear Ms. Kamimura:

SUBJECT: Draft Environmental Assessment  
Varona Village Phase II, Ewa, Oahu  
TRK: 9-1-17: 68 (DOL), 69 (DOL), and 75 (DOL)

We have reviewed the subject environmental assessment and have determined that the proposed development of 519 residential units will have the following enrollment impact on the area schools:

School	Grades	Projected Students
Ewa Elementary	K-6	130
Iliwa Intermediate	7-8	31
Campbell High	9-12	52

The projected 213 students from this development will have an impact on the schools in the area. All three schools are operating at capacity and have a shortage of classrooms.

The Department of Education (DOE) will request that the developer make a fair-share contribution to the satisfaction of the DOE for needed school facilities for those schools impacted by this residential development. The developer should be directed to contact the DOE to determine the fair-share contribution prior to issuing zoning approvals, subdivision approvals, or building permits.

Page 2  
September 11, 1996

Should there be any questions, please call the Facilities Branch at 733-4862.

Sincerely,

*Herman M. Aizawa*  
Herman M. Aizawa, Ph.D.  
Superintendent

HMA:hy

cc: A. Suga, OBS  
W. Staszko, LDO



LAND PLANNING  
LANDSCAPE ARCHITECTURE  
ENVIRONMENTAL STUDIES

November 6, 1996

Mr. Herman M. Aizawa, Ph.D.  
Superintendent  
State of Hawaii  
Department of Education  
P.O. Box 23360  
Honolulu, Hawaii 96804

Dear Mr. Aizawa:

**SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT**

Thank you for your review of the environmental assessment for the proposed Varona Village Phase II project and for the student enrollment projections. Please be assured that DHCD or the projects' future developers will make a fair-share contribution for needed school facilities for those schools impacted by the proposed project prior to small lot subdivision approval.

If you have any further comments or questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

*Vincent R. Shigeekuni*

Vincent R. Shigeekuni  
Associate

cc: Avis Kamimura, Department of Housing and Community Development  
Office of Environmental Quality Control

1543.0404-23.m41

W. Frank Braddock - Thomas S. Wallace - R. Sue Duncan - Russell Y.J. Chung  
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STATE OF HAWAII  
DEPARTMENT OF HEALTH  
P.O. BOX 3278  
HONOLULU, HAWAII 96801

October 18, 1996

96-130/epo

OCT 25

LAWRENCE WALKER  
DIRECTOR OF H.A.C.H.

In Reply, Please Refer to

Ms. Avis Kamimura  
Department of Housing and  
Community Development  
City and County of Honolulu  
650 South King Street, 5th Floor  
Honolulu, Hawaii 96813

Dear Ms. Kamimura:  
Subject: Draft Environmental Assessment  
Varona Village Phase II  
Ewa, Oahu  
TMK: 9-1-17: por. 68 & 69, 75

Thank you for allowing us to review and comment on the subject project. We have the following comments to offer:

**Air Pollution**

**Control of Fugitive Dust:**

The City and County of Honolulu proposes to develop 519 residential units on 61 acres located in the Ewa district on the Island of Oahu. This development project is planned to take eight years and will be completed by the year 2005.

Due to the arid climactic conditions and frequent winds in this area, the proposed grading, excavation and construction presents a significant potential for fugitive dust emissions. The close proximity to neighboring residential establishments and major thoroughfares only adds to the potential dust problems. Implementation of adequate dust control measures during all phases of this project are necessary. Construction activities must comply with provisions of Chapter §11-60.1, Hawaii Administrative Rules, section §11-60.1-33 on Fugitive Dust.

The contractor should provide adequate means to control dust from road areas and during the various phases of construction activities. These means include but are not limited to:

Ms. Avis Kamimura  
October 18, 1996  
Page 2

- a. planning the different phases of construction, focusing on minimizing the amount of dust-generating materials and activities, centralizing material transfer points and onsite vehicular traffic routes, and locating potentially dusty equipment in areas of the least impact;
- b. providing an adequate water source at site prior to startup of construction activities;
- c. landscaping and rapid covering of bare areas, including slopes, starting from the initial grading phase;
- d. control of dust from shoulders, project entrances, and access roads;
- e. providing adequate dust control measures during weekends, after hours, and prior to daily startup of construction activities; and
- f. control of dust from debris being hauled away from project site.

If there are any questions on the control of fugitive dust, please contact Jon-Pierre Michaud of the Clean Air Branch at 586-4200.

**Water Pollution**

A National Pollutant Discharge Elimination System (NPDES) permit is required for any discharge to waters of the State including the following:

1. Storm water discharges relating to construction activities for projects equal to or greater than five acres;
2. Storm water discharges from industrial activities;
3. Construction dewatering activities;
4. Cooling water discharges less than one million gallons;
5. Groundwater remediation activities; and
6. Hydrotesting water.

Any person requesting to be covered by a NPDES general permit for any of the above activities should file a Notice of Intent with the Department's Clean Water Branch at least 90 days prior to commencement of any discharge to waters of the State.

Ms. Avis Kamimura  
October 18, 1996  
Page 3

96-130

Any questions regarding this matter should be directed to  
Mr. Denis Lau of the Clean Water Branch at 586-4309.

Sincerely,



BRUCE S. ANDERSON, Ph.D.  
Deputy Director for  
Environmental Health

c: CNB  
CAB  
OEQC  
PBR Hawaii ✓



LAND PLANNING  
LANDSCAPE ARCHITECTURE  
ENVIRONMENTAL STUDIOS

November 6, 1996

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

Dear Mr. Anderson:

**SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT**

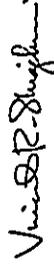
Thank you for your review of the environmental assessment for the proposed Varona Village Phase II project and the information provided in your letter. The environmental assessment will be revised to include that all construction activities must comply with provisions of Chapter 11-60.1, Hawaii Administrative Rules, section 11-60.1-33 on Fugitive Dust and to include all of the means to control dust that were stated in your letter.

The environmental assessment will also include that a site specific National Pollutant Discharge Elimination System (NPDES) Permit is required for the project.

If you have any further comments or questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PBR HAWAII



Vincent R. Shigekuni  
Associate

cc: Avis Kamimura, Department of Housing and Community Development  
Office of Environmental Quality Control

1431004/26.wf1

W. Frank Brandt • Thomas S. Warren • R. Sam Thurston • Russell Y.J. Chung  
PACIFIC TOWER, SUITE 600 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 523-3631 FAX: (808) 523-4102  
BRANDT/WH/TH/RS/RY  
BRANDT CENTER 1115 ALA MOANA CENTER HONOLULU, HAWAII 96813 TELEPHONE: (808) 944-1115 FAX: (808) 944-1000

BENJAMIN A. CAVETANO  
COMMISSIONER OF HAWAII



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
P.O. BOX 671  
HONOLULU, HAWAII 96809

MICHAEL D. WILSON  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES

DEPT.  
CLIENT'S COORDINATOR

LAND PLANNING  
LANDSCAPE ARCHITECTURE  
ENVIRONMENTAL STUDIES

OCT 2 1996

REF:IM-AJ

36 OCT-3 AM '96  
Avis Kamimura  
Department of Housing and Community Development  
City and County of Honolulu  
650 South King Street, 5th Floor, Room 505  
Honolulu, Hawaii 96813

Dear Ms. Kamimura:

FILE NO. A141

SUBJECT: Draft Environmental Assessment, Varona Village Phase II  
City and County of Honolulu, Dept. of Housing and  
Community Development  
Fax Map Key: 9-1-171009-68, POR. 69 & POR. 75

We have reviewed the subject application and would like  
to offer the following comments:

Water and Land Development, Land Division.

We confirm that the proposed project is located in Zone X, an  
area determined to be outside the 500-year flood plain. FEMA  
Community Panel map No. 150001 0130 C, which depicts the project  
site, was revised on 4/21/95 after a section of Kalo Gulch near  
the site was improved. Previously, the site was within the 100-  
year flood plain.

Should you have any questions, you may contact Al Jodar at  
587-0424.

Aloha,

*Michael D. Wilson*  
MICHAEL D. WILSON

CC: OEQC  
1:VETATA@OWSU.VU.CC.DH.HI

PAGE 8/8 ID: 00865275488 OCT-07-98 09:11 FROM: HOUSING COMM. DEV.



LAND PLANNING  
LANDSCAPE ARCHITECTURE  
ENVIRONMENTAL STUDIES

October 10, 1996

Mr. Michael D. Wilson  
Chairperson  
State of Hawaii  
Department of Land and Natural Resources  
P.O. Box 621  
Honolulu, Hawaii 96809

Dear Mr. Wilson:

SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT

Thank you for your review of the environmental assessment for the proposed Varona Village Phase II  
project and the information provided on the Flood Insurance Rate Map for the project areas.

If you have any further comments or questions regarding the environmental assessment, please do not  
hesitate to contact me.

Sincerely,

PBR HAWAII

*Vincent R. Shigekuni*

Vincent R. Shigekuni  
Associate

cc: Avis Kamimura, Department of Housing and Community Development w/encl.  
Office of Environmental Quality Control w/encl.

141100865275488

W. Frank Parks • Thomas S. Votaw • R. Sean Sherman • Robert Y. Chung  
PACIFIC TOWER, SUITE 600 1000 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5641 FAX: (808) 525-1102  
MANAGEMENT CENTER 1000 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5641 FAX: (808) 525-1102





LAND PLANNING  
LANDSCAPE ARCHITECTURE  
ENVIRONMENTAL STUDIES

October 3, 1996

Mr. Kazu Hayashida, Director  
State of Hawaii  
Department of Transportation  
869 Punchbowl Street  
Honolulu, Hawaii 96813-5097

Dear Mr. Hayashida:

**SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT**

Thank you for your review of the environmental assessment for the proposed Varona Village Phase II project. We have reviewed your letter dated September 23, 1996 and offer the following responses to your comments:

1. As recommended, the Department of Housing and Community Development (DHCD) will coordinate with the Department of Transportation (DOT) regarding additional right-of-way (beyond 116 feet) that may be required at the intersection of Renton Road. Additional right-of-way for bikeways and/or the provision of a bikeway along one side of North-South Road is being coordinated with the Department of Transportation Services consultant on the North-South Road Major Investment Study.
2. Please be assured that DHCD's access plans at the proposed signalized North/South Road intersections with Renton Road and the Area E access road will be coordinated with DOT's Highways Division.
3. DHCD is committed to contributing its fair share of the costs of the construction of North-South Road.

10 Frank Beach • Thomas S. Wicks • E. Sam Duncan • Russell Y. Chung  
PACIFIC TOWER, SUITE 600 • 800 BISHOP STREET • HONOLULU, HAWAII 96813 • TELEPHONE: (808) 551-5651 • FAX: (808) 551-1402  
MAUNALI OFFICE: 1111 LAGOON DRIVE • MAUNALI, HAWAII 96759 • TELEPHONE: (808) 943-3333 • FAX: (808) 943-0000

Mr. Kazu Hayashida, Director  
**SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT**  
October 3, 1996  
Page 2

Thanks again for your letter. If you have any further questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PDR HAWAII

*Vincent R. Shigekuni*

Vincent R. Shigekuni  
Associate

cc: Avis Kamimura, Department of Housing and Community Development w/encl.  
Office of Environmental Quality Control w/encl.  
193.0048-17-41





## University of Hawai'i at Mānoa

Environmental Center  
A Unit of Water Resources Research Center  
2550 Campus Road • Crawford 317 • Honolulu, Hawai'i 96822  
Telephone: (808) 956-7361 • Facsimile: (808) 956-3960

SEP 27

September 23, 1996  
EA-0147

Ms. Avis Kamimura  
City and County of Honolulu  
Department of Housing and Community Development  
630 South King Street, 5th Floor  
Honolulu, Hawai'i 96813

Dear Ms. Kamimura:

### Draft Environmental Assessment Varona Village Phase II Ewa, Oahu

In 1990, the Department of Housing and Community Development (DHCD) undertook renovation and redevelopment of the Ewa Plantation villages of Renton, Tenney, and Varona. Most of the planned additions and improvements described in a 1990 Environmental Impact Statement (EIS) entitled "Ewa Villages Master Plan" have been built. The newest proposed increment, Varona Village Phase II, consists of development in three areas: Area E (25 acres), Varona Village Expansion Area (27 acres), and Makai Area (9 acres). Proposed development includes 157 single-family units in the Expansion Area, 52 single-family units or community-type facilities in the Makai Area, and 252 market single-family units in Area E.

This review was completed with the assistance of Jon Matsuoka, Social Work; Paul Eken, Emeritus Agronomy and Soil Science; and Paul Berkowitz of the Environmental Center.

#### General Comments

In the 1990 EIS, the Master Plan calls for new development in Tenney and Renton Villages but not in Varona Village. The document lists Varona Village as a relocation site only, stating that "[r]edevelopment of Varona Village will take place after the redevelopment of Tenney and Renton Villages at which time a separate EIS will be prepared." Apparently, the present EA is intended to serve the purpose of the additional EIS that was proposed in 1990. We suggest that the DHCD should

An Equal Opportunity/Affirmative Action Institution

Ms. Avis Kamimura  
Department of Housing and Community Development  
September 23, 1996  
Page 2

explain why they decided to file an EA instead of an EIS, and why they anticipate a Finding of No Significant Impact (FONSI) for a project which covers 61 acres, seeks to erect as many as 519 new housing units, and, as noted below, appears to meet at least four of the significance criteria of Section 11-200-12, Hawaii Administrative Rules (HAR).

#### Significance Criteria

Given the magnitude of the proposed changes, the project appears to meet EIS Rules significance criteria on a number of points, any one of which would warrant preparation of an EIS. For instance, given that the Ewa Sugar Plantation Villages have been nominated to the National Register of Historic Places, the project appears to have the potential to affect valuable cultural resources. Thus, the first criterion on the significance list may be met since the project could involve "...an irrevocable commitment to loss or destruction of any natural or cultural resource." Since the document only provides a cursory one-paragraph analysis of the area's cultural characteristics, it is impossible to evaluate the proposed action's effects on cultural resources. To provide an appropriate level of detail, Section 4.4 on cultural resources needs to be revised and expanded.

The fourth significance criterion pertains to social and economic welfare. In this regard, the Varona Village EA acknowledges that "... the proposed project will provide a significant contribution to the community by providing quality homes and community facilities." Given this admission of its own significance, it appears that the proposed project will "... substantially [affect] the economic or social welfare of the community or State." The question is not whether the action will harm the environment or community but whether the action will produce significant changes. Thus, according to the HAR, the scope of the proposed project appears significant and merits an EIS instead of an EA.

Furthermore, in terms of social welfare, the document's Social Impact Assessment (SIA) is practically nonexistent and needs to be broadened at the next stage of the Chapter 343 process. Although our reviewers supported the goal of providing affordable housing for Oahu residents, they wanted to see more detail about the project's implementation. Their biggest concern focused on how the proposed action would affect local residents. Who will be qualified to buy the homes? What is the DHCD doing to insure that the homes are purchased by local residents and not outside speculators, mainland retirees, or military personnel? Does the DHCD have a definition of the type of person they are trying to assist? Before continuing further with the project, these concerns should be addressed and made public.

The proposed project appears significant in at least two other areas, secondary impacts and cumulative effects. As stated in Section 4.1.5, the Varona Village Phase II Master Plan requires new infrastructure such as roadways, drainage improvements, electrical systems, and communication lines. Additionally in the Summary of Impacts Section, the EA claims that "traffic patterns will be altered, air and noise impacts will occur, and additional demands on existing water and wastewater infrastructure

systems within this area will result." According to our reviewers, these infrastructure improvements represent "substantial secondary effects" (Section 11-200-12(6) ) and thus warrant the preparation of an EIS.

Finally we suggest not only that these secondary effects are significant but that they need to be analyzed cumulatively in light of other development occurring on Oahu. Throughout the document, the proposed project remains unconnected to its surroundings. For instance, the EA analyzes traffic in a limited region without fully considering the broader effects of cumulative development on H-1 traffic. In terms of water resources, the document ought to discuss potential links to the Weiahole Ditch water rights dispute. How might the proposed action along with other development on the leeward side affect future water allocation? In terms of noise, how might reuse of Barbers Point Naval Air Station affect noise levels in the vicinity of the project? Lastly and perhaps most importantly, preparers of this EA fail to address the secondary and cumulative effects of increased discharge in the Ewa Marina area. Despite extensive controversy expressed in public meetings, the City apparently assumes that developers of Ewa Marina will eventually accept more runoff through their property. In light of Ewa Marina's concern over water quality standards, this assumption seems naive. Before continuing further with this project, the City needs to either resolve this political and environmental issue or develop a contingency drainage plan.

#### Other Comments

A few of the background sections which summarize the affected environment are deficient. In the Climate Section (5.1), the document fails to mention effects of land and sea breezes on the climate. These wind patterns affect the potential for salt spray and smoke drift. The EA also does not discuss the area's high evaporation rate as it pertains to potential water need for lawns, landscaping, and pools. Furthermore, as paved surfaces replace former sugarcane land and evaporation rates fall, air temperatures will increase.

In Section 5.2 (Geology/ Topography), the document ought to clarify the location of Varona Village relative to the 25-foot sea stand where the Ewa clay plain meets the coral plain. This clarification would offer insight on whether coral sink holes could play a role in development and in water flow management. Also some landscaping consequences might result from the drastic differences between the deeper and plastic Honouliuli soils and the very shallow Mamala soils.

Finally in the Flood and Drainage Section (5.4), one of our reviewers suggested that in light of the presence of Kaloi gulch and the prior flood plain classification, the 50-year flood is not an adequate basis for hazard assessment. Evidence for this suggestion can be found in two separate scientific papers:

1. Bowles and Mink, 1977. Hydrologic and Soils Study of Proposed Sanitary Landfills, p. 3.
2. Schroeder, 1978. "Meteorology of Hawaiian Flash Floods", *American Meteorological Society Los Angeles Conference*, p. 17-20.

Can residents of Varona Village get flood insurance? What is the actual status of the drainage modifications in Appendix E? Do the drainage improvements plan for the 100-year flood or for some other maximum value?

#### Conclusion

Although our reviewers support the goal of providing affordable housing, all of them suggest that the magnitude and scale of the proposed changes warrant an EIS. In our analysis we found the proposed action potentially significant in at least four areas: (1) cultural resources, (2) social welfare, (3) secondary effects, and (4) cumulative impact. Given the scope of the project, it seems inappropriate to file for a FONSI; thus we suggest that the document be revised, expanded, and resubmitted as an EIS. Since the 1990 Ewa Villages EIS covers much of the same baseline information, a supplemental EIS should suffice.

Thank you for the opportunity to comment.

Sincerely,



John T. Harrison  
Environmental Coordinator

cc: OEQC  
✓ PBR Hawaii  
Roger Fujioka  
Jon Matsuoaka  
Paul Ekern  
Paul Berkowitz



LAND PLANNING  
LANDSCAPE ARCHITECTURE  
ENVIRONMENTAL STUDIES

November 8, 1996

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

Dear Mr. Harrison:

**SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT**

Thank you for your review of the environmental assessment for the proposed Varona Village Phase II project. We have reviewed your letter dated September 23, 1996 and offer the following responses:

**Significance Criteria**

1. According to the State Historic Preservation Division (SHPD), the proposed project is adjacent to and not part of the Ewa Plantation Villages historic district, and SHPD feels that the proposed project will have "no effect" on the character of the historic district (refer to attached letter).

2. Per your suggestion, the last paragraph of page 52 of the environmental assessment will be revised to read that: "The proposed project will contribute to the community by providing quality homes and community facilities." No claims of significance will be stated or implied.

3. Since your reviewers support affordable housing, we are providing the following responses to your questions regarding the marketing of the proposed affordable housing:  
All residents of the State of Hawaii who financially qualify, and meet City eligibility requirements, such as first time homeownership and income limits, will be qualified to buy the affordable homes (see attached).  
To insure that the homes are purchased by local residents and not outside speculators, mainland retirees, or military personnel, DHCD will be limiting sales to: owner occupants, residents of Hawaii, first time buyers and others who meet the attached eligibility criteria.

DHCD is trying to assist primarily former OSCo workers and their families, and secondarily all those who meet the attached eligibility criteria.  
The information provided should broaden the Social Impact Assessment, as requested.

W. Frank Rowell • Thomas S. Wiers • R. San Duncan • Russell V. Chung  
PACIFIC TOWER, SUITE 650, 801 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 551-5431 FAX: (808) 523-5122  
BOARDING ENTRANCE 1141/1143 COOK CENTER 114 ADELPHI STREET, SUITE 200 HILLO, HAWAII 96718 TELEPHONE: (808) 941-3115 FAX: (808) 941-0500

Mr. John T. Harrison, Environmental Coordinator  
**SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT**  
November 8, 1996  
Page 2

4. Nearly all of the major infrastructure improvements have been installed or will be installed as part of the larger Ewa Villages Project, which was the subject of a 1990 EIS.
5. The traffic impact assessment analyzed traffic operations at locations that have the potential to be affected by the proposed Varona Village Phase II development. The future traffic forecasts include traffic generated by the Varona Village Phase II and background traffic (traffic not generated by Varona Village Phase II). The background traffic forecast was based on a sub-regional computerized travel demand model developed for the ongoing North-South Road Corridor Study. This model utilizes future land uses for a Year 2020 horizon year that are consistent with the islandwide planning process and plans for the Ewa area.
6. Since the Commission on Water Resources Management (CWRM) makes the final decision on water allocation, DHCD will abide with CWRM's decisions.
7. Since the current use (Naval Air Station) of Barbers Point represents the worst case scenario in terms of noise levels, it would appear safe to assume that less intensive uses of Barbers Point would result in lower noise levels in the vicinity of the project.
8. Page 28 of the Draft Environmental Assessment states that "impacts on developments downstream of the project sites should be mitigated by drainage improvements within their projects." Page 29 describes the drainage improvements proposed for the Varona Villages Phase II project.

Ewa Marina has always been considered the terminus for runoff from the Kaloi Gulch watershed. A drainage report and addendum for Kaloi Stream improvements was prepared for the developers of Oahu West Development (now known as Ewa by Gentry) and Ewa Marina. The 1980/1981 report had estimated peak runoff flows of about 13,500 cfs entering Ewa Marina based on the City and County standards at that time. Incorporation of a detention basin would have reduced the flow to almost 10,000 cfs. Although the term "retention" basin is used in the reports, the hydraulic analysis was actually based on a "detention" basin rather than a true retention basin since culverts were provided at the invert of the basin. The culverts allowed flows less than the peak flow to be discharged for maintenance purposes.

Both the report and addendum suggested that the basin be incorporated in golf courses or open fields. The Ewa Villages and Ewa by Gentry golf courses have incorporated detention/retention features in the course designs, allowing for the dampening of peak flows and improvement of the quality of runoff, especially for the more frequent rainfall events. These improvements should satisfy the requirements of Ordinance 96-34 regarding water quality of runoff. Ordinance 96-34 recognizes that measures to improve the quality of runoff should be applied to the more frequent, less intense storms. The City and County of Honolulu Department of Public Works (DPW) is in the process of updating their storm drainage standards to include water quality issues and it has been our experience that DPW has been asking

Mr. John T. Harrison, Environmental Coordinator  
SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT  
November 8, 1996  
Page 3

developers of projects to incorporate Best Management Practices to address storm water quality concerns. We expect this requirement to continue for all future developments within the Kaloi watershed.

In addition to the above reports, a drainage master plan had been prepared for the previous owners of the property. The Ewa Marina Drainage Master Plan, which was approved by the Department of Public Works in July, 1985, anticipated runoff of about 10,000 cfs from the mauka areas.

Lastly, we understand that the developers of Ewa Marina have always recognized the amount and impact of runoff planned to enter their property. This is evidenced in their discussion of the benefits of the marina in their environmental impact statement.

#### Other Comments

1. We appreciate the information provided on land and sea breezes, wind patterns, salt spray, smoke drift, high evaporation rate and increasing air temperatures. Appropriate revisions to Environmental Assessment will be made where necessary.

2. In general, the site is underlain by a mantle of surficial clayey soils, most likely of both the Mamala soils and the Honouliuli soils. In addition, Geolabs-Hawaii believes that coral deposits may be encountered at depths of about 10 to 20 feet below the existing ground surface at the site based on their previous experience in the vicinity of the site. Based on Geolabs-Hawaii's review of the topography at the project site, the existing ground surface elevations range from approximately +42 feet Mean Sea Level (MSL) at the Makai Area to about +60 feet MSL at Area E. In general, the coral deposit of the Waimanalo sea stand (25-foot sea stand) typically has a top elevation of about +25 feet MSL. Therefore, some of the coral deposits at the site may be of the 25-foot sea stand (Waimanalo sea stand). In areas with the higher ground surface elevations, the top of coral elevation in these areas may have correspondingly higher top of coral elevations. The coral deposits with a higher top of coral elevation would be of the older 40-foot sea stand (Waialae sea stand). Both types of coral deposits are anticipated at the site. However, the coral deposits are generally overlain by soil deposits of the Mamala and Honouliuli soils.

With regard to the foundations for the future house structures, depending on the final grades proposed, Geolabs-Hawaii believes that future house foundations at the project site will generally be constructed in the mantle of surficial clayey soils. The thickness of these soils may be on the order of at least 10 to 20 feet. This was confirmed by the drilled borings performed for the Ewa Villages Planned Community Development for the Department of Housing and Community Development several years ago. Based on their review of the subsurface conditions encountered in the borings drilled at the project site, Geolabs-Hawaii believes that the potential for encountering cavity or sink holes at this Varona Village Expansion project site to be low. Depending on the type of construction planned for this project, the foundations for the future

Mr. John T. Harrison, Environmental Coordinator  
SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT  
November 8, 1996  
Page 4

house structures would be designed to reduce the potential of impacts resulting from coral cavities.

- Existing tenants of Varona Village (who are not "homeowners") do not require flood insurance.
- The actual status of the drainage modifications are as stated in Appendix E.
- The drainage improvements are planned for the 100-year flood. The major drainageway through the Ewa Villages golf course has been designed for a 100-year event. Revisions to the Flood Insurance Rate Map has been approved by the Federal Emergency Management Administration.

For the reasons set forth above, and because extensive information was provided in the Draft EA, we feel that the EA review process, in accordance with Chapter 343, provides for adequate environmental review. A copy of your letter and this response will be included in the final environmental assessment and notice of determination for this project.

If you have any further questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,  
PDR HAWAII



Vincent R. Shigekuni  
Associate

Enclosure: Letter from SHPD  
Eligibility Criteria

cc: Avis Kamimura, Department of Housing and Community Development w/encd.

1310114-27-61

BENJAMIN A. LEVYLAND  
GOVERNOR OF HAWAII



STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION  
33 SOUTH KING STREET, 5TH FLOOR  
HONOLULU, HAWAII 96813

DEPARTMENT OF LAND AND NATURAL RESOURCES  
DIVISION OF LAND AND NATURAL RESOURCES  
DEPUTY GOVERNOR, HAWAII

AGRICULTURE DEVELOPMENT  
PROGRAMS  
ADMINISTRATIVE AND  
CONSULTATION AND  
DEVELOPMENTAL AFFAIRS  
CONSULTATION AND  
RESPONSE DEVELOPMENT  
CONTRACTS  
PROPERTY ACQUISITION  
PLANNING  
LAND MANAGEMENT  
STATE PLANNING  
WATER AND LAND DEVELOPMENT

October 18, 1996

LOG NO: 18313  
DOC NO: 9610col19  
Architecture

Ms. Avis Kamimura  
Department of Housing and  
Community Development  
City and County of Honolulu  
650 South King Street, 5th floor  
Honolulu, Hawaii 96813

Dear Ms. Kamimura:

SUBJECT: Draft Environmental Assessment (EA)  
Varona Village Phase II  
TMK 9-1-17-68 (por), 69 (por), & 75 (por)  
Ewa, Oahu

Thank you for the inquiry October 7, 1996, regarding the Varona Village Phase II, Environmental Impact or Environmental Assessment. This is to confirm that Varona Village Phase II is adjacent to and not part of the Ewa Plantation Villages historic district. We believe that the development of the residential area will have no effect on the character of the historic district.

Thank you for the opportunity to comment. Should you have any questions, please call Carol Ogata at 587-0004.

Aloha,

DON HIBBARD, Administrator  
State Historic Preservation Division

CO:jk

cc: PBR Hawaii, Pacific Tower, Suite 650, 1001 Bishop Street, Honolulu, HI 96813, Attn: Vincent Shigetani.

II. INFORMATION ABOUT AFFORDABLE HOUSING REQUIREMENTS IN TENNEY-REITOR

A. WHO IS ELIGIBLE TO PURCHASE AN AFFORDABLE HOME?

1. The applicant must be a citizen of the United States or a permanent resident alien who now resides in the State of Hawaii.
2. The applicant must be at least eighteen years of age.
3. The applicant must reside in the State of Hawaii and reside in the dwelling unit purchased from the City and County of Honolulu.
4. The applicant must have a Gross Household Income sufficient to qualify for the loan to finance the purchase.
5. The applicant must not now own and not have owned during the one year period preceding the date of this application, a majority interest in fee simple or leasehold lands suitable for dwelling purposes, or a majority interest in lands under any trust agreement or other fiduciary arrangement in which another person holds the legal title to such land. The applicant's spouse, co-applicant, and household members are also prohibited from owning real property.
6. The applicant must abide by the restrictions in Chapter 201E, Sections 221-223, Hawaii Revised Statutes, on the use, transfer, and sale (buyback) of the land and dwelling unit. The applicant must be the owner-occupant at all times during the restriction period.
7. The applicant must abide by the provisions of the Shared Appreciation Equity program. The Shared Appreciation Equity program is briefly explained below on this Information Sheet.
8. The applicant must never have purchased a dwelling unit from the City, State, or have been assisted in an affordable housing program administered by the City or State. However, the City may, on an individual basis, allow a person who had previously purchased a dwelling unit to reapply, provided the sale of such person's first dwelling was caused by extreme hardship such as family death, divorce, loss of employment, or disability.
9. The applicant may apply for only one City-sponsored project at a time. An applicant may apply for other projects concurrently if those projects are not City-sponsored.
10. Preference to purchase will be given to households who fall within the following preference categories:
  - a. Government-displaces: Households that have been displaced or displaced from their homes because of governmental action (including eligible residents of the Ewa Villages). Such households must present a certificate of displacement or notification letter from the displacing agency. Such

11-11-11-11-11

Post-it Fax/Date	7671	Date	11/18	Page	5
From	Shigetani, Vincent	To	Don Hibbard		
Subject	PBR Hawaii	CC	DHCD		
Phone	587-0004	Fax	587-0004		



C. EXAMPLE OF SHARED APPRECIATION

1. Calculation of the City's and Buyer's shares (percentages) of appreciation at the time of original sale:
  - a. The Original Fair Market Value (determined by appraisal): \$240,000
  - b. Minus the Original Purchase Price (price at which you bought the home): -120,000
  - c. Equals: 120,000
  - d. The City's original 1/3 share of appreciation is 120,000 ÷ 3 = 40,000
  - e. The Buyer's original 2/3 share of appreciation is 120,000 minus 40,000 = 80,000
2. Calculation of the Net Appreciation which City and Buyer will share:
  - a. The appraised value of the home at the time of sale or transfer, say: 330,000
  - b. Minus the aftertransfer costs (broker's fee, escrow fee, etc.), say: -20,000
  - c. Equals the Buyer's original affordable sales price: 310,000
  - d. Equals the Net Appreciation to be shared: 100,000
3. Calculation of the dollar amounts of the City's and Buyer's shares of appreciation:
  - a. City's share of appreciation (20% of \$160,000): 32,000
  - b. Buyer's share of appreciation (70% of \$160,000): 128,000

III. INFORMATION ABOUT HOM-TO APPLY

- A. HOW DO I APPLY?

Gather the materials and complete the forms listed in the Buyer's Checklist (see Section IV) and turn them in to the Department of Housing.
- B. WHAT HAPPENS AFTER I APPLY?

1. The City will certify your eligibility to purchase affordable housing using the materials you provide.

If you are eligible, but have not signed a contract to purchase by December 31, 1996, you may have to be recertified.
2. The City will notify you in writing if you are eligible or ineligible. Please allow a month for this notification.
3. You are responsible for notifying DHCD of any changes in your mailing address and telephone numbers. Please submit address changes in writing to DHCD:

Tenney/Renton Villages III  
Department of Housing and Community Development  
650 S. King Street, 5th Floor  
Honolulu, Hawaii 96813

If a notice mailed to you by DHCD is returned, DHCD is not responsible for ascertaining your new mailing address.

- C. TO BE SUCCESSFUL IN BUYING A HOME YOU MUST COMPLETE FOUR STEPS:
  - A. Eligibility: You must be certified eligible by the City to purchase an affordable house offered for sale.

The City will notify you by mail if you are eligible or ineligible.

If you are eligible, the Tenney/Renton Villages real estate broker will contact you to proceed with step C, Sales Contract.

B. **Financial Qualification:** You must be "pre-qualified" to obtain a loan sufficient to purchase a house. To pre-qualify you, Honolulu Mortgage Company, a mortgage lender, or Bank of Hawaii will call you to discuss your income, savings, employment history, and credit history as well as available loan programs to estimate how much you can spend on a house.

DHCD has contracted with Honolulu Mortgage Company and Bank of Hawaii to be the lenders to assist you; however, you may go to the mortgage lender of your choice.

C. **Sales Contract:** When the Tenney/Renton Villages real estate broker offers you the opportunity to select a house that you are financially pre-qualified to buy, you will sign a sales contract to purchase the house. You will also be asked to sign an ELIGIBILITY REQUIREMENT AFFIDAVIT, certifying that you are eligible to purchase affordable housing offered for sale by the City.

If you have completed Steps A and B, but no units are available, you will remain on the waiting list. However, if you have not purchased a unit by December 31, 1996, your eligibility to purchase may have to be recertified by DHCD. The waiting list will expire on December 31, 1997.

D. **Final Loan Approval:** After the sales contract is signed, you must make a final loan application. Escrow for the sale will be opened by Long and Helene Escrow. (Escrow acts as a neutral third party to ensure that the sale transaction occurs as stated in the contract and is legally recorded.) If you receive final loan approval, you will then be able to purchase the house.



BEKUNAWA L. GATTEGAO  
GOVERNOR



STATE OF HAWAII  
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM  
LAND USE COMMISSION

P.O. Box 2359  
Honolulu, HI 96804-2359  
Telephone: 808-587-3822  
Fax: 808-587-3827

August 20, 1996

MS 2 18

Ms. Avis Kamimura  
Department of Housing and Community  
Development  
City and County of Honolulu  
650 South King Street, 5th Floor  
Honolulu, Hawaii 96813

Dear Ms. Kamimura:

Subject: Draft Environmental Assessment (DEA) for Varona  
Village Phase II

We have reviewed the subject DEA and have the following  
comments to offer:

- 1) We confirm that the project site is designated within the State Land Use Urban and Agricultural Districts. On page 1, we note that the Project Summary incorrectly identifies the Agricultural District as the "Agriculture" District.
- 2) A conceptual plan for the project area delineating the land uses and their relative location within said area should be provided.
- 3) The infrastructure costs listed in the DEA should be broken down by category (i.e., roadways, wastewater, water, electrical, etc.). Additionally, the preliminary off-site and major on-site infrastructure improvement and building construction costs should be provided.
- 4) The project's cumulative impacts upon public facilities for potable water, wastewater, and solid waste should be more thoroughly discussed as they relate to other existing and planned projects in the area.
- 5) With respect to the project's drainage system, clarification should be provided as to when the downstream restrictions are anticipated to be removed.

ESTHER UEDA  
EXECUTIVE OFFICER

Ms. Avis Kamimura  
August 20, 1996  
Page 2

6) The Flood Insurance Rate Map for the project site, referenced on page 27, should be included.

7) We understand that a land use district boundary amendment petition for the agricultural portion of the project, as well as for agricultural lands immediately adjacent to Varona Village, will be filed with the Commission in the near future.

We have no further comments to offer at this time. We appreciate the opportunity to comment on the subject DEA.

Should you have any questions, please feel free to call me or Bert Saruwatari of our office at 587-3822.

Sincerely,

ESTHER UEDA  
Executive Officer

EU:bks

cc: OEQC  
Vincent Shigekuni



LAND PLANNING  
CONSTRUCTION  
September 20, 1996

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

Dear Ms. Ueda:

**SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT**

Thank you for review of the environmental assessment for the proposed Varona Village Phase II project. We have reviewed your letter dated August 20, 1996 and offer the following responses to your questions and comments:

1. We appreciate your confirmation that the project site is designated within the State Land Use Urban and Agricultural Districts. Please note that the Draft Environmental Assessment (DEA) will be revised to correctly identify the District as "Agricultural".
2. To address your request for a conceptual plan for the project area, Figure 4 for the DEA will be revised to delineate proposed land uses and their relative location. (See attached)
3. Per your request, the infrastructure improvement costs provided on page 11 of the DEA will be revised as follows:

**Estimated Construction Costs**

<b>Area E</b>	
Site Preparation and Earthwork	\$ 860,000
Roadways	\$ 1,620,000
Storm Drain System	\$ 930,000
Sewer System	\$ 660,000
Water System	\$ 660,000
Electric, Telephone, St. Lighting, & CATV	\$ 1,250,000
Street Trees	\$ 320,000
Buildings (252 units x \$90@SF x 1,300SF)	\$ 29,484,000
<b>Total</b>	<b>\$ 35,784,000</b>

K. Frank Brandt • Thomas S. Wilson • E. Sue Denton • Reed T. Chung  
PACIFIC TOWER, SUITE 600 300 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 551-5431 FAX: (808) 553-8102  
SEASIDE OFFICE: 1001 LAGOON CENTER 400 ALUPUN STREET, SUITE 201 HILLO, HAWAII 96743 TELEPHONE: (808) 943-2211 FAX: (808) 943-2200

Ms. Esther Ueda  
**SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT**  
September 20, 1996  
Page 2

Varona Village Expansion Area	\$ 1,330,000
Site Preparation and Earthwork	\$ 1,600,000
Roadways	\$ 1,720,000
Storm Drain System	\$ 1,050,000
Sewer System	\$ 1,100,000
Water System	\$ 1,500,000
Electric, Telephone, St. Lighting, & CATV	\$ 500,000
Street Trees	\$ 14,012,250
Buildings (157 units x \$85@SF x 1,050SF)	
<b>Total</b>	<b>\$ 22,812,250</b>

Makai Area	
Site Preparation and Earthwork	\$ 510,000
Roadways	\$ 440,000
Storm Drain System	\$ 350,000
Sewer System	\$ 320,000
Water System	\$ 320,000
Electric, Telephone, St. Lighting, & CATV	\$ 410,000
Street Trees	\$ 150,000
Residential Buildings (110 units x \$85@SF x 1,050SF)	\$ 9,817,500
<b>Total</b>	<b>\$ 12,317,500</b>

The majority of onsite infrastructure improvements have already been constructed. The North-South Road, between Area E and the Expansion Area, is the only major improvement that would serve the project that has yet to be constructed. In addition, the full North-South Road cross section may not be needed to initially provide access to Area E. Area E could probably be served by half of the 116' right-of-way proposed for the North-South Road.

Because the areas to be developed are limited in size and planned for small single family subdivisions or multi-family development, no major onsite infrastructure is anticipated. Onsite infrastructure for single family developments are expected to consist of short, local roadways and cut-de-sacs with comparatively small distribution systems for utilities. The same holds true for multi-family developments, with driveways, access roads, and parking lots replacing the roadways.

4. Individually, the development areas will have little impact to public facilities in the area given the relatively small size of the projects. The Varona Village, Phase II project is included in the master plans for Ewa Villages, providing an analysis of the cumulative impacts of the entire Ewa Villages Project on regional infrastructure. The master plans have

Ms. Estlier Ueda  
SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT  
September 20, 1996  
Page 3

been approved by the appropriate agencies, indicating their concerns to have been adequately addressed. More specifically:

**Potable Water:** A potable water master plan for Ewa Villages has been prepared that includes the Varona Villages, Phase II project. The master plan has been approved by the Board of Water Supply. In addition, a Final Environmental Impact Statement for Off-Site Water System Improvements for Ewa Development Projects has been prepared for the Department of Housing and Community Development. This study also includes the Varona Village, Phase II, as well as most of the existing and proposed developments in the East Kapolei/Ewa/West Loch area. The improvements proposed in the study are to mitigate the impacts of continued development in the Honouliuli area.

**Wastewater:** A wastewater master plan for the entire Ewa Villages project has been prepared and approved by the Department of Wastewater Management. The past expansion of the Honouliuli Wastewater Treatment Plant provides for adequate treatment capacity in the near term. Provisions for future expansion of treatment facilities also exist. We understand that a consultant to the City is currently preparing a Facilities Plan for the Honouliuli Wastewater Treatment Plant service area that addresses the continued development in the area.

**Solid Waste:** The ability of existing facilities to accept solid waste from this project has been discussed and confirmed with the City's Department of Refuse. As the agency most responsible for solid waste disposal on the island, we are assuming that the Department of Refuse is constantly monitoring the cumulative impact of solid waste being generated on Oahu.

5. The removal of downstream restrictions is largely dependent on the development schedule of Haseko's Ewa Marina project. We understand that Haseko is continuing its planning of the project, but have not indicated when the marina might be constructed. Downstream restrictions may be removed earlier if Haseko agrees to accept an increase in the runoff entering their property prior to construction of the marina.

6. A revised Flood Insurance Rate Map (FIRM) has not been printed at this time (please refer to page 3, paragraph 4 of the attached letter from FEMA). The Federal Emergency Management Agency (FEMA) has issued a Letter of Map Revision, accepting the revised flood plain boundaries. Furthermore, according to a letter received from the US Corps of Engineers in regards to the DEA, "the flood hazard information provided on page 27 of the DEA is correct." (See attached)

Ms. Estlier Ueda  
SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT  
September 20, 1996  
Page 4

7. The Department of Housing and Community Development has verified that it plans to file a petition to amend the State Land Use Agricultural District boundaries for that portion of Ewa Villages (including the proposed project) still within the Agricultural District.

If you have any further questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni  
Associate

Enclosures: Revised Figure  
Letter from FEMA  
Letter from Corps of Engineers

cc: Avis Kamimura, Department of Housing and Community Development  
Office of Environmental Quality Control

1593.0404.13.w-61



Federal Emergency Management Agency  
Washington, D.C. 20472

CERTIFIED MAIL  
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:  
Case No.: 96-09-187P

Community: City and County of Honolulu,  
Hawaii

Community No.: 150001

Panels Affected: 0110 D, 0130 C, and 0135 C

Effective Date of  
This Revision: **DEC 15 1995**

102-1-A-C

The Honorable Jeremy Harris  
Mayor, City and County of Honolulu  
530 South King Street, Room 300  
Honolulu, Hawaii 96813

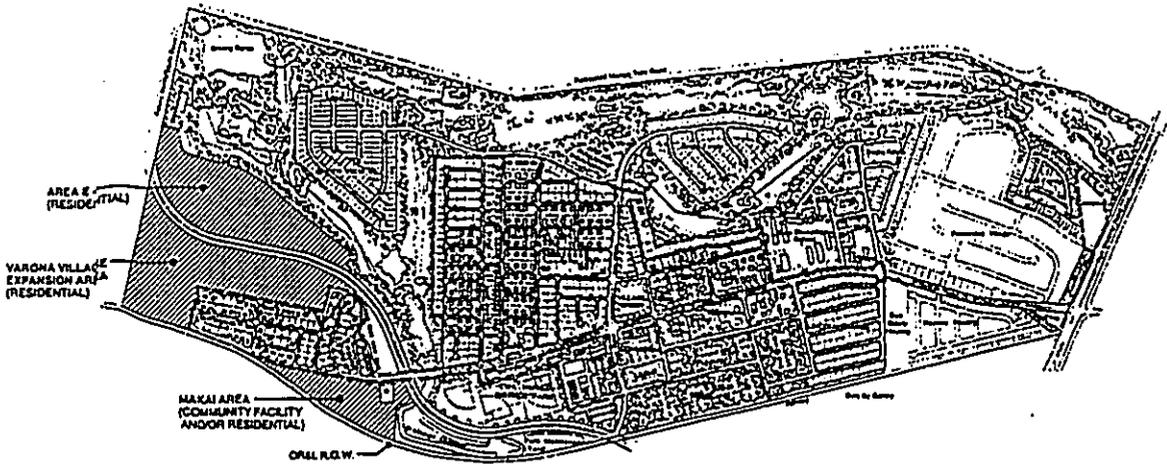
Dear Mayor Harris:

This is in response to a letter dated November 15, 1995, from Mr. Patrick T. Onishi, Director, Department of Land Utilization, City and County of Honolulu, regarding the reissuance of a Letter of Map Revision (LOMR) dated March 21, 1995, for the City and County of Honolulu, Hawaii. The March 21 LOMR revised Panels 0110 C, 0130 C, and 0135 C of the Flood Insurance Rate Map (FIRM) and Flood Profile: Panel 113P of the Flood Insurance Study (FIS) report for the City and County of Honolulu, Hawaii, both dated September 28, 1990. The March 21 LOMR has since been superseded by FIRM Panel 0110 D and the FIS report for the City and County of Honolulu, Hawaii, both dated September 30, 1995. The analysis used to amend the previous FIRM and FIS report is still valid.

The March 21 LOMR was issued in response to a letter dated January 16, 1995, from Mr. Greg H. Hiyakumoto, P.E., Senior Civil Engineer, R. M. Towill Corporation, regarding the effective FIRM and FIS report for the City and County of Honolulu, Hawaii. With his letter, Mr. Hiyakumoto provided additional information to support an October 14, 1994, request for a LOMR submitted by Mr. Donald A. Clegg, former Director, Department of Land Utilization, City and County of Honolulu. Mr. Clegg requested that the Federal Emergency Management Agency (FEMA) revise the effective FIRM to reflect the effects of the Ewa Villages Revitalization Project, a flood-control project that was designed to contain the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) along Kaloi Gulch in a series of detention basins.

All data required to complete our review of the March 21 LOMR were submitted with Mr. Clegg's October 14 letter and Mr. Hiyakumoto's January 16 letter. Because this LOMR is a reissuance of the March 21 LOMR, fees were not assessed for the review.

We have completed our review of the submitted data and the flood data shown on the effective FIRM, and have revised the FIRM to modify the elevations, floodplain boundary delineations, and zone designations of the base flood along Kaloi Gulch from approximately 300 feet downstream of the abandoned railroad to approximately 250 feet upstream of Mango Tree Road. The base flood elevations (BFEs) and width of the Special Flood Hazard Area (SFHA) generally decreased, with a maximum decrease in BFE of 7 feet and a maximum decrease in SFHA width of 3,700 feet. The only increase in SFHA width, approximately 150 feet, occurs approximately 1,300 feet west of the culvert under North-



VARONA VILLAGE PHASE II LAND USE SUMMARY			
PROJECT AREA	PROPOSED LAND USE	APPROX. ACREAGE	APPROX. NUMBER OF UNITS
AREA E	RESIDENTIAL	25	252
VARONA VILLAGE EXPANSION AREA	RESIDENTIAL	37	187
MAKAI AREA	COMMUNITY FACILITY RESIDENTIAL	9	110

LEGEND

Project Area

Historic District Boundary

Source: City and County of Honolulu, Department of Housing and Community Development  
R. M. Towill Corporation  
Barry Harris, Project Manager

FIGURE 4  
EWA VILLAGE MASTER PLAN  
VARONA VILLAGE, PHASE II



South Road. The revision also extended the limit of detailed study approximately 500 feet upstream. Property in the vicinity of Mango Tree Road that was previously shown on the FIRM to be in Zone D, an area where flood hazards have not been determined, was shown in the SFHA, and BFEs were determined. The property that is affected by this revision is owned by the community, and no insurable structures are affected by the increases in the SFHA width.

The hydraulic analysis submitted in support of the March 21 LOMR indicated that floodwaters will pond upstream of the cane road that connects North-South Road to another cane road (labeled "Cane Haul Road" on the FIRM) until the entire base flood discharge passes over the road. The submitted "Topographic Flood Workmap," prepared by R. M. Towill Corporation, dated September 20, 1994, showed that this ponding will occur for the reach of Kaloi Gulch downstream of Renton Road in the area of the Ewa-Maui District Park and the Gentry Palm Court subdivision. Our evaluation of the available topographic data indicated that, during the base flood event, floodwaters will flow through the Gentry Palm Court subdivision. If so, weir flow over the cane road would not be the only outlet from the ponded area. Because no detailed split-flow analysis assessing how much flow passes through the subdivision and how much passes over the cane road had been performed, no BFEs were determined for the reach of Kaloi Gulch downstream of Renton Road. The SFHA downstream of Renton Road was delineated based on the submitted work map and was designated Zone A. Should your community wish to undertake a detailed analysis of the split-flow condition, you may submit the required hydraulic analyses and supporting data and request a revision to this LOMR in accordance with Section 65.6 of the National Flood Insurance Program (NFIP) regulations.

If North-South Road is extended as indicated on the work map, the flood hazard will increase upstream of the road. We recommend that an analysis be performed before the road is extended evaluating the effect of the extension on the flood hazard to property upstream, as well as the Gentry Palm Court subdivision. If floodwaters pass through the Gentry Palm Court subdivision, additional property downstream of the existing limit of study will be affected. Any split-flow analysis performed should extend beyond the downstream limit of study shown on the FIRM assessing where the split-flow rejoins the main stream of Kaloi Gulch and evaluating any flood hazard to property downstream the split flow may create.

The modifications are shown on the enclosed annotated copies of FIRM Panel 0110 D, dated September 30, 1995; FIRM Panels 0130 C and 0135 C dated September 28, 1990; and Flood Profile Panel 113P in the FIS report dated September 30, 1995. This LOMR hereby revises these panels of the effective FIRM and the Flood Profile in the FIS report.

The following table is a partial listing of existing and modified BFEs:

Location	Existing BFE (feet)*	Modified BFE (feet)*
Kaloi Gulch:		
Just upstream of Renton Road	45	42
Approximately 2,100 feet upstream of Renton Road	49	42
Approximately 3,100 feet upstream of Renton Road	52	50
Approximately 250 feet upstream of Mango Tree Road	None	66

\*Referenced to the National Geodetic Vertical Datum, rounded to the nearest whole foot

Public notification of the revised BFEs was given in the Honolulu Advertiser on April 18 and April 25, 1995. In addition, a notice of changes was published in the Federal Register. FEMA received no valid requests for changes to the modified BFEs for Kaloi Gulch during the statutory 90-day appeal period that began on April 25, 1995, and ended on July 23, 1995. Therefore, the BFEs for Kaloi Gulch revised by the March 21 LOMR remain valid.

Because this LOMR will not be printed and distributed to primary users, such as local insurance agents and mortgage lenders, your community will serve as a repository for these new data. We encourage you to disseminate the information reflected by this LOMR throughout the community, so that interested persons, such as property owners, local insurance agents, and mortgage lenders, may benefit from the information. We also encourage you to prepare a related article for publication in your community's local newspaper. This article should describe the assistance that officials of your community will give to interested persons by providing these data and interpreting the NFIP maps.

The revisions are effective as of the date of this letter; however, a review of the determination made by this LOMR and any requests to alter this determination should be made within 30 days. Any request to alter the determination must be based on scientific or technical data.

Due to present funding constraints, we must limit the number of physical map revisions processed. Consequently, we will not republish the FIRM and FIS report for your community to reflect the modifications described in this LOMR at this time. However, when changes to FIRM Panels 0110 D, 0130 C, and 0135 C and the FIS report for your community warrant a physical revision and republication in the future, we will incorporate the modifications described in this LOMR at that time.

This response to Mr. Onishi's request is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development, including this request, and for ensuring that necessary permits required by Federal or State law have been received. With knowledge of local conditions and in the interest of safety, State and community officials may set higher standards for construction, or may limit development in floodplain areas. If the State of Hawaii or your community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence.

The basis of this LOMR is, in whole or in part, a channel-modification/culvert project. NFIP regulations, as cited in Paragraph 60.3(b)(7), require that communities assure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management regulations. Consequently, the ultimate responsibility for maintenance of the channel modification/culvert rests with your community.

The map panels as listed above and as revised by this letter will be used for all flood insurance policies and renewals issued for your community.

This determination has been made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and is in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed minimum NFIP criteria. These criteria are the minimum and do not supersede any State or local requirements of a more stringent nature. This includes adoption

4

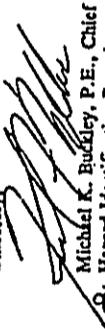
of the effective FIRM to which the regulations apply and the modifications described in this LOMR. Our records show that your community has met this requirement.

A Consultation Coordination Officer (CCO) has been designated to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Mr. Kevin J. Clark  
Acting Director, Mitigation Division  
Federal Emergency Management Agency, Region IX  
The Presidio of San Francisco, Building 105  
San Francisco, California 94129-1250  
(415) 923-7177

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please contact the CCO for your community at the telephone number cited above. If you have any technical questions regarding this LOMR, please contact Mr. John Magnoni of our staff in Washington, DC, either by telephone at (202) 646-3932 or by facsimile at (202) 646-4596.

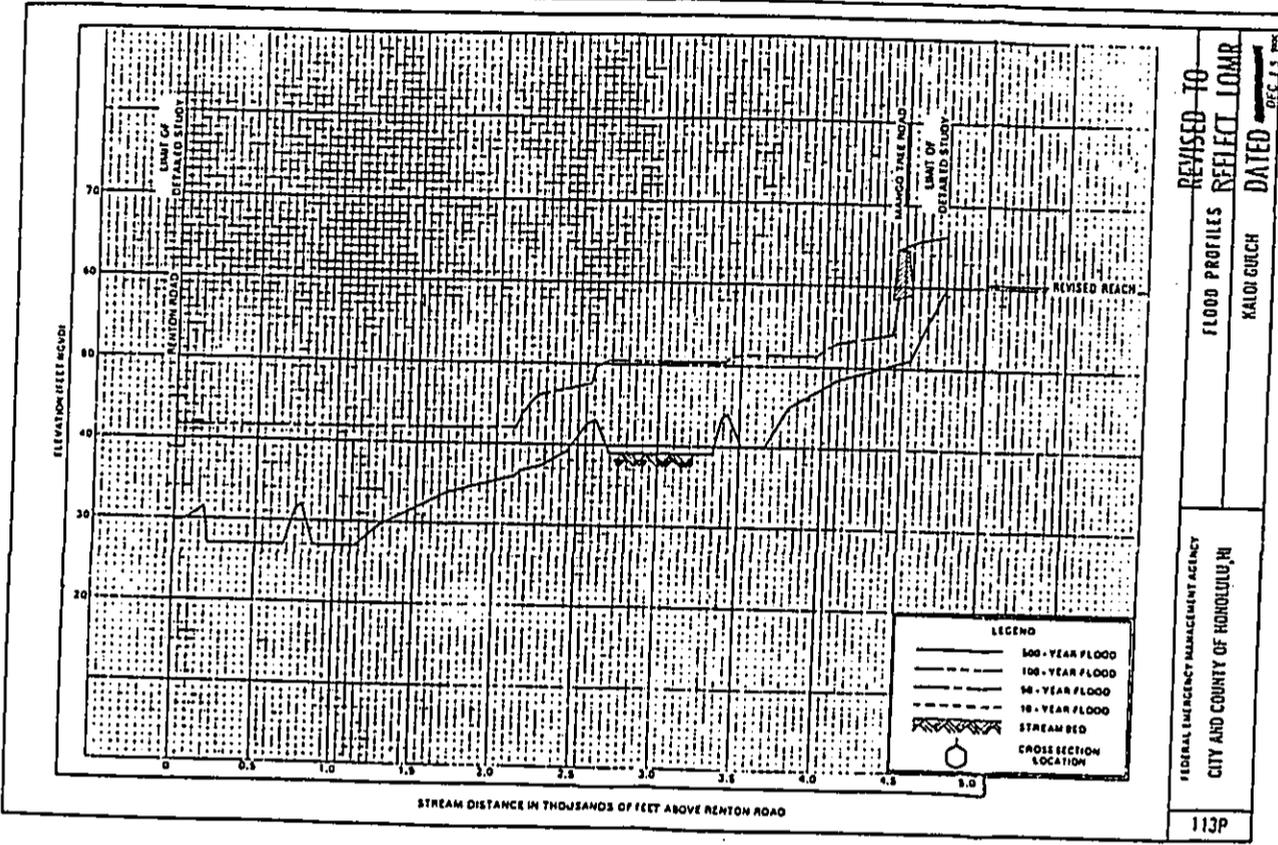
Sincerely,

  
Michael K. Buckley, P.E., Chief  
Hazard Identification Branch  
Mitigation Directorate

Enclosures

cc: Mr. Patrick T. Onishi  
Director, Department of Land Utilization  
City and County of Honolulu

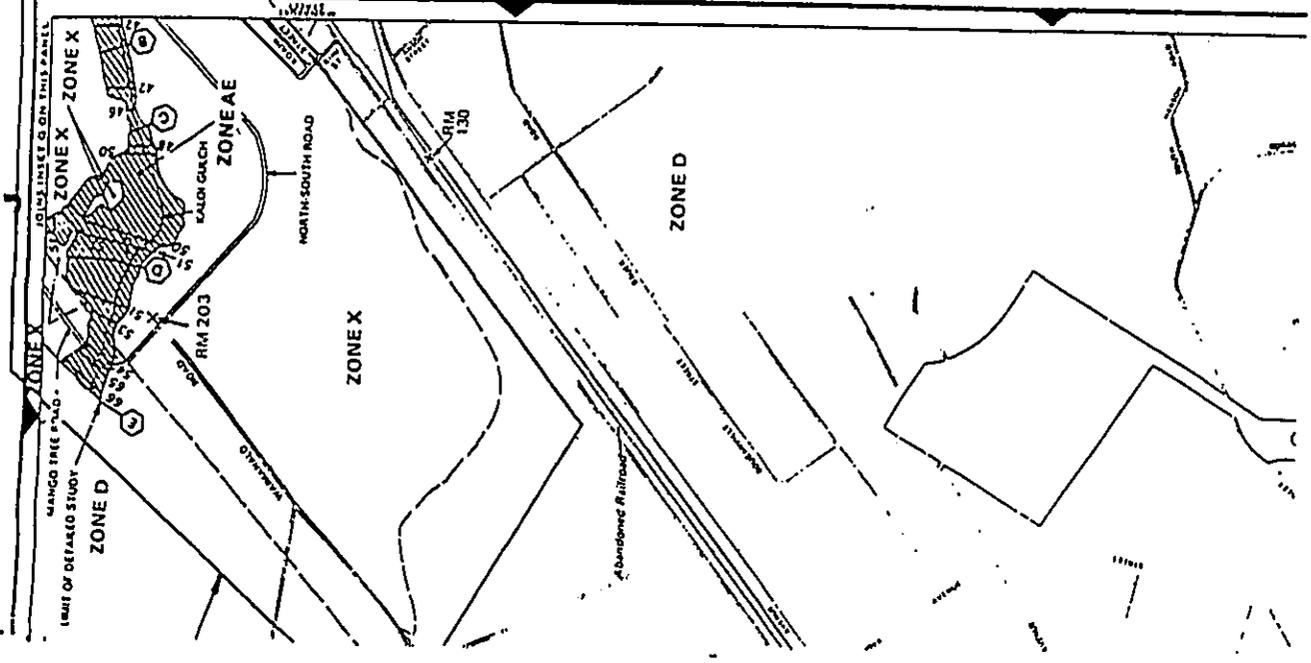
Mr. Greg H. Hiyabumoto, P.E.  
Senior Civil Engineer  
R. M. Towill Corporation



113P  
FEDERAL EMERGENCY MANAGEMENT AGENCY  
CITY AND COUNTY OF HONOLULU, HI  
REVISED TO  
FLOOD PROFILES REFLECT LOMR  
KALOI GURCH  
DATED  
DEC 15, 1982

PANEL 0130C

- LEGEND**
- SPECIAL FLOOD HAZARD AREAS IN BY 100-YEAR FLOOD
  - ZONE A: Areas with flood depths of 1 to 3 feet from an average annual storm surge of about 1 foot above the normal high tide level.
  - ZONE AE: Areas with flood depths of 1 to 3 feet from an average annual storm surge of about 1 foot above the normal high tide level.
  - ZONE AH: Areas with flood depths of 1 to 3 feet from an average annual storm surge of about 1 foot above the normal high tide level.
  - ZONE AD: Areas with flood depths of 1 to 3 feet from an average annual storm surge of about 1 foot above the normal high tide level.
  - ZONE A99: Areas with flood depths of 1 to 3 feet from an average annual storm surge of about 1 foot above the normal high tide level.
  - ZONE V: Areas with flood depths of 1 to 3 feet from an average annual storm surge of about 1 foot above the normal high tide level.
  - ZONE VE: Areas with flood depths of 1 to 3 feet from an average annual storm surge of about 1 foot above the normal high tide level.
  - FLOODWAY AREAS IN ZONE AE
  - OTHER FLOOD AREAS
  - ZONE X: Areas of 100-year flood of less than 1 foot above the normal high tide level.
  - OTHER AREAS
  - ZONE D: Areas determined to be of very flood plain.
  - ZONE O: Areas in which flood is undetermined.
  - Flood Boundary
  - Flood-at-Boundary
  - Zone D Boundary
  - Boundary Dividing Special Flood Zones and Dividing Areas of Coastal Zone Flood I Within Special Flood Zones.
  - Base Flood Elevation (in feet)
  - Cross Section Line
  - Site Flood Elevation Where Uniform Within
  - Elevation Reference: MSL



**NOTES**

This map is for use in the National Flood Insurance Program and does not constitute a warranty, particularly from local officials. It is not intended to be used for purposes other than those for which it was prepared. Floodway widths are provided for information only. Floodway widths are provided for information only. Coastal zone flood I areas are shown in Special Flood Hazard Zones. Areas of special flood hazard are shown in Special Flood Hazard Zones. Areas of special flood hazard are shown in Special Flood Hazard Zones.

**NATIONAL FLOOD INSURANCE PROGRAM**

**FIRM FLOOD INSURANCE RATE MAP**

CITY AND COUNTY OF HONOLULU, HAWAII

PANEL 130 OF 135  
SEE MAP INDEX FOR PANELS NOT PRINTED

**REVISED TO REFLECT LOMR DATED DECEMBER 5, 1985**

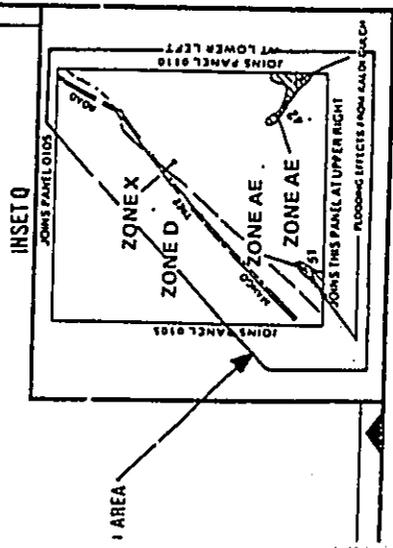
COMMUNITY-PANEL NUMBER 150001 0130C

MAP REVISED: SEPTEMBER 28, 1990

Federal Emergency Management Agency

MAP LEGEND  
Revised 100-Year Floodplain

OCEAN







BENJAMIN I. CAYETAHO  
DEPUTY DIRECTOR



STATE OF HAWAII  
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

375 SOUTH KING STREET  
FOURTH FLOOR  
HONOLULU, HAWAII 96813  
TELEPHONE: 832-1414  
FACSIMILE: 832-1418

September 9, 1996

The Honorable Roland D. Libby, Jr., Director  
Department of Housing and Community Development  
City and County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

Dear Mr. Libby:

We submit for your response (required by Section 343-5(b), Hawaii Revised Statutes) the following comments on a draft environmental assessment (DEA) for the Varona Village Phase II prepared by PBR Hawaii, August 1996, and transmitted to our Office by your August 6, 1996, letter (Draft/EA Var/REV5). Notice of this draft environmental assessment was published in the August 23, 1996, edition of the *Environmental Notice*. In 1991, your agency accepted pursuant to Chapter 343, Hawaii Revised Statutes, the Ewa Villages Master Plan Final Environmental Impact Statement ("FEIS") prepared by R. M. Towill Corporation.

1. **NOMINATION OF EWA SUGAR PLANTATION VILLAGES TO THE NATIONAL REGISTER OF HISTORIC PLACES:** The U. S. Department of the Interior, National Park Service, announced its receipt of a nomination of the "Ewa Sugar Plantation Villages" to the National Register of Historic Places in the *Federal Register*, Volume 61, Number 74, at page 16641. We also published notice of the nomination in *The Environmental Notice* of May 8, 1996 at page 25. Please discuss how nomination of the Ewa Sugar Plantation Villages to the National Register of Historic Places will affect the proposed Varona Villages Phase II Project.

2. **CONSULTATION WITH THE STATE HISTORIC PRESERVATION DIVISION MANDATORY UNDER SECTION 6E-4, HRS:** Although page 7 of the DEA, in paragraph 4, states in part that "[t]he Varona Village Phase II Master Plan proposes a land use plan to retain the 'plantation' residential character of Varona Village and enhance the cultural resources of the Ewa Villages," the discussion does not articulate how this is to be accomplished.

Section 6E-4, Hawaii Revised Statutes (1995 Supplement at page 25) states in pertinent part that "[b]efore any agency or officer of the State or its political subdivisions commences any project which may affect historic property ... the agency or officer shall advise the department [of land and natural resources] and allow the department an opportunity for review of the effect of the proposed project on historic properties ... The proposed project shall not be commenced ... until the department shall have given its written concurrence." [Emphasis supplied]

The DEA does not indicate that such concurrence was given for the Varona Villages Project. Such concurrence should provide needed guidance on retaining the character of Varona Village. Please consult with the State Historic Preservation Division of the Department of Land and Natural Resources.

The Honorable Roland D. Libby, Director  
Department of Housing and Community Development  
City and County of Honolulu  
September 9, 1996  
Page 2 of 2

3. **SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT:** On pages 2-6 and 2-7, the 1991 FEIS states that "[r]edevelopment of Varona Village will take place after the redevelopment of Tenny and Remion Villages at which time a separate EIS will be prepared."

The analysis of significance set forth in the DEA (at page 52) effectively dismisses the first criterion in section 11-200-12 of the EIS rules ("involves an irrevocable commitment to loss or destruction of any natural or cultural resources") by stating that "no significant archaeological or historical sites are known to exist on the subject property."

We do not feel that this criterion can be easily dismissed or mitigated since the nomination of the "Ewa Sugar Plantation Villages (including Varona Village)" to the National Register of Historic Places underscores its historical significance, and since the proposed action represents what we understand to be a substantive change in size, scope, intensity from the original 1991 master plan.

On page 57, under "Objectives and Policies for the Physical Environment - Social, Natural Beauty, and Historic Resources" the draft environmental assessment, citing HRS §§226-12(b)(1) and (4) (Hawaii State Plan) concludes that urbanization will have no effect on "archaeological resources," all the while neglecting the fact that the "Ewa Sugar Plantation Villages as a whole is historically important as evidenced in its nomination to the National Register."

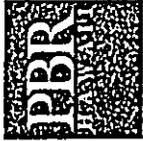
For the reasons set forth above, it seems that a supplemental environmental impact statement would be the appropriate vehicle for environmental review. Please consult with the State Historic Preservation Division of DLNR and discuss your reasons (including possible mitigative measures) for not preparing a supplemental statement in the final environmental assessment and notice of determination for this project.

Please include a copy of this letter and your response in the final environmental assessment and notice of determination for this project. If there are any questions, please call Mr. Leslie Segundo, Environmental Health Specialist, at 886-4185.

Sincerely,

GARY GILL  
Director

c: Mr. Avis Kamimura, Department of Housing and Community Development  
Mr. Vincent Shigetani, PBR Hawaii



DEPARTMENT OF PLANNING  
AND ECONOMIC DEVELOPMENT  
STATE OF HAWAII

November 6, 1996

Mr. Gary Gill, Director  
State of Hawaii  
Office of Environmental Quality Control  
220 South King Street, 4th Floor  
Honolulu, Hawaii 96813

Dear Mr. Gill:

**SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT**

Thank you for review of the Environmental Assessment (EA) for the proposed Varona Village Phase II project. We have reviewed your letter dated September 9, 1996 and offer the following responses:

1. According to the State Historic Preservation Division (SHPD), the proposed project is adjacent to and not part of the Ewa Plantation Villages historic district, and SHPD feels that the proposed project will have "no effect" on the character of the historic district (refer to attached letter). To further clarify this matter, the EA will be revised to state that the proposed project does not include the existing Varona Village, which is currently being redeveloped.
2. Although the project is not located within the Ewa Plantation Villages historic district, the proposed land use plan is intended to retain the plantation residential character of Varona Village and enhance the cultural resource of the Ewa Villages by developing the proposed Varona Village Expansion Area (which surrounds the existing Varona Village) in a manner comparable to the new housing in Tenney Village (as stated on page 8, paragraph 7).  
In accordance with Section 6E-8, HRS, the applicant is continuing its ongoing consultations with the State Historic Preservation Division.
3. As previously noted, the proposed project is located outside of the Historic District, and therefore, the statement that "no significant archaeological or historical sites are known to exist on the subject property" is correct. Therefore, the project does not appear to involve "an irrevocable commitment to loss or destruction of any natural or cultural resource." We have consulted with the State Historic Preservation Division, and they have stated that: "We

Mr. Gary Gill, Director  
**SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT**  
November 6, 1996  
Page 2

believe that the development of the residential area will have 'no effect' on the character of the historic district."

The reference in the FEIS for Ewa Villages that a "separate EIS will be prepared" for the redevelopment of Varona Village implies that Chapter 343 shall be compiled with. If, after reviewing the environmental assessment considering the significance criteria in Section 11-200-9, HAR, the proposed project is not found to cause significant impacts, Section 11-200-9, HAR, provides for the accepting authority to issue a negative declaration. It would seem reasonable, then, that this environmental document would have met the intent of the reference of a "separate EIS".

For the reasons set forth above, and because extensive information was provided in the Draft EA, we feel that the EA review process, in accordance with Chapter 343, provides for adequate environmental review. A copy of your letter and this response will be included in the final environmental assessment and notice of determination for this project.

If you have any further questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

*Vincent R. Shigekuni*

Vincent R. Shigekuni  
Associate

Enclosure: Letter from SHPD

cc: Avis Kamimura, Department of Housing and Community Development w/encl.

1-813-645-28-61

K. Frank Brandt • Thomas S. Watten • R. Sus Duncanson • Russell V. Chung  
PACIFIC TOWER, SUITE 610, 1000 BUSHOP STREET, HONOLULU, HAWAII 96813 TELEPHONE: (808) 551-5631 FAX: (808) 551-1102  
MANAGEMENT CENTER, 100 ALIEN STREET, SUITE 200, HONOLULU, HAWAII 96813 TELEPHONE: (808) 551-5631 FAX: (808) 551-1102



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
STATE HISTORIC PRESERVATION DIVISION  
31 SOUTH KING STREET, 4TH FLOOR  
HONOLULU, HAWAII 96813

OFFICE OF THE HISTORIC PRESERVATION DIVISION  
STATE OF HAWAII, DEPARTMENT OF LAND AND NATURAL RESOURCES  
SUITE 400, 1001 BISHOP STREET, HONOLULU, HI 96813

ADMINISTRATIVE SERVICES  
ARCHITECTURE  
COMMUNITY DEVELOPMENT  
CULTURAL AFFAIRS  
ENVIRONMENTAL AFFAIRS  
HISTORIC PRESERVATION  
LAND MANAGEMENT  
PLANNING  
PUBLIC AFFAIRS  
RECORDS MANAGEMENT  
REGULATORY AFFAIRS  
TECHNICAL SERVICES  
TRAINING  
UTILITY

October 18, 1996

LOG NO: 18313  
DOC NO: 9610co19  
Architecture

Ms. Avis Kamimura  
Department of Housing and  
Community Development  
City and County of Honolulu  
650 South King Street, 5th floor  
Honolulu, Hawaii 96813

Dear Ms. Kamimura:

SUBJECT: Draft Environmental Assessment (EA)  
Varona Village Phase II  
TMK 9-1-17:68 (por), 69 (por), & 75 (por)  
Ewa, Oahu

Thank you for the inquiry October 7, 1996, regarding the Varona Village Phase II, Environmental Impact or Environmental Assessment. This is to confirm that Varona Village Phase II is adjacent to and not part of the Ewa Plantation Villages historic district. We believe that the development of the residential area will have 'no effect' on the character of the historic district.

Thank you for the opportunity to comment. Should you have any questions, please call Carol Ogata at 587-0004.

Aloha,

DON HIBBARD, Administrator  
State Historic Preservation Division

CO:jk

cc: PBR Hawaii, Pacific Tower, Suite 650, 1001 Bishop Street, Honolulu, HI 96813, Attn: Vincent Shigetani



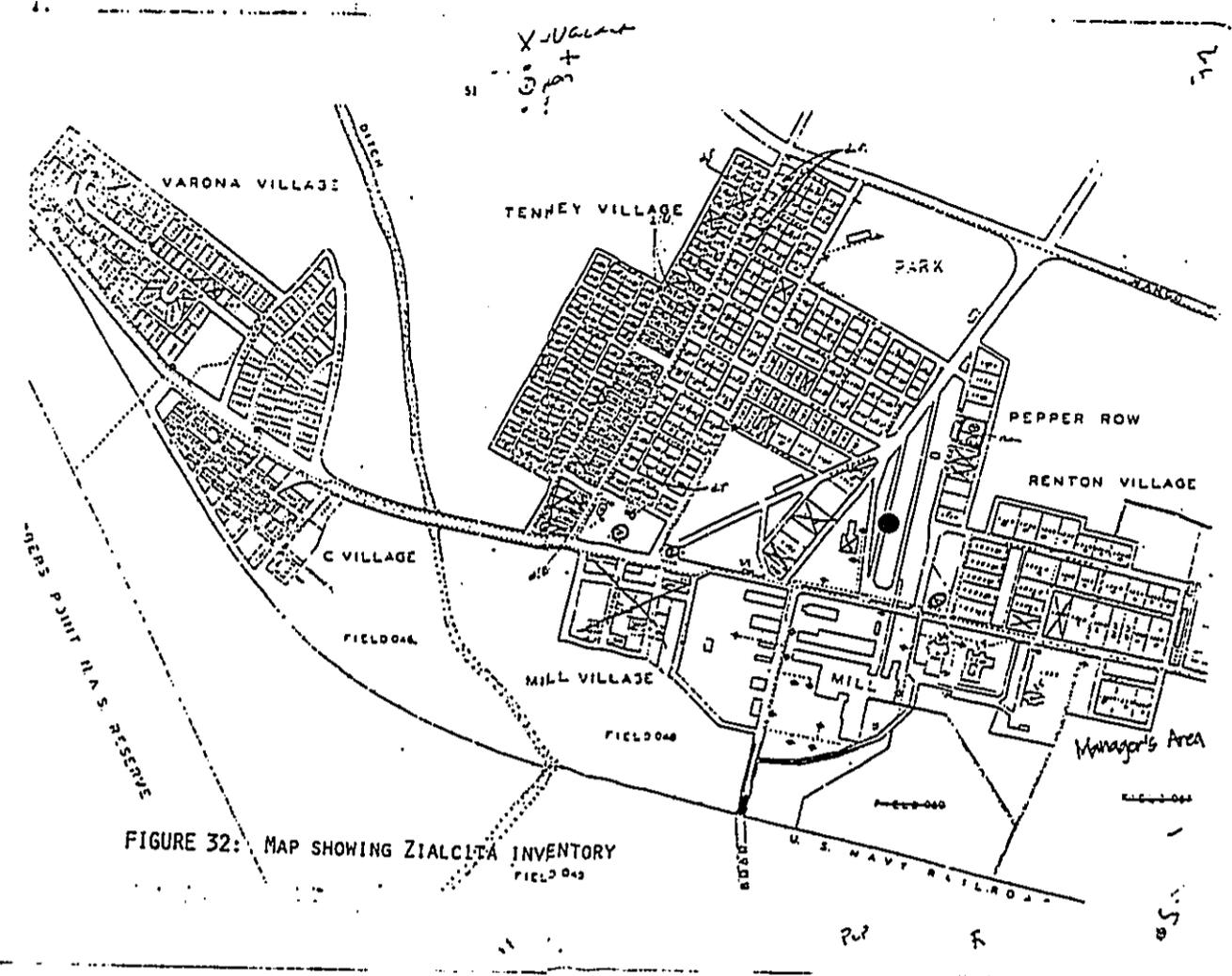


FIGURE 32: MAP SHOWING ZIALCITA INVENTORY

DEPUTY  
 DEPARTMENT OF LAND AND NATURAL RESOURCES  
 DEPUTY COMMISSIONER



STATE OF HAWAII  
 DEPARTMENT OF LAND AND NATURAL RESOURCES  
 STATE HISTORIC PRESERVATION DIVISION  
 25 SOUTH KING STREET, 6TH FLOOR  
 HONOLULU, HAWAII 96813

September 11, 1996

Ms. Avis Kamimura  
 Department of Housing and  
 Community Development  
 City and County of Honolulu  
 650 South King Street, 5th floor  
 Honolulu, Hawaii 96813

LOG NO: 18015  
 DOC NO: 9609co12  
 Architecture

Dear Ms. Kamimura:

SUBJECT: Draft Environmental Assessment (EA)  
 Varona Villages Phase II  
 TMK 9-1-17:68 (por), 69 (por), & 75 (por)  
 Ewa, Oahu

We have received on August 13, 1996, the draft environmental assessment of the Varona Villages Phase II from PBR Hawaii. Consideration should be given to the effect the project may have on the adjacent historic resources, as stated in the Archaeological Reconnaissance of the Ewa Villages Project Site, Honolulu, Ewa, Oahu, September 1990. It should be noted somewhere in the text, probably in section 4.4 Cultural Characteristics that the site is adjacent to historic sites. The OR&L Railway and Land Company Right of Way is listed on the National Register of Historic Places. Ewa plantation Villages has been determined eligible for the National Register and is listed on the Hawaii Register (1996), and has been submitted as a National Historic Landmark (1996).

Thank you for the opportunity to comment. Should you have any questions, please call Carol Ogata at 587-0004.

Aloha,

*[Signature]*

DON HIBBARD, Administrator  
 State Historic Preservation Division

CO:jk

copy: PBR Hawaii, Pacific Tower, Suite 650, 1001 Bishop Street, Honolulu, HI 96813, Attn: Vincent Shigekuni  
 Dean Uchida, Administrator, Land Division



September 17, 1996

Mr. Don Hibbard, Administrator  
State of Hawaii  
Department of Land and Natural Resources  
State Historic Preservation Division  
33 South King Street, 6th Floor  
Honolulu, Hawaii 96813

Dear Mr. Hibbard:

**SUBJECT: VARONA VILLAGE PHASE II ENVIRONMENTAL ASSESSMENT**

Thank you for review of the environmental assessment for the proposed Varona Village Phase II project. We have reviewed your letter dated September 11, 1996 and appreciate the information provided. As suggested, Section 4.4 Cultural Characteristics will be revised to read as follows:

*During the agricultural period, the area was extensively modified and altered from its natural condition. As such, the property does not contain plants or animals of traditional Hawaiian gathering value, and is not currently used for cultural or religious practices. Additionally, the site does not contain significant cultural remains or resources. However, the project site is adjacent to historic sites. The OREGON Railway and Land Company Right-of-Way is listed on the National Register of Historic Places. Ewa Plantation Village has been determined eligible for the National Register and is listed on the Hawaiian Register (1996), and has been submitted as a National Historic Landmark (1996). The boundaries of Ewa Plantation Village Historic District are shown on Figure 4. As such, in accordance with Section 6E-8, HRS, the applicant is continuing its ongoing consultations with the State Historic Preservation Division.*

Thanks again for your letter and for the additional information provided by Carol Ogata. If you have any further questions regarding the environmental assessment, please do not hesitate to contact me.

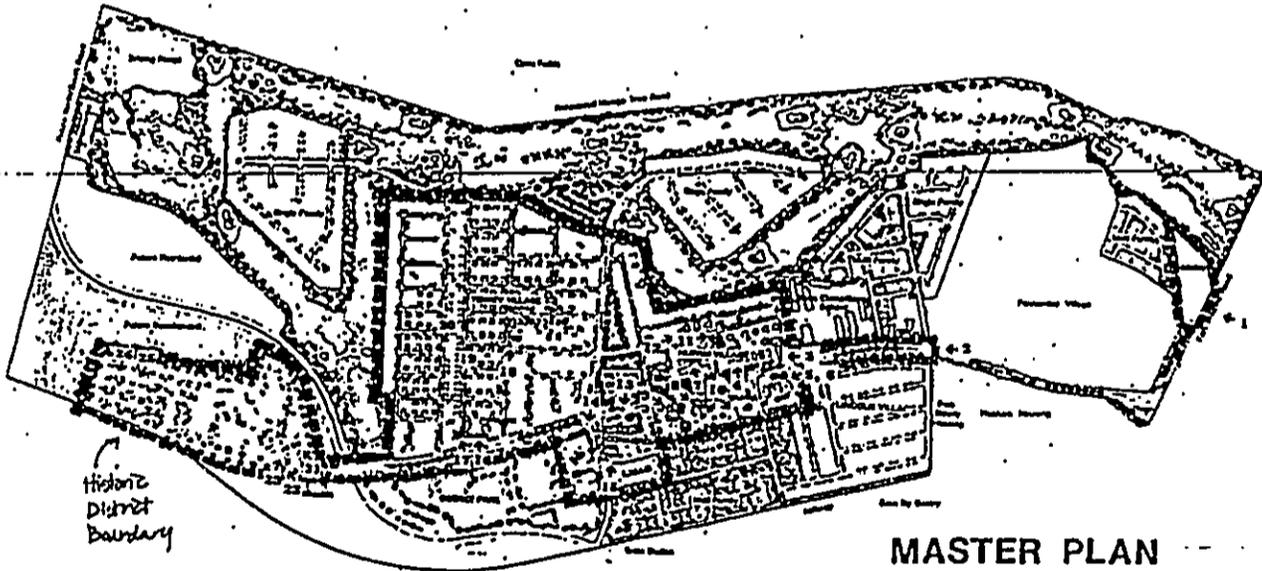
Sincerely,  
PBR HAWAII  
*Vincent R. Shigekuni*  
Vincent R. Shigekuni  
Associate

Enclosure: Figure 4  
cc: Avis Kamimura, Department of Housing and Community Development w/encl.  
Office of Environmental Quality Control w/encl.

151330A10-10-61

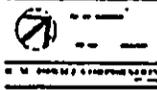
W. Frank Brando • Thomas S. Wisner • R. Stan Duncan • Russell Y. Chung  
PACIFIC TOWER, SUITE 600 100 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 531-5621 FAX: (808) 533-1072  
MAILING OFFICE: 1100 LOKAHEA CENTER 44 ALUANI STREET, SUITE 201 HONOLULU, HAWAII 96813 TELEPHONE: (808) 531-5111 FAX: (808) 531-5999

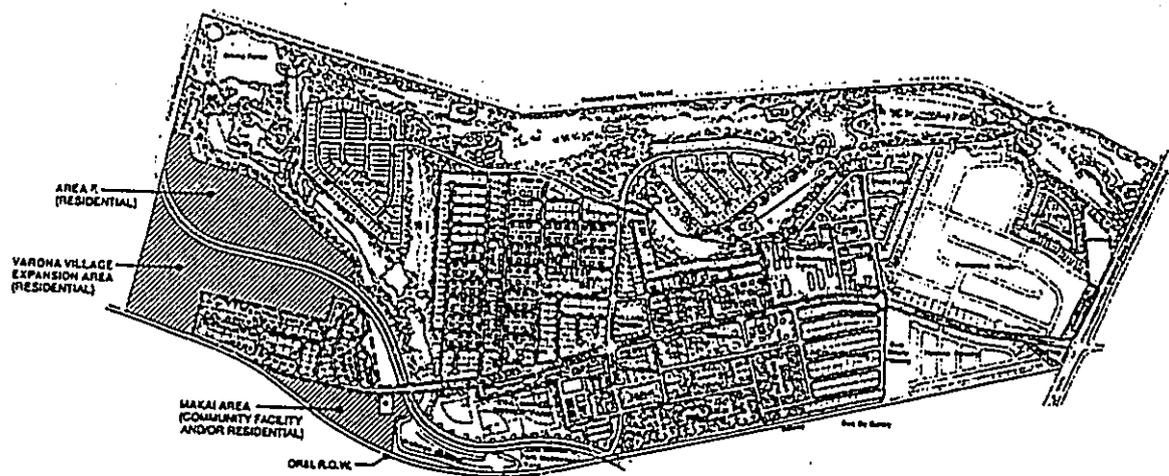
Post-It™ brand fax transmittal memo 7671 # of pages 1  
To: Vincent Shigekuni From: C. Ogata  
Dept. CA  
Fax to: 522-1402 Fax #



SITE PLAN

**MASTER PLAN**  
**EWA VILLAGES REVITALIZATION PROJECT**  
FOR THE CITY & COUNTY OF HONOLULU • DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT



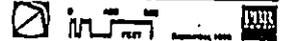


VARONA VILLAGE PHASE II LAND USE SUMMARY			
PROJECT AREA	PROPOSED LAND USE	APPROX. ACREAGE	APPROX. NUMBER OF UNITS
AREA E	RESIDENTIAL	25	232
VARONA VILLAGE EXPANSION AREA	RESIDENTIAL	27	167
MAKAI AREA	COMMUNITY FACILITY RESIDENTIAL	9	110

**LEGEND**  
 Project Area  
 Historic District Boundary

Source: City and County of Honolulu, Department of Housing and Community Development  
 R. M. Yee & Company  
 State Historic Preservation Division

**FIGURE 4**  
**EWA VILLAGE MASTER PLAN**  
**VARONA VILLAGE, PHASE II**





COPY

COPY

September 23, 1996

Roland D. Libby, Jr.  
Page 2  
September 23, 1996

TO: ROLAND D. LIBBY, JR., DIRECTOR  
DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

ATTN: AVIS KAMIMURA *AK*

FROM: RAYMOND H. SATO, MANAGER AND CHIEF ENGINEER  
BOARD OF WATER SUPPLY

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT FOR THE VARONA VILLAGE  
PHASE II PROJECT. EWA\_OAHU\_TMK: 2-1-17: PORTIONS OF 68\_69\_75

Thank you for the opportunity to review and comment on the Draft Environmental Assessment (DEA) for the proposed housing development.

We have the following comments to offer:

1. The proposed development conforms to the approved Water Master Plan. The Department of Housing and Community Development (DHCD) is required to coordinate the installation of the necessary on-site and off-site water system improvements including resource development, transmission and daily storage. The DEA should discuss project phasing and show that the installation of the water system infrastructure will be concurrent with the housing construction.
2. Page 39, Section 5.13.1, Paragraph 2: The existing Honolulu water system includes a 5.0 million gallon (mg) storage reservoir and a 1.0 mg breaker reservoir with spillway elevations of 228 and 440 feet respectively. The paragraph should be revised to clarify the situation.
3. Page 30, Section 5.5, Paragraph 5: The DEA should specify if nonpotable water will be used for irrigation purposes within the project site. If this is the situation, then a full discussion should be included on the installation of the required dual water system. Incorporated in this discussion should be the impacts and mitigative measures associated with usage of nonpotable water.

The Commission on Water Resource Management regulates groundwater withdrawals from the Ewa Caprock Aquifer through the issuance of Water Use Permits. The statement that "...the DOH will grant Water Use Permits from the aquifer ..." should therefore be revised. The Ewa Caprock aquifer's sustainable yield has significantly decreased from the cessation of plantation operations; therefore, reclaimed sewage effluent, when available, will supplement the reduction of the brackish water resource. The use of reclaimed sewage effluent and the correct application of the UIC line and the Pass-No Pass line should be coordinated with the Department of Health.

4. Page 41, Section 5.13.2, Paragraph 2: We understand the upgrade of a portion of the Honolulu plant to secondary treatment was to be completed in August 1996. This should be verified with the Department of Wastewater Management.

If you have any questions, please contact Barry Usagawa at 527-5235.

cc: Office of Environmental Quality Control  
PBR Hawaii



LAND PLANNING  
LANDMARK ARCHITECTURE  
ENVIRONMENTAL STUDIES

October 10, 1996

Mr. Raymond H. Sato  
Manager and Chief Engineer  
Board of Water Supply  
City and County of Honolulu  
630 South Beretania Street  
Honolulu, Hawaii 96813

SUBJECT: VARONA VILLAGE PHASE II  
DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Sato:

Thank you for your review of the environmental assessment for the proposed Varona Village Phase II project. We have reviewed your memorandum of September 23, 1996 and offer the following responses to your comments:

1. We appreciate the information that the proposed development conforms to the approved Water Master Plan. Although a project construction schedule is not available at this time, the Department of Housing and Community Development (DHCD) understands that it is required to coordinate the installation of the necessary on-site and the provision of off-site water system, including resource development, transmission and daily storage concurrent with or prior to housing construction.
2. Page 39, Section 5.13.1, Paragraph 2 of *Existing Conditions* will be revised to read as follows:  
*Maximum day demand storage for Ewa Villages is planned to be obtained from reservoirs in Honolulu and Kula. A 5.0 million gallon (mg) storage reservoir and a 1.0 mg breaker reservoir in Honolulu, with spillway elevations of 228' and 440', respectively, currently serve the system. Additional storage and transmission facilities for this system have been planned and will be implemented as demand requires.*
3. As the proposed project is intended to be mostly for single-family residential use and no common areas are proposed, irrigation will be limited to watering of lawns.

W. Frank Brandt • Thomas S. Wilcox • R. Scott Duncan • Russell V.J. Chung  
PACIFIC TOWER, SUITE 600 800 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 581-5641 FAX: (808) 583-1197  
BRANDT/PRICE BUILDING CENTER 100 ALIPIA STREET, SUITE 200 HULLI, HAWAII 96720 TELEPHONE: (808) 943-3333 FAX: (808) 943-3333

Mr. Raymond H. Sato  
SUBJECT: VARONA VILLAGE PHASE II DRAFT ENVIRONMENTAL ASSESSMENT  
October 10, 1996  
Page 2

We appreciate the information provided on the agency which regulates groundwater withdrawals, and page 30, Section 5.5, paragraph 2 will be revised to read "...the Commission on Water Resources Management will grant Water Use Permits from the aquifer..."

4. Subsequent to the filing of this Draft EA, upgrades to the Honolulu WWTTP was completed. As a result, page 41, Section 5.13.2, paragraph 2 of *Existing Conditions* will be revised to read as follows:

*The Honolulu WWTTP is located approximately one-half mile southeast of the proposed Makai Area development. The WWTTP presently operates as a primary treatment facility with design capacity of 38 MGD. The plant was recently upgraded to the design capacity and to achieve secondary treatment. The present wastewater flows to the WWTTP are in excess of 23 MGD, but well below the 38 MGD design capacity.*

Thanks again for your comments. If you have any further comments or questions regarding the environmental assessment, please do not hesitate to contact me.

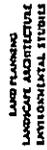
Sincerely,

PBR HAWAII

Vincent R. Shigekumi  
Associate

cc: Avis Kanimura/Department of Housing and Community Development  
Office of Environmental Quality Control

1543.004-19-61



LAND PLANNING  
LANDSCAPE ARCHITECTURE  
ENVIRONMENTAL STUDIES

September 25, 1996

Mr. Randall K. Fujiki  
Director and Building Superintendent  
Building Department  
City and County of Honolulu  
650 South King Street, 2nd Floor  
Honolulu, Hawaii 96813

SUBJECT: VARONA VILLAGE PHASE II  
DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Fujiki:

Thank you for your review of the environmental assessment for the proposed Varona Village Phase II project. If you have any comments or questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

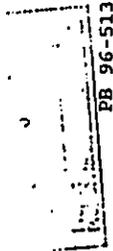
*Vincent R. Shigekuni*

Vincent R. Shigekuni  
Associate

cc: Avis Kamimura/Department of Housing and Community Development  
Office of Environmental Quality Control

1513.04M-14-461

W. Frank Braudi • Thomas S. Witten • R. Sue Duerksen • Russell Y. J. Chung  
PACIFIC TOWER, SUITE 650 809 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 524-1402  
BRAND OFFICE 11171 KALANANAKU CENTER 1111 H.O. HAWAII WAY TELEPHONE: (808) 933-3333 FAX: (808) 944-1499



September 4, 1996

MEMO TO: ROLAND D. LIBBY, DIRECTOR  
DEPARTMENT OF HOUSING & COMMUNITY DEVELOPMENT

ATTN: AVIS KAMIMURA

FROM: RANDALL K. FUJIKI  
DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: VARONA VILLAGE, PHASE II  
DRAFT ENVIRONMENTAL ASSESSMENT (DEA)

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

Should there be any questions, please contact Douglas Collinson at 527-6375.

*Randall K. Fujiki*

RANDALL K. FUJIKI  
Director and Building Superintendent

QC DC:jo  
cc: PBR Hawaii (Vincent Shigekuni) ✓  
Office of Environmental Quality Control

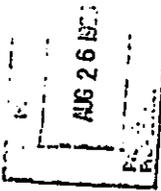
FIRE DEPARTMENT  
CITY AND COUNTY OF HONOLULU

3375 KOAPAKA STREET, SUITE H425  
HONOLULU, HAWAII 96819-1869



JEREMY HARRIS  
815704

ANTHONY J. LOPEZ, JR.  
FIRE CHIEF  
ATLANTIC ELECTRONICS  
FIRE DEPARTMENT



August 21, 1996

TO: ROLAND D. LIBBY, JR., DIRECTOR  
DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

ATTN: AVIS KAMIMURA

FROM: ANTHONY J. LOPEZ, JR., FIRE CHIEF

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT  
VARONA VILLAGE PHASE II PROJECT  
EWA, OAHU (TMK 9-1-17: 88 (POR.), 69 (POR.) AND 75 (POR.))

We have reviewed the subject material and have the following corrections:

First response is an engine company and a ladder company from Waipahu Fire Station, with support from Ewa Beach Fire Station engine company.

The Campbell Industrial Fire Station was renamed Kapolei Fire Station and was opened on September 12, 1995. It houses a Battalion Chief, his Aide and is in operation at the same location.

Should you have any questions, please call Captain Peter Gaskell of our Administrative Services Bureau at 831-7730.

ANTHONY J. LOPEZ, JR.  
Fire Chief

AJLPHG:ay

cc: Vincent Shigekuni, PBR Hawaii



LAND PLANNING  
LANDMARK ARCHITECTURE  
ENVIRONMENTAL STUDIES

September 12, 1996

Mr. Anthony J. Lopez, Jr., Fire Chief  
Fire Department  
City and County of Honolulu  
3375 Koapaka Street, Suite H425  
Honolulu, Hawaii 96819-1869

SUBJECT: VARONA VILLAGE PHASE II  
DRAFT ENVIRONMENTAL ASSESSMENT

Dear Chief Lopez:

Thank you for review of the environmental assessment for the proposed Varona Village Phase II project. We greatly appreciate the information provided and Section 5.13.5 pertaining to fire service will be revised to read as follows:

*Fire services in the Ewa area are provided from an engine company and a ladder company from the Waipahu Fire Station, with support from the Ewa Beach Fire Station engine company. The Makaiolo Fire Station is also available for support. The Kapolei Fire Station opened in 1995. It houses an engine company and a ladder company.*

*New facilities being planned for the Ewa area include a Ko Olina engine-and-ladder company, and the relocation of the existing Ewa Beach Fire Station into a new facility within the Ewa Marina Project.*

W. Frank Beach • Thomas S. Winters • R. Sun Duncanson • Kenneth V.J. Chong  
PACIFIC TOWER SUITE 400 850 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-1102  
FACSIMILE: (808) 521-1102 TELEPHONE: (808) 521-1102 FAX: (808) 521-1102

Mr. Anthony J. Lopez, Jr., Fire Chief  
SUBJECT: VARONA VILLAGE PHASE II DRAFT ENVIRONMENTAL ASSESSMENT  
September 12, 1996  
Page 2

If you have any further comments or questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

*Vincent R. Shigekuni*  
Vincent R. Shigekuni  
Associate

cc: Avis Kamimura/Department of Housing and Community Development  
Office of Environmental Quality Control

DEPARTMENT OF PARKS AND RECREATION  
CITY AND COUNTY OF HONOLULU  
650 SOUTH KING STREET  
HONOLULU, HAWAII 96813

JEREMY HARRIS  
MANAGER  
043884



DONALD HANAIKE  
DIRECTOR  
ALVIN K. AU  
DEPUTY DIRECTOR

August 23, 1996

28

TO: ROLAND D. LIBBY, DIRECTOR  
DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

FROM: DONA L. HANAIKE, DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)  
VARONA VILLAGE PHASE II PROJECT  
EWA, OAHU, HAWAII  
TAX MAP KEY 9-1-017:068 (POR.), 069 (POR.)  
AND 075 (POR.)

We have reviewed the draft EA for the above-described project and make the following comment.

The proposed project is in compliance with the City's Park Dedication Ordinance No. 4621.

Thank you for the opportunity to review the project.

If you have any questions, please contact Lester Lai of our Advance Planning Branch at extension 4696.

FOR DONA L. HANAIKE  
DIRECTOR

DH:ei

cc: Office of Environmental Quality Control  
PBR Hawaii



LAND PLANNING  
LANDSCAPE ARCHITECTURE  
ENVIRONMENTAL STUDIOS

September 12, 1996

Ms. Dona L. Hanaike, Director  
Department of Parks and Recreation  
City and County of Honolulu  
650 South King Street, 9th Floor  
Honolulu, Hawaii 96813

SUBJECT: VARONA VILLAGE PHASE II  
DRAFT ENVIRONMENTAL ASSESSMENT

Dear Ms. Hanaike:

Thank you for review of the environmental assessment for the proposed Varona Village Phase II project. We greatly appreciate the information provided in the project's compliance with the Park Dedication Ordinance No. 4621. Section 5.13.7 pertaining to recreational facilities will be revised accordingly.

If you have any further comments or questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni  
Associate

cc: Avis Kamimura/Department of Housing and Community Development  
Office of Environmental Quality Control

193.048-07-961

W. Frank Branda • Thomas S. Wilson • R. Scott Thurston • Russell J. Chung  
PACIFIC TOWER, SUITE 400 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 571-5431 FAX: (808) 571-1122  
BRAND CENTER 1101 KALANIANA'OHU DRIVE, HONOLULU, HAWAII 96813 TELEPHONE: (808) 571-1122 FAX: (808) 571-1122

PLANNING DEPARTMENT  
**CITY AND COUNTY OF HONOLULU**  
430 SOUTH KING STREET, 8TH FLOOR • HONOLULU, HAWAII 96813-3017  
PHONE: (808) 533-4111 • FAX: (808) 533-4930



JEREMY HARRIS  
MAYOR

CHERYL D. SOON  
CHIEF PLANNING OFFICER  
CAROLL TAKAHASHI  
DEPUTY CHIEF PLANNING OFFICER

U.S.T. 1.

TH 8/96-1716

September 26, 1996

**MEMORANDUM**

**TO:** ROLAND D. LIBBY, JR., DIRECTOR  
DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

**ATTN:** AVIS KAMIMURA

**FROM:** CHERYL D. SOON, CHIEF PLANNING OFFICER  
PLANNING DEPARTMENT

**SUBJECT:** DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR THE VARONA  
VILLAGE PHASE II PROJECT, EWA, OAHU, HAWAII  
TAX MAP KEY: 9-1-17: PORTIONS OF 68, 69 AND 75

In response to the letter from PBR Hawaii dated August 13, 1996, we have reviewed the subject EA and offer the following comments.

1. The proposed project is consistent with the vision of the revised Ewa Development Plan (DP) which is presently under review by the Honolulu City Council.
2. The three sites are currently designated Agriculture on the current Ewa DP Land Use Map. Therefore, a DP Land Use Map amendment will be required to change the current Agriculture land use designation to Residential and Public and Quasi-Public use for any community facilities. Since the proposed land use change involves an expansion of more than 20 acres to residential use, the DP Land Use Map amendment must be processed through the annual amendment review. The deadline for submitting the completed application is January 22, 1997.

Roland D. Libby, Jr., Director  
Department of Housing and Community Development  
September 26, 1996  
Page 2

Thank you for the opportunity to comment on this matter. Should you have any questions, please contact Tim Hata of our staff at 527-6070.

*Cheryl D. Soon*  
CHERYL D. SOON  
Chief Planning Officer

CDS:fr  
cc: PBR Hawaii  
OEQC



POLICE DEPARTMENT  
**CITY AND COUNTY OF HONOLULU**  
801 SOUTH BERETANIA STREET  
HONOLULU, HAWAII 96813 - AREA CODE (808) 529-3111



JEREMY HARRIS  
MAYOR

MICHAEL S. NAKAMURA  
CHIEF

HAROLD M. KAWASAKI  
LEE DONOHUE  
DEPUTY CHIEFS

OUR REFERENCE BS-DL

August 21, 1996

AUG 23 1996

TO: ROLAND D. LIBBY, JR., DIRECTOR  
DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

FROM: MICHAEL S. NAKAMURA, CHIEF OF POLICE  
HONOLULU POLICE DEPARTMENT

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT  
VARONA VILLAGE PHASE II  
TRK# 9-1-171-68 (FOR) AND 75 (FOR)

This is in response to PBR Hawaii's letter of August 13, 1996, requesting comments concerning the above subject. Section 5.13.5, pertaining to police service, is in need of revisions.

The subject property is located in District 8, which covers the Waianae Coast and the Eva Plain. District 3, which was reduced upon the creation of District 8 in 1994, now spans only the Pearl City and Waipahu areas. It is true that HPD plans to build a regional station in Kapolei, but that facility will not, in and of itself, add any officers to the district.

HPD has long been seeking new positions to keep up with the rapid growth in Leeward and Central Oahu. Some requests for new positions for Eva have been approved in the FY 1996-1997 budget just passed by the City Council. If all goes according to plan, it will take us about two years to put new officers in the field.

Thank you for the opportunity to comment.

MICHAEL S. NAKAMURA  
Chief of Police

By *Eugene Kenua*  
EUGENE UKURUA, Assistant Chief  
Administrative Bureau

cc: ✓ Mr. Vincent Shigekuni  
Associate, PBR Hawaii



LAURENCE P. SHIGEKUNI  
ASSOCIATE  
ENVIRONMENTAL STUDIOS

September 4, 1996

Mr. Michael S. Nakamura  
Chief of Police  
Police Department  
City and County of Honolulu  
801 South Beretania Street  
Honolulu, Hawaii 96813

Dear Chief Nakamura:

SUBJECT: VARONA VILLAGE PHASE II DRAFT ENVIRONMENTAL ASSESSMENT

Thank you for review of the environmental assessment for the proposed Varona Village Phase II project. We greatly appreciate the information provided and Section 5.13.5 pertaining to police service will be revised to read as follows:

*The subject property is located in the Police Department's District 8, which covers the Waianae Coast and the Eva Plain. Response time for the entire district fluctuates between five and seven minutes. In order to meet the growing needs of the Eva Plain communities, the police department plans to add a new regional station in nearby Kapolei. Some new positions for Eva have just been approved in the fiscal year 1996-1997 budget which will be implemented in the field in two years.*

If you have any further comments or questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

*Vincent P. Shigekuni*

Vincent P. Shigekuni  
Associate

cc: Avis Kamimura, Department of Housing and Community Development  
Office of Environmental Quality Control

1543194104-w61

W. Frank Brands • Thomas S. Wilson • R. Sue Duncan • Kenneth J. Chung  
PACIFIC TOWER SUITE 650 300 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5431 FAX: (808) 523-1102  
BRANDS OFFICE: 1110 LAGOON CENTER 300 AUTUMN STREET, SUITE 304 HILLO, HAWAII 96720 TELEPHONE: (808) 943-3333 FAX: (808) 943-1000

DEPARTMENT OF PUBLIC WORKS  
CITY AND COUNTY OF HONOLULU

630 SOUTH KING STREET  
HONOLULU, HAWAII 96813



JEFFREY HARRIS  
DIRECTOR

KENNETH E. SPRAGUE  
LEAD PLANNING  
DIRECTOR AND CHIEF ENGINEER  
DARRIN J. HANAMOTO  
SENIOR ARCHITECTURE  
DESIGN DIRECTOR

ENV 96-208

September 4, 1996

MEMORANDUM:

TO: ROLAND LIBBY, DIRECTOR  
DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

ATTENTION: AVIS KAHIMURA

FROM: KENNETH E. SPRAGUE  
DIRECTOR AND CHIEF ENGINEER

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (DEA)  
VARONA VILLAGE PHASE II  
TMK: 2-1-171 FORS. 98, 99 AND 75

We have reviewed the subject DEA and have the following comments:

1. Will the increase of runoff resulting from the development be determined on site?
2. The DEA should address City Ordinance 96-34 for controlling peak runoff. If Varona Village is part of the Ewa Village plan for detention, then mention it.
3. Statement that peak runoff will increase 2.5 to 3 times (on page 28) needs to be addressed in the context of the overall master plan if increases have already been considered and mitigated measures be established.
4. Improvements with City right-of-way should be in accordance with City standards and the Americans with Disabilities Act Accessibility guidelines.

Should you have any questions, please contact Mr. Alex Ho, Environmental Engineer, at Local 4150.

cc: PBR Hawaii



LEAD PLANNING  
LANDSCAPE ARCHITECTURE  
ENVIRONMENTAL STUDIOS

September 13, 1996

Mr. Kenneth E. Sprague  
Director and Chief Engineer  
Department of Public Works  
City and County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

SUBJECT: VARONA VILLAGE PHASE II  
DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Sprague:

Thank you for review of the environmental assessment for the proposed Varona Village Phase II project. We offer the following responses to your comments:

1. Runoff from the development will be discharged into the Ewa Villages Golf Course which provides detention for the entire Ewa Villages Revitalization project, including the project site.
2. Section 5.A of the Draft EA (the third sentence of the last paragraph of page 28) states: "The project sites have been included in a drainage master plan prepared for the entire Ewa Villages." At the end of this sentence we will add the following: "Use of the golf course as the major drainage way helps to dampen peak flows and promotes infiltration, in accordance with the intent of Ordinance 96-34."
3. The following will be added to the end of the third paragraph of page 28:

"Peak runoff from site will increase with the development of this project due to the increase in impervious surfaces and reduced time of concentration, however, peak runoff will be dampened by routing the runoff through the golf course. The impact of runoff from this project has been incorporated in the mitigative measures of the overall drainage master plan for Ewa Villages."

16 Frank Broun • Thomas S. Wilson • E. Sean Duncan • Russell V. J. Chung  
PACIFIC TOWER, SUITE 600 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 531-5431 FAX: (808) 533-1022  
BRANCH OFFICE: FIELD HOUSE CENTER 300 ALIPIA STREET, SUITE 300 HILLO, HAWAII 96720 TELEPHONE: (808) 941-1111 FAX: (808) 941-0000

Mr. Kenneth E. Sprague  
SUBJECT: VARONA VILLAGE PHASE II DRAFT ENVIRONMENTAL ASSESSMENT  
September 13, 1996  
Page 2

4. Improvements in Area E and the Makai Area should be done in accordance with typical City and County standards and the Americans with Disabilities Act Accessibility guidelines. Any deviations will require exemptions pursuant to Chapter 201E of the Hawaii Revised Statutes. Improvements within the Varona Village Expansion Area, with its narrower right-of-ways, will vary from typical subdivision roadways. The narrower right-of-ways are intended to preserve the historic character of the area. Because the roadways in the Expansion Area do not meet City and County standards, an exemption would be required pursuant to Chapter 201E of the Hawaii Revised Statutes. The exemption request would be similar to the actions required of Tenney and Renton Villages.

If you have any further comments or questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

*Vincent R. Shigekuni*

Vincent R. Shigekuni  
Associate

cc: Avis Kamimura/Department of Housing and Community Development  
Office of Environmental Quality Control

PBR Hawaii

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

PACIFIC PARK PLACE  
311 KEMOLAN BOULEVARD, SUITE 1200  
HONOLULU, HAWAII 96813



JACINTO HARRIS  
81968

CHARLES O. SWANSON  
DIRECTOR

- 4

Roland D. Libby  
Page 2  
September 23, 1996

We look forward to our continued coordination on this project. Should you have any questions regarding these comments, please contact Faith Miyamoto of the Transportation System Planning Division at Local 6976.

September 23, 1996

8/96-03807R

*C. Swanson*  
for CHARLES O. SWANSON

MEMORANDUM

TO: ROLAND D. LIBBY, JR., DIRECTOR  
DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

ATTN: AVIS KAMIMURA

FROM: CHARLES O. SWANSON, DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT FOR VARONA VILLAGE  
PHASE II PROJECT

cc: Office of Environmental Quality Control  
Mr. Vincent Shigekuni, PBR Hawaii

In response to the August 13, 1996 memorandum from PBR Hawaii, we reviewed the subject document and have the following comments to offer:

1. Continued coordination with this department is of the utmost importance, especially relating to plans in the areas that may be affected by the proposed North-South Road.
2. A roadway master plan should be submitted to this department for each of the three areas where the streets will either be dedicated to the City or subdivided as a separate parcel.
3. Traffic signals should be installed by the developer of each area at the time the signals are warranted.
4. A revised traffic study should be prepared if the base assumptions or conditions contained in the initial study change.
5. The study states that traffic signals will be warranted at the intersection of Park Row and Renton Road. Provisions should be made to incorporate any required work to the intersection as part of the development of the area.



LAND PLANNING  
LANDSCAPE ARCHITECTURE  
ENVIRONMENTAL STUDIOS

October 3, 1996

Mr. Charles O. Swanson, Director  
Department of Transportation Services  
City and County of Honolulu  
Pacific Park Plaza  
711 Kapiolani Boulevard, Suite 1200  
Honolulu, Hawaii 96813

SUBJECT: VARONA VILLAGE PHASE II  
DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Swanson:

Thank you for your review of the environmental assessment for the proposed Varona Village Phase II project. We have reviewed your memorandum of September 23, 1996 (your reference number 8/96-03807R) and offer the following responses to your comments:

1. Please be assured that it is the Department of Housing and Community Development's (DHCD) desire to continue coordination with the Department of Transportation Services (DTS), especially relating to plans in the areas that may be affected by the proposed North-South Road. In that regard, please note that DHCD's traffic consultant on the proposed project is DTS's consultant on the North-South Road Major Investment Study (MIS).
2. As recommended, a roadway master plan will be submitted to DTS for each of the project areas where the streets will either be dedicated to the City or subdivided as a separate parcel.
3. Also as recommended, the developer of each project area shall be required to install traffic signals at the time signals are warranted.
4. While highly unlikely, in the event that more intensive development is proposed, a revised traffic study shall be prepared and submitted to your Department. Otherwise, it is felt that it would be more appropriate that changes in base assumptions or conditions, without the project, should be incorporated in the ongoing North-South Road MIS.
5. As recommended, pullboxes, underground conduits and traffic signal interties shall be provided at the intersection of Park Row and Reiton Road as part of the proposed

W. Frank Branch • Thomas S. Vines • E. Sue Duncan • Russell Y. Chung  
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MANAHI OFFICE: 1110 LAGOON CENTER MANAHI STREET, SUITE 306 HILO, HAWAII 96720 TELEPHONE: (808) 942-3333 FAX: (808) 942-0999

Mr. Charles O. Swanson, Director  
SUBJECT: VARONA VILLAGE PHASE II DRAFT ENVIRONMENTAL ASSESSMENT  
October 3, 1996  
Page 2

development prior to occupation, although traffic signals shall not be installed unless warranted.

If you have any further comments or questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

*Vincent R. Shigekuni*

Vincent R. Shigekuni  
Associate

cc: Avis Kamimura/Department of Housing and Community Development  
Office of Environmental Quality Control

1543 OAH-18-w61





LAND PLANNING  
LANDSCAPE ARCHITECTURE  
ENVIRONMENTAL STUDIOS

November 8, 1996

Mr. Felix B. Limitaco, P.E.  
Director  
Department of Wastewater Management  
City and County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

SUBJECT: VARONA VILLAGE PHASE II  
DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Limitaco:

Thank you for your review of the environmental assessment for the proposed Varona Village Phase II project. We have reviewed those comments and representatives of our consulting engineering firm, Engineering Concepts, Inc. (ECI) have met with Ms. Tessa Yuen of your Department to resolve these issues. Based on ECI's meeting with Ms. Yuen, we offer the following responses:

1. Ms. Yuen noted that the single family and multi-family densities for Area E were not clearly stated. As a result, the second paragraph of section 4.1.4 (page 8) of the Environmental Assessment (EA) will be revised as follows: "Area E is intended to be developed for market single-family residential and/or up to 252 multi-family residential units." Also Table 1 (page 9) of the EA will be revised to indicate whether the proposed residential uses are multi-family or single family.
2. During the meeting, it was noted that the Department's projection of future flows was based on the assumption that the 252 units identified on the above pages were single-family units and thus the higher equivalent population factor was applied, resulting in higher flows.
3. The approved Ewa Villages Sewerage Master Plan also included 70 acres from the golf course in the determination of peak flows (adding wet weather infiltration) for the segment of sewer line indicated as inadequate. The inclusion of the additional 70 acres of wet weather infiltration with the estimated domestic flows resulted in the flows exceeding the 90 percent of pipe capacity limitation stated in the Department's letter. It was agreed that the

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MAUNALOAN OFFICE: 1181 LILUANOKI CENTER MAUNALOAN STREET, SUITE 208 HILLO, HAWAII 96705 TELEPHONE: (808) 943-3333 FAX: (808) 943-9099

Mr. Felix B. Limitaco, P.E., Director  
SUBJECT: VARONA VILLAGE PHASE II DRAFT ENVIRONMENTAL ASSESSMENT  
November 8, 1996  
Page 2

Department would allow the 90 percent limitation to be exceeded with the golf course area included, as long as the capacity of the pipe was not exceeded. We have attached a copy of the revised sewer flows estimate verifying that the capacity of the existing pipe is not exceeded.

4. As requested by Ms. Yuen, the EA will be revised to include a statement indicating that the identified project densities are the maximum developable (for conservative analysis in estimating the maximum impact of development) and would not be increased. This would assure adequate capacity in the system.
5. Please be assured that the Ewa Villages Sewerage Master Plan will be revised and resubmitted after final decisions are made on the type and densities of each development.

If you have any further comments or questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PDR HAWAII

Vincent R. Shigekuni  
Associate

Enclosure: Computation of Wastewater Flow

cc: Avis Kamimura/Department of Housing and Community Development  
Office of Environmental Quality Control

1543 044-09-461





DEPARTMENT OF THE ARMY  
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS  
FORT SHAFTER, HAWAII 96858-5440

REPLY TO  
ATTENTION OF

August 28, 1996

Planning and Operations Division

Mr. Vincent Shigekuni  
PBR Hawaii  
1001 Bishop Street, Suite 650  
Honolulu, Hawaii 96813

Dear Mr. Shigekuni:

Thank you for the opportunity to review and comment on the Draft Environmental Assessment (DEA) for Varona Village Phase II Project located in Ewa, Oahu (TMK 9-1-17: por. 68, 69, and 75). The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act.

a. Based on the information provided, a DA permit would be required for any discharge of dredged or fill material into the waterway of Kaloi Gulch. Please contact our Regulatory Section at 438-9258 for further information and refer to file number 960000343.

b. The flood hazard information provided on page 27 of the DEA is correct.

Sincerely,

*Lawrence O. Muraoka, P.E.*  
Lawrence O. Muraoka, P.E.  
Acting Chief, Planning  
and Operations Division



PLANNING AND OPERATIONS  
DIVISION  
ENVIRONMENTAL STUDIES

September 12, 1996

Mr. Lawrence O. Muraoka, P.E., Acting Chief  
Planning and Operations Division  
Department of the Army  
Pacific Ocean Division  
Corps of Engineers  
Fort Shafter, Hawaii 96858-5440

SUBJECT: VARONA VILLAGE PHASE II  
DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Muraoka:

Thank you for review of the environmental assessment for the proposed Varona Village Phase II project. We greatly appreciate the information provided regarding the DA Permit requirements. We do not foresee the need for any discharge of dredged or fill material into the waterway of Kaloi Gulch at this time. However, it is anticipated that future construction of drain outlets in Kaloi Gulch may need additional permits.

If you have any further comments or questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

*Vincent R. Shigekuni*

Vincent R. Shigekuni  
Associate

cc: Avis Kamimura/Department of Housing and Community Development  
Office of Environmental Quality Control

1543494-06.w61

W. Frank Brands - Thomas S. Waters - R. Sam Thurston - Kenneth Y. Chung  
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS  
1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-1107  
FACSIMILE: (808) 521-1107  
MAIL ROOM: 1001 BISHOP CENTER MAIL ROOM HONOLULU, HAWAII 96813 FAX: (808) 521-1107



United States  
Department of  
Agriculture

Natural  
Resources  
Conservation  
Service

P.O. Box 50004  
Honolulu, HI  
96850

Our People...Our Islands...In Harmony

September 26, 1996

Department of Housing and Community Development  
City and County of Honolulu  
650 South King Street, 5th Floor  
Honolulu, Hawaii 96813

ATTN: Avis Kamimura

SEP 30 1996

Dear Ms. Kamimura:

Subject: Draft Environmental Assessment (DEA) - Varona Village Phase II, Ewa,  
O'ahu, Hawaii

We have reviewed the above mentioned document and have no comments to offer at  
this time.

Thank you for the opportunity to review this document.

Sincerely,

KENNETH M. KANESHIRO  
State Conservationist

cc: Mr. Vincent Shigekuni, PBR Hawaii, Pacific Tower, Suite 650, 1001 Bishop Street,  
Honolulu, Hawaii 96813

The Natural Resources Conservation Service works hand-in-hand with  
the American people to conserve natural resources on private lands.

AN EQUAL OPPORTUNITY EMPLOYER



LAND PLANNING  
LANDSCAPE ARCHITECTURE  
ENVIRONMENTAL STUDIOS

September 30, 1996

Mr. Kenneth M. Kaneshiro, State Conservationist  
United States Department of the Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, Hawaii 96850

SUBJECT: VARONA VILLAGE PHASE II  
DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Kaneshiro:

Thank you for your review of the environmental assessment for the proposed Varona Village  
Phase II project. If you have any comments or questions regarding the environmental assessment,  
please do not hesitate to contact me.

Sincerely,

PBR HAWAII

Vincent R. Shigekuni  
Associate

cc: Avis Kamimura/Department of Housing and Community Development  
Office of Environmental Quality Control

143.D4426-61

W. Frank Brando • Thomas S. Vuolo • R. San Duncker • Russel N. J. Chung  
PACIFIC TOWER, SUITE 650 1001 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 531-5631 FAX: (808) 533-4192  
BRANDY OFFICE 1430 LAGOON CENTER 1400 ALIPIA STREET, SUITE 204 HILLO, HAWAII 96799 TELEPHONE: (808) 943-3133 FAX: (808) 943-3899

**GTE Hawaiian Tel**  
*Beyond the call*

GTE Hawaiian Telephone Company Incorporated  
P.O. Box 2200 - Honolulu, HI 96811 - (808) 548-4511

September 12, 1996

SEP 16

Department of Housing and Community Development  
City and County of Honolulu  
650 King Street, 5th Floor  
Honolulu, Hawaii 96813  
Attn: Avis Kamimura

Subject: Varona Village Phase II

Thank you for the opportunity to review and comment on the Environmental Assessment for Varona Village Phase II.

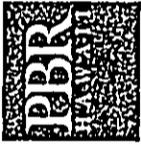
GTE Hawaiian Telephone, HTCo, does not foresee any problems in providing telecommunication services to the proposed facilities. However, further review will be required by HTCo during the design stages of the project.

If you have any questions or concerns, please call Daren Lum at 483-8034.

Sincerely,

  
Garret Hayashi  
Operations Supervisor  
Outside Plant Engineering

cc: PBR HAWAII  
Kevin Ayano



LAND PLANNING  
LANDSCAPE ARCHITECTURE  
ENVIRONMENTAL STUDIOS

September 25, 1996

Mr. Garret Hayashi  
Operations Supervisor  
Outside Plant Engineering  
GTE Hawaiian Tel  
P.O. Box 2200  
Honolulu, Hawaii 96814

SUBJECT: VARONA VILLAGE PHASE II  
DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Hayashi:

Thank you for your review of the environmental assessment for the proposed Varona Village Phase II project. We appreciate the information provided and understand that further review will be required by HTCo during the design stages of the project.

If you have any further comments or questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

  
Vincent R. Shigekuni  
Associate

cc: Avis Kamimura/Department of Housing and Community Development  
Office of Environmental Quality Control

154J DWH-18-w61

W. Frank Brandt - Thomas S. Wilson - R. San Donato - Russell Y.J. Chung  
PACIFIC TOWER, SUITE 609 1008 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 551-5451 FAX: (808) 553-1102  
MAUNALOA OFFICE: 1100 LAGOON CENTER MAUNALOA, HAWAII 96969 TELEPHONE: (808) 941-3333 FAX: (808) 941-3000



United States Department of the Interior  
 U.S. GEOLOGICAL SURVEY  
 WATER RESOURCES DIVISION  
 677 Ala Moana Boulevard, Suite 415  
 Honolulu, Hawaii 96813

August 19, 1996

Mr. Vincent Shigekuni  
 Associate  
 PBR Hawaii  
 Pacific Tower  
 1001 Bishop St., Suite 650  
 Honolulu, Hawaii 96813

Dear Mr. Shigekuni:

Subject: Draft Environmental Assessment  
 Varona Village Phase II  
 Ewa, Oahu

The staff of the U.S. Geological Survey, Water Resources Division, Hawaii District, has reviewed the Draft Environmental Assessment, and we have no comments to offer at this time.

We are returning the report for your future use. Thank you for allowing us to review it.

Sincerely,

*William Meyer*  
 William Meyer  
 District Chief

Enclosure

AUG 22 1996



LAND PLANNING  
 LANDSCAPE ARCHITECTURE  
 ENVIRONMENTAL STUDIOS

September 25, 1996

Mr. William Meyer, District Chief  
 United States Department of the Interior  
 U.S. Geological Survey  
 Water Resources Division  
 677 Ala Moana Boulevard, Suite 415  
 Honolulu, Hawaii 96813

SUBJECT: VARONA VILLAGE PHASE II  
 DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Meyer:

Thank you for your review of the environmental assessment for the proposed Varona Village Phase II project. If you have any comments or questions regarding the environmental assessment, please do not hesitate to contact me.

Sincerely,

PBR HAWAII

*Vincent R. Shigekuni*

Vincent R. Shigekuni  
 Associate

cc: Avis Kamimura/Department of Housing and Community Development  
 Office of Environmental Quality Control

143,040-15,661

W. Frank Brandt • Thomas S. Winters • R. San Duncan • Russell Y. Chung  
 PACIFIC TOWER, SUITE 650 677 BISHOP STREET HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5631 FAX: (808) 523-1102  
 RECEPTION OFFICE: 1100 LACONIA CENTER 101 ALIFONG STREET, SUITE 300 HILLO, HAWAII 96720 TELEPHONE: (808) 943-3333 FAX: (808) 943-0887

# **VARONA VILLAGE PHASE II**

## **APPENDICES**

# **VARONA VILLAGE PHASE II**

## **APPENDIX A**

### *Air Quality Study*

**AIR QUALITY STUDY  
FOR THE PROPOSED  
VARONA VILLAGE PHASE II PROJECT**

**OAHU, HAWAII**

Prepared for:  
**PBR HAWAII**

July 1996



**B. D. NEAL & ASSOCIATES**  
*Applied Meteorology • Air Quality • Computer Science*  
P.O. BOX 528, OCEAN VIEW, HAWAII 96742-0528  
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**1.0 SUMMARY**

The City and County of Honolulu is proposing to develop the last remaining area of its Ewa Villages project in the Ewa Plains area of Oahu. Referred to as the Varona Village Phase II Project, this development involves three areas totaling approximately sixty-one acres. A total of 519 single- and multi-family units are planned along with related community facilities. Development would occur over the next eight years with full occupancy by the year 2005. This study examines the potential short- and long-term air quality impacts that could occur as a result of construction and use of the proposed facilities. Mitigative measures to reduce any potential air quality impacts from the project are suggested where possible and appropriate.

Both federal and state standards have been established to maintain ambient air quality. At the present time, seven parameters are regulated including: particulate matter, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, ozone and lead. Hawaii state air quality standards are more stringent than the comparable national limits except for the standards for sulfur dioxide, particulate matter and lead, which are set at the same levels.

Regional and local climate together with the amount and type of human activity generally dictate the air quality of a given location. The climate of the project area is very much affected by its leeward and only slightly inland situation. Winds are predominantly trade winds which are deviated somewhat from the northeast toward the east by the local terrain. During winter,

occasional storms may generate strong winds from the south (Kona winds) for brief periods. When the trade winds or Kona winds are weak or absent, landbreeze-seabreeze circulations may develop. Wind speeds typically vary between about 5 and 15 miles per hour providing relatively good ventilation much of the time. Temperatures in the leeward Oahu area are generally very moderate with average daily temperatures ranging from about 65°F to 85°F. Extreme temperatures range from about 50°F to about 95°F. Rainfall is relatively low with an average of about 21 inches per year.

The present air quality of the project area is relatively good and has probably improved recently with the discontinuation of sugar cane growing in the Ewa Plain area. Air quality data from the nearest monitoring stations operated by the state Department of Health suggest that all national air quality standards are currently being met, although occasional exceedances of the more stringent state standards for ozone and for carbon monoxide may occur.

If the proposed project is given the necessary approvals to proceed, it is inevitable that some short- and long-term impacts on air quality will unavoidably occur either directly or indirectly as a consequence of project construction and use. Short-term impacts from fugitive dust will likely occur during the project construction phase. To a lesser extent, exhaust emissions from stationary and mobile construction equipment and from workers' vehicles may also affect air quality during the period of construction. State air pollution control regulations require that there be no visible fugitive dust emissions at the property

line. Hence, an effective dust control plan should be implemented to ensure compliance with state regulations and to avoid complaints from residents and businesses adjacent to construction areas. Fugitive dust emissions can be controlled to a large extent by watering of active work areas, using wind screens, keeping adjacent paved roads clean, and by covering of open-bodied trucks. Other dust control measures could include limiting the area that can be disturbed at any given time and/or mulching or chemically stabilizing inactive areas that have been worked. Paving and landscaping of project areas early in the construction schedule will also reduce dust emissions. Monitoring of dust emissions along the project boundary could be considered to evaluate the effectiveness of dust control measures. Exhaust emissions from traffic disruption can be mitigated by moving construction equipment and workers to and from the project site during off-peak traffic hours.

After construction, vehicles coming to and from the proposed project will result in a long-term increase in air pollution emissions in the project area, particularly along Renton Road. To assess the impact of emissions from these vehicles, an air quality modeling study was undertaken to estimate current ambient concentrations of carbon monoxide at the intersection of Renton Road and Park Row and to predict future levels both with and without the proposed project at this and two other intersections in the project area. During worst-case conditions, model results indicated that present 1-hour carbon monoxide concentrations are within the state and national ambient air quality standards. Model results also indicated that presently the state and national 8-hour carbon monoxide standards are being met.

In the year 2005 without the project, worst-case 1-hour concentrations were predicted to increase at the intersection of Renton Road and Park Row to a level exceeding the state standard during the morning peak hour. The Renton Road at North-South Road intersection also produced predicted concentrations in excess of the state standard. Both locations, however, were predicted to remain within the less stringent national 1-hour standard. State and national 8-hour carbon monoxide standards were predicted to be exceeded at the Renton Road/North-South Road intersection while Renton Road at Park Row exceeded only the state standard.

With the project worst-case concentration levels within the project area would increase slightly or remain the same at the two Renton Road intersections studied. A third intersection, Area E Access Road at North-South Road, which exists only in the future with project case, was also predicted to exceed the state 1-hour standard. All three locations were found to produce predicted concentrations in excess of the state 8-hour standard and one intersection, Renton Road/North-South Road, exceeded the national 8-hour standard.

It should be noted here that, because the state standards are set at such stringent levels, it is likely that they are currently exceeded at many locations in the state that have even moderate traffic volumes. Although potential exceedance of the national 8-hour standard is also indicated either with or without the project at the Renton Road/North-South Road intersection, the projected 8-hour concentrations are probably less reliable than

the 1-hour estimates due to the prediction methodologies involved.

Options available to mitigate long-term, traffic-related air pollution are generally to further improve roadways, to reduce traffic or to reduce individual vehicular emissions. Based on the air quality modeling results, it may be appropriate to consider the feasibility of further improving some intersections in the project area, particularly the intersection of Renton Road and North-South Road. Aside from providing added roadway improvements, air pollution impacts from vehicular emissions could conceivably be additionally mitigated by reducing traffic volumes through the promotion of bus service and car pooling and/or by adjusting local school and business hours to begin and end during off-peak times. This mitigation measure, however, is generally considered only partially successful. Reduction of emissions from individual vehicles is generally beyond the control of any single development and would have to be achieved through the promulgation of county, state or federal air pollution control regulations. For example, Hawaii currently does not require annual inspections of motor vehicle air pollution control equipment. Although this has been proposed in past legislative sessions, there currently is no indication that the state is contemplating adopting such rules.

Another potential mitigation measure might be to provide added buffer zones between walkways and roadways where space is available. Technically, however, the public would have to somehow be excluded from the buffer zones. The predicted worst-case concentrations in this report are based on a separation distance of 3 m

(10 ft) between walkways and roadways. Doubling this distance to about 6 m (20 ft) would reduce maximum concentrations in some cases by about 10 to 15 percent.

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

## 2.0 INTRODUCTION AND PROJECT DESCRIPTION

The City and County of Honolulu is proposing for development a residential project, referred to as the Varona Village Phase II Project. The development is to be in three distinct areas located north, west, and south of the existing Varona Village in the Ewa Plains area of the island of Oahu. As indicated in Figure 1, the proposed project site is located along both sides of Renton Road, south of the Ewa Villages Golf Course. The entire proposed development includes 61 acres of land, most of which will be used for a mixture of 519 single-family residences and townhomes. The project will also include community facilities. Development will conclude by the year 2005.

The purpose of this study was to evaluate the potential air quality impacts of the proposed project and recommend mitigative measures, if possible and appropriate, to reduce or eliminate any degradation of air quality in the area. Before examining the potential impacts of the proposed project, a discussion of ambient air quality standards is presented and background information concerning the regional and local climatology and the present air quality of the project area is provided.

## 3.0 AMBIENT AIR QUALITY STANDARDS

Ambient concentrations of air pollution are regulated by both national and state ambient air quality standards (AAQS). National AAQS are specified in Section 40, Part 50 of the Code of Federal Regulations (CFR), while State of Hawaii AAQS are defined in Chapter 11-59 of the Hawaii Administrative Rules. Table 1 summarizes both the national and the state AAQS that are specified in the cited documents. As indicated in the table, national and state AAQS have been established for particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone and lead. The state has also set a standard for hydrogen sulfide. 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, and the state 1-hour limit for ozone is more than two times as stringent as the federal standard.

Hawaii AAQS for sulfur dioxide were relaxed in 1986 to make the state standards essentially the same as the national limits. In 1993, the state also revised its particulate standards to follow those set by the federal government. 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.

#### 4.0 REGIONAL AND LOCAL CLIMATOLOGY

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

Hawaii lies well within the belt of northeasterly trade winds generated by the semi-permanent Pacific high pressure cell to the north and east. On the island of Oahu, the Koolau and Waianae Mountain Ranges are oriented almost perpendicular to the trade winds, which accounts for much of the variation in the local climatology of the island. The site of the proposed project is located southwest of Pearl Harbor in the Ewa Plains area.

The nearest long-term wind data available for the project area are collected either at the Barbers Point Naval Air Station, located about 3 miles to the southwest, or at the Honolulu International Airport, located about 8 miles to the east. These data are probably representative of the project site. Wind frequency data given in Table 2 for Barbers Point show that the annual prevailing wind direction for this area of Oahu is east

northeast (the same as at Honolulu International Airport). On an annual basis, 38.1 percent of the time the wind is from this direction, and more than 80 percent of the time the wind is in the northeast quadrant. Winds from the south are infrequent occurring only a few days during the year and mostly in winter in association with Kona storms. Wind speeds average about 10 knots (12 mph) and mostly vary between about 5 and 15 knots (6 and 17 mph). Surface winds at the project site are likely similar to those recorded at Barbers Point.

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 depend 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. Based on more than 50 years of data collected at the Ewa Plantation, average annual daily minimum and maximum temperatures in the project area are 65°F and 84°F, respectively [1]. The extreme minimum temperature on record is 47°F, and the extreme maximum is 93°F.

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 project area, stability class 5 or 6 is probably the highest stability class that occurs, developing during clear, calm nighttime or early morning hours when temperature inversions form due to radiational cooling. Stability classes 1 through 4 occur during the daytime, depending mainly on the amount of cloud cover and incoming solar radiation and the onset and extent of the sea breeze.

Mixing height is defined as the height above the surface through which relatively vigorous vertical mixing occurs. Low mixing heights can result in high ground-level air pollution concentrations because contaminants emitted from or near the surface can become trapped within the mixing layer. In Hawaii, minimum mixing heights tend to be high because of mechanical mixing caused by the trade winds and because of the temperature moderating effect of the surrounding ocean. Low mixing heights may sometimes occur, however, at inland locations and even at times along coastal areas early in the morning following a clear, cool, windless night. Coastal areas also may experience low mixing levels during sea breeze conditions when cooler ocean air rushes in over warmer land. Mixing heights at most locations in Hawaii typically are above 3000 feet (1000 meters).

Rainfall can have a beneficial affect on the air quality of an area in that it helps to suppress fugitive dust emissions, and it also may "washout" gaseous contaminants that are water soluble. Rainfall in Hawaii is highly variable depending on elevation and on location with respect to the tradé wind. The Ewa Plain is one of the driest areas on Oahu due to its leeward and near sea level location. Average annual rainfall in the project area is probably close to 21 inches as measured at the former Ewa Plantation, but may vary from about 10 inches during a dry year to more than 40 inches during a wet year. Most of the rainfall tends to occur during the winter months. Monthly rainfall may vary from as little as a trace to as much as 15 inches or more.

#### 5.0 PRESENT AIR QUALITY

Present air quality in the project area is mostly affected by air pollutants from vehicular, industrial, natural and/or agricultural sources. Table 3 presents an air pollutant emission summary for the City and County of Honolulu that was compiled for 1980 emissions. These are the latest data that are available. Emissions are undoubtedly higher at this time, but the proportional relationships may continue to be about the same. Also, these emission rates may provide a relative measure with which to assess project-related emissions presented later in this study. As suggested in the table, the mineral products industry was the most significant source category for emissions of particulate matter. Sulfur dioxide emissions originated mainly from power plants, while motor vehicles accounted for much of the emissions of nitrogen oxides, carbon monoxide and hydrocarbons.

Fort Weaver Road, slightly more than a mile from the project site on the northeast, is a major arterial roadway that presently carries moderate to heavy levels of vehicle traffic during peak traffic hours. Emissions from motor vehicles using this roadway, primarily nitrogen oxides and carbon monoxide, will tend to be carried over the project site by the prevailing winds. Emissions emanating from traffic on the H-1 Freeway, situated about two miles to the north, probably do not significantly impact the site.

Several sources of industrial air pollution are located in the Campbell Industrial Park, which is located about three miles to the southwest at Barbers Point. Industries currently operating there include the Chevron and PRI refineries, H-Power and others. Prevailing winds from the northeast will carry these emissions away from the site most of the time. Another large industrial source of air pollution is the Waiau Power Plant situated about six miles to the northeast. Emissions from Waiau Power Plant consist primarily of sulfur dioxide and nitrogen oxides from oil-burning generator units. Due to the prevailing wind pattern in the area, it is likely that these emissions occasionally impact air quality in the project area.

Until recently, air pollution in the project area originating from agricultural sources could mainly be attributed to sugar cane operations near the project site. Emissions from both the mill and the canefield operations in the area have now been eliminated with the closure of the Oahu Sugar Company. Although it is currently unclear how all of the former sugar cane lands will be utilized, it is expected that diversified agriculture

will be promoted. Due to the project's location in the midst of former sugar cane lands, it is quite likely that air pollution emissions associated with the new diversified agricultural operations will impact the site from time to time.

Natural sources of air pollution emissions that also could affect the project area but cannot be quantified very accurately include the ocean (sea spray), plants (aero-allergens), wind-blown dust, and perhaps distant volcanoes on the island of Hawaii.

The State Department of Health operates a network of air quality monitoring stations at various locations on Oahu. Each station, however, typically does not monitor the full complement of air quality parameters. Table 4 shows an annual summary of air quality measurements that were made nearest to the project site for each of the regulated air pollutants for the period 1989 through 1993. These are the most recent data that are currently available.

During the years 1991 to 1993, sulfur dioxide was monitored by the State Department of Health at an air quality station located at Makaiwa Gulch about 3 miles to the southwest of the project site. There were no exceedances of the state/national 24-hour AAQS for sulfur dioxide during the 3-year period. Concentrations monitored were consistently low with 24-hour averages ranging from near 0 to 47  $\mu\text{g}/\text{m}^3$ .

The nearest monitoring station for particulate matter less than 10 microns in diameter (PM-10) was located at Kapolei about 3 miles to the west. Twenty-four hour average PM-10 concentrations monitored at this location ranged from 8 to 164  $\mu\text{g}/\text{m}^3$  from 1991 through 1993. Average daily concentrations were approximately 25  $\mu\text{g}/\text{m}^3$ . One exceedance of the state and national AAQS was reported.

The nearest carbon monoxide measurements were made at West Beach, about five miles to the west of the project site. During the period, the average daily maximum 1-hour concentration measured at this location was less than 1  $\text{mg}/\text{m}^3$ . During the most recent year reported, 1993, the daily maximum 1-hour concentration ranged from 0 to 17.8  $\text{mg}/\text{m}^3$ , with two exceedances of the state 1-hour AAQS recorded. The national AAQS was not exceeded. During previous years (1991-92), maximum 1-hour concentrations were lower and did not exceed the state AAQS. Daily maximum 8-hour values for 1989-93 have not been reported at this writing, but concentrations for earlier years were less than 5  $\text{mg}/\text{m}^3$  and averaged about 1.3  $\text{mg}/\text{m}^3$ . No exceedances of the state or national 8-hour AAQS have been reported. Present concentrations of carbon monoxide in the project area are estimated later in this study based on air quality modeling of vehicular emissions.

The nearest available ozone measurements were obtained at Sand Island (about 10 miles east southeast of the project site). The maximum 1-hour concentration for each year from 1990 to 1993 has averaged 118  $\mu\text{g}/\text{m}^3$  and two to seven exceedances of the state AAQS per year have been recorded. Ozone concentrations were somewhat lower during 1989 when a maximum concentration of 96  $\mu\text{g}/\text{m}^3$  was

measured and no exceedances of the state standard were registered.

The nearest and most recent measurements of ambient lead concentrations that have been reported were made at the downtown Honolulu monitoring station between 1991 and 1993. Lead concentrations at this location have had a downward trend for several years, most probably reflecting the increased use of unleaded gasoline. Average quarterly concentrations were near or below the detection limit, and no exceedances of the state AAQS were recorded. Monitoring for this parameter was discontinued during 1988 and resumed in 1991.

Nitrogen dioxide was not monitored by the Department of Health anywhere in the state during the first four years of the 1989-93 reporting period. In 1993 measurements were taken at Kapolei and the annual mean value reported was 12  $\mu\text{g}/\text{m}^3$ , safely inside the state and national AAQS.

Based on the data and discussion presented above, it appears likely that the State of Hawaii AAQS for sulfur dioxide, nitrogen dioxide, lead and, with the closing of the Oahu Sugar Company, probably particulate matter are currently being met at the project site. It is likely, however, that the state AAQS for ozone may be exceeded on occasion based on the Sand Island measurements for this parameter. Carbon monoxide readings from West Beach indicate that the state AAQS for carbon monoxide may also be exceeded at a rate of about one to two times per year in traffic congested areas.

#### 6.0 SHORT-TERM IMPACTS OF PROJECT

Short-term direct and indirect impacts on air quality could potentially occur during project construction. For a project of this nature, there are two potential types of air pollution emissions that could directly result in short-term air quality impacts during project construction: (1) fugitive dust from vehicle movement and soil excavation; and (2) exhaust emissions from on-site construction equipment. Indirectly, there also could be short-term impacts 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-moving activities associated with site clearing and preparation work. 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 dirt-disturbing activity taking place, the moisture content of exposed soil in work areas, and the wind speed. The EPA [2] has provided a rough estimate for uncontrolled fugitive dust emissions from construction activity of 1.2 tons per acre per month under conditions of "medium" activity, moderate soil silt content (30%), and precipitation/evaporation (P/E) index of 50. Uncontrolled fugitive dust emissions in the project area would likely be somewhat higher due to the relatively dry climate. In

any case, State of Hawaii Air Pollution Control Regulations [3] prohibit visible emissions of fugitive dust from construction activities at the property line. Thus, an effective dust control plan for the project construction phase is essential.

Adequate fugitive dust control can usually be accomplished by the establishment of a frequent watering program to keep bare-dirt surfaces in construction areas from becoming significant sources of dust. In dust-prone or dust-sensitive areas, other control measures such as limiting the area that can be disturbed at any given time, applying chemical soil stabilizers, mulching and/or using wind screens may be necessary. Control regulations further stipulate that open-bodied trucks be covered at all times when in motion if they are transporting materials that could be blown away. Haul trucks tracking dirt onto paved streets from unpaved areas is oftentimes a significant source of dust in construction areas. Some means to alleviate this problem, such as road cleaning or tire washing, may be appropriate. Paving of parking areas and/or establishment of landscaping as early in the construction schedule as possible can also lower the potential for fugitive dust emissions.

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

relatively insignificant compared to vehicular emissions on nearby roadways.

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.

## 7.0 LONG-TERM IMPACTS OF PROJECT

### 7.1 Roadway Traffic

After construction is completed, use of the proposed facilities will result in increased motor vehicle traffic on nearby roadways, potentially causing long-term impacts on ambient air quality in the project vicinity. Motor vehicles with gasoline-powered engines are significant sources of carbon monoxide, and they also emit nitrogen oxides and other contaminants.

Federal air pollution control regulations require that new motor vehicles be equipped with emission control devices that reduce emissions significantly compared to a few years ago. In 1990, the President signed into law the Clean Air Act Amendments. This new legislation requires further emission reductions be phased in

beginning in 1994. The combination of current and new restrictions on emissions from new motor vehicles will lower average emissions each year as more and more older vehicles leave the state's roadways. Carbon monoxide emissions, for example, will go down by about 15 percent on the average during the next 10 years due to the replacement of older vehicles with newer models.

To evaluate the potential long-term indirect ambient air quality impact of 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 that can be addressed locally to some extent, whereas nitrogen oxides air pollution most often is a regional issue that cannot be addressed by a single new development.

For this project, three scenarios were selected for the carbon monoxide modeling study: year 1996 with present conditions, year 2005 without the project, and year 2005 assuming the project is complete and fully occupied. To begin the modeling study, critical receptor areas in the vicinity of the project site 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, intersections

identified by the project traffic engineers as being impacted by the project and as having either high traffic volumes or congested traffic conditions were selected for air quality analysis. These included one existing intersection (Renton Road/Park Row), one which will exist in the future with and without project cases (Renton Road/North-South Road) and one which will exist only in the future with project case (Area E Access Road/North-South Road). Intersection configurations and traffic conditions at each of these locations are detailed in the traffic impact report for the project [4].

The main objective of the modeling study was to estimate maximum 1-hour average carbon monoxide concentrations for each of the three scenarios studied. To evaluate the significance of the estimated concentrations, a comparison of the predicted values for each scenario can be made. Comparison of the estimated values to the national and state AAQS will provide another measure of significance.

The traffic impact report for the project indicates that traffic volumes will be higher at most locations during the afternoon peak hour than during the morning peak period. However, worst-case emission and meteorological dispersion conditions typically occur during the morning hours at most locations. Thus, both morning and afternoon peak-traffic hours were examined for each scenario to ensure that worst-case concentrations were identified.

The EPA computer model MOBILE5A [5] was used to calculate vehicular carbon monoxide emissions for each year studied. This model is the most recently released version of the EPA mobile emission models. Emission estimates provided by the MOBILE5A model have been updated based on EPA's recent testing of on-road vehicles. This latest series of tests has indicated that emission control equipment deteriorates more rapidly than had been previously thought. Hence, MOBILE5A emission estimates are higher (in some cases as much as twice as high) compared to emission estimates derived from earlier versions of the model, particularly in states like Hawaii that have no inspection and maintenance program for emission control equipment.

One of the key inputs to the MOBILE5A emission model 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 MOBILE5A emission model are the cold/hot start fractions. Motor vehicles operating in cold- or hot-start modes emit excess air pollution until reaching stabilized operating temperatures. Typically, motor vehicles reach stabilized operating temperatures after about 4 miles of driving. For traffic operating on surface streets around the project area, it was assumed that during both morning and afternoon peak traffic hours 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. These operational mode values were estimated based on a report from the California Department of Transportation [6] and taking into consideration the likely origins of morning/afternoon traffic in the project area.

Ambient temperatures of 59 and 68 degrees Fahrenheit were used for morning and afternoon peak-hour emission computations, respectively. These are conservative assumptions since morning/afternoon ambient temperatures will generally be warmer than this and emission estimates given by MOBILE5A are inversely proportional to the ambient temperature.

After computing vehicular carbon monoxide emission factors through the use of the MOBILE5A emission model, these data were then input to the latest version of the computer model CALINE4 [7]. CALINE4 was developed by the California Transportation Department to simulate vehicular movement and atmospheric dispersion of vehicular emissions. This model 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 impact report for the project [4]. The traffic volumes for the future with project scenario include project traffic as well as traffic from other growth that is expected to occur in the area by the year 2005. Traffic queuing estimates were made based on Transportation Research Board procedures [8] and U.S. EPA guidelines [9]. Deceleration/acceleration times were calculated

based on the posted speed limits at existing intersections and anticipated limits at future intersections.

Model roadways were set up to reflect roadway geometry, physical dimensions and operating characteristics. Presently, pedestrian walkways exist very close to most of the roadways within the project area. Concentrations predicted by air quality models generally are not considered valid within the roadway mixing zone. The roadway mixing zone is usually taken to include 3 meters on either side of the traveled portion of the roadway and the turbulent area within 10 meters of a cross street. Model receptor sites were thus located at the edges of the mixing zones near all intersections that were studied. All receptor heights were placed at 1.8 meters above ground to simulate levels within the normal human breathing zone.

Input meteorological conditions for this study were defined to provide "worst-case" results. One of the key meteorological inputs is atmospheric stability category. For these analyses, atmospheric stability category 5 was assumed for morning scenarios and stability category 4 was assumed for afternoon cases. These are the most conservative stability categories that are generally used for estimating worst-case pollutant dispersion at suburban locations. A surface roughness length of 100 cm and a mixing height of 300 meters was used in all cases. 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 small background concentration of 0.5 ppm to all predicted concentrations for 1996. Although significant development and increased traffic are expected to occur within the project area within the next few years, background carbon monoxide concentrations may not change significantly since individual emissions from motor vehicles are forecast to decrease substantially. Hence, a background value of 0.5 ppm was assumed to persist for the 2005 scenarios.

#### Predicted Worst-Case 1-Hour Concentrations

Table 5 summarizes the final results of the modeling study in the form of the estimated worst-case 1-hour morning and afternoon ambient carbon monoxide concentrations. Estimated worst-case carbon monoxide concentrations are presented in the table for the year 1996 with existing traffic and for the year 2005 both with and without 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 higher estimated 1-hour concentration within the project vicinity for the present (1996) case was 1.7 mg/m<sup>3</sup>. This was projected to occur during the morning peak traffic hour near the intersection of Renton Road and Park Row. The afternoon predicted concentration at this intersection was slightly lower at 1.4 mg/m<sup>3</sup>. As suggested by these predicted

concentrations, present traffic volumes for both peak hours are quite low. Both estimated concentrations are well within the state standard of 10 mg/m<sup>3</sup> and the national limit of 40 mg/m<sup>3</sup>.

In the year 2005 without the proposed project, the highest worst-case 1-hour concentration in the project area, 29.8 mg/m<sup>3</sup>, was predicted to occur during the morning near the intersection of Renton Road and North-South Road. Anticipated traffic volumes at this intersection are considerable, approaching 5000 vehicles during each of the peak hours. Northbound traffic queuing on North-South Road contributed heavily to the morning estimate which is higher than the afternoon concentration of 27.3 mg/m<sup>3</sup> at the same location despite a lower morning traffic volume. This probably can be attributed to less favorable morning meteorological dispersion conditions. Predicted concentrations at the Renton Road/Park Row intersection increased significantly, in line with anticipated traffic volume increases. Three of the four predicted worst-case 1-hour concentrations for this scenario exceeded the state AAQS but all were within the national standard.

Predicted 1-hour worst-case concentrations for the 2005 with project scenario ranged from 9.7 mg/m<sup>3</sup> during the afternoon at the intersection of Renton Road and Park Row to 31.1 mg/m<sup>3</sup> during the morning at Renton Road at North-South Road. Increases were slight when compared to the without project case due to the relatively modest amount of traffic contributed by the project. In fact, the afternoon concentration at the intersection of Renton Road and Park Row did not change at all compared to the without project case. Similar to the without project case, all

but one of the predicted worst-case 1-hour concentrations for this scenario exceeded the state AAQS but all were within the national standard.

#### Predicted Worst-Case 8-Hour Concentrations

Worst-case 8-hour carbon monoxide concentrations were estimated by multiplying the worst-case 1-hour values by a persistence factor of 0.5. This accounts for two factors: (1) traffic volumes averaged over eight hours are lower than peak 1-hour values, and (2) meteorological 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 [10] concluded that 1-hour to 8-hour persistence factors could typically be expected to range from 0.4 to 0.5. EPA guidelines [11] 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 [12] suggest 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 will likely yield reasonable estimates of worst-case 8-hour concentration.

The resulting estimated worst-case 8-hour concentrations are indicated in Table 6. For the 1996 scenario, the estimated worst-case 8-hour carbon monoxide concentration was 0.8 mg/m<sup>3</sup>

near the intersection of Renton Road and Park Row. This is well within both the state standard of 5 mg/m<sup>3</sup> and the national limit of 10 mg/m<sup>3</sup>.

The predicted maximum value for the year 2005 without project scenario was 14.9 mg/m<sup>3</sup>, occurring at the intersection of Renton Road and North-South Road. This exceeds both the state and national 8-hour AAQS. The worst-case concentration level near the Renton Road/ Park Row intersection was 5.1 mg/m<sup>3</sup>, which is slightly over the state limit but within the national standard.

With the project, the maximum 8-hour concentration in the year 2005 was estimated to occur once again at the intersection of Renton Road and North-South Road with a predicted concentration of 15.6 mg/m<sup>3</sup>. This represents a nearly 5 percent increase over the 2005 without project case and indicates the continued potential exceedance of the state and national 8-hour AAQS. The predicted concentration at the Renton Road/Park Row intersection increased by 4 percent compared to the without project case, slightly over the state limit but within the national standard. The Area E Access Road/North-South Road intersection produced a worst-case 8-hour concentration of 9.7 mg/m<sup>3</sup>, within the national limit but over the state standard.

#### Conservativeness of Estimates

The results of this study reflect several assumptions that were made concerning both traffic movement and worst-case meteorological conditions. One such assumption concerning worst-case

1-hour meteorological conditions is that a wind speed of 1 meter per second with a steady direction for one hour will occur. A steady wind of 1 meter per second blowing from a single direction for an hour is extremely unlikely and may occur only once a year or less. With wind speeds of 2 meters per second, for example, computed carbon monoxide concentrations would be only about half the values given above. The 8-hour estimates are also conservative and are probably less reliable than the 1-hour estimates due to the methodology used to compute the estimates. Further, it is unlikely that anyone would occupy the assumed receptor sites (within 3 m of the roadways) for a period of 8 hours.

#### 7.2 Electrical Demand

The proposed project also will cause indirect air pollution emissions from power generating facilities as a consequence of electrical power usage. The annual electrical demand of the project when fully developed is expected to reach approximately 5 million kilowatt-hours. This is based on an average estimated electrical power demand of 800 kilowatt-hours per month per unit. Electrical power for the project will most probably be provided mainly by oil-fired generating facilities located on Oahu. However, with H-Power and the AES coal-fired power plant now online at Campbell Industrial Park, some of the project power could also come from sources burning other fuels. In order to meet the electrical power needs of the proposed project, power generating facilities will be required to burn more fuel and hence more air pollution will be emitted at these facilities. Given in Table 7 are estimates of the indirect air pollution emissions that would result from the project electrical demand

assuming all power is provided by burning more fuel oil at Oahu's power plants. If power is supplied instead or in part by coal or solid waste burning facilities, emissions will likely be higher than the values given in the table.

### 7.3 Solid Waste Disposal

Solid waste generated from the proposed development when fully completed and occupied is not expected to exceed about 2.5 tons per day from residential sources (13) plus additional amounts from community facility elements of the project. No estimates are available for solid waste generated by the latter. Most project refuse will likely be hauled away and burned at the H-Power facility at Campbell Industrial Park to generate electricity. Burning of the waste to generate electricity will result in emissions of particulate, carbon monoxide and other contaminants, but these will be offset to some extent by reducing the amount of fuel oil that would be required to generate electricity for the project. Table 8 gives emission estimates assuming all project solid waste from residential components is burned at H-Power. With the high level of particulate emission control achieved at H-Power, emission quantities from the burning of project solid waste would be relatively small compared to emissions from other sources on the island.

### 8.0 CONCLUSIONS AND RECOMMENDATIONS.

Air quality in the project area is currently relatively good except possibly for occasional air pollution excursions at scattered locations and times. Air quality monitoring data from

the Department of Health indicate that sporadic exceedances of the state ozone standard (which is set at a relatively stringent level) may presently occur on Oahu. Based on air quality monitoring data, standards for carbon monoxide may also presently be exceeded on occasion within small "hot-spot" areas near traffic-congested intersections in the project area.

If not controlled properly, fugitive dust emissions during project construction could have a temporary impact on the air quality of areas adjacent to the development. Uncontrolled fugitive dust emissions from construction activities are estimated to amount to about 1.2 tons per acre per month or more, depending on rainfall. To control dust, active work areas and any temporary unpaved work roads should be watered at least twice daily on days without rainfall. Use of wind screens and/or limiting the area that is disturbed at any given time will also help to contain fugitive dust emissions. Wind erosion of inactive areas of the site that have been disturbed could be controlled by mulching. Dirt-hauling trucks should be covered when traveling on roadways to prevent windage. A routine road cleaning and/or tire washing program will also help to reduce fugitive dust emissions that may occur as a result of trucks tracking dirt onto paved roadways in the project area. Paving of parking areas and establishment of landscaping early in the construction schedule will also help to control dust. Monitoring of dust concentrations along the project boundary could be considered during the period of construction to evaluate the effectiveness of project dust control measures and to perhaps determine if enhanced dust controls are necessary.

During construction phases, emissions from engine exhausts (primarily consisting of carbon monoxide and nitrogen oxides) will also occur both from on-site construction equipment and from vehicles used by construction workers and from trucks traveling to and from the project. Increased vehicular emissions due to disruption of traffic by construction equipment and/or commuting construction workers can be alleviated by moving equipment and personnel to the site during off-peak traffic hours.

After construction, emissions from motor vehicle traffic coming to and from the proposed project will occur on a long-term basis. Motor vehicle related emissions of carbon monoxide are the greatest concern. Based on the projected peak-hour traffic volumes and the roadway configurations and lanes given for the project, air quality model projections for the year 2005 indicate that with or without the project the national 1-hour standard for carbon monoxide would be met but that the more stringent state 1-hour standard would likely be exceeded by a wide margin during worst-case conditions near the intersection of Renton Road and North-South Road and to a somewhat lesser extent near the intersections of Renton Road at Park Row and the Area E Access Road at North-South Road. With or without the project in the year 2005, air quality model predictions indicate that both the state and the national 8-hour standards for carbon monoxide could be exceeded during worst-case conditions at all three intersections as well. However, due to the methodology involved, predicted worst-case 8-hour carbon monoxide concentrations are probably less reliable than the 1-hour estimates. In both the 1-hour and the 8-hour averaging periods, emissions from project traffic would cause little or no increase in concentrations at

both of the study intersections which exist with and without the project.

Options available to mitigate long-term, traffic-related air pollution from increased project motor vehicle traffic are to improve roadways, reduce traffic or reduce individual vehicular emissions. In view of the significant impact on air quality near the proposed intersection of Renton Road and North-South Road, it may be appropriate to consider adding roadway improvements to the design of this future intersection if feasible.

Aside from further improving roadways, air pollution impacts from vehicular emissions could conceivably be mitigated by reducing traffic volumes through the promotion of bus service and car pooling and/or by adjusting local school and business hours to begin and end during off-peak times. However, this mitigation measure is generally considered only partially successful. Reduction of emissions from individual vehicles would have to be achieved through the promulgation of county, state or federal air pollution control regulations. For example, Hawaii currently does not require annual inspections of motor vehicle air pollution control equipment. At the present time, there is no indication that the state is contemplating adopting such rules.

Another potential mitigation measure would be to provide added buffer zones between walkways and roadways in areas where space is available. Technically, however, the public would have to somehow be excluded from the buffer zones. The predicted worst-case concentrations in this report are based on a separation

distance of 3 m (10 ft) between walkways and roadways. Doubling this distance to about 6 m (20 ft) would in many cases reduce maximum concentrations by about 10 to 15 percent.

Any long-term impacts on air quality due to indirect emissions from supplying the project with electricity and from the disposal of waste materials generated by the project will likely be relatively small based on the magnitudes of both the estimated demands and the indirect emissions. To further moderate any impacts, indirect emissions from project electrical demand could likely be reduced somewhat by incorporating energy-saving features into project design requirements. This might include the use of solar water heaters, water heater timers or possibly hot water on demand systems; designing building space so that window positions maximize indoor light without unduly increasing indoor heat; using landscaping where feasible to provide afternoon shade to cut down on the use of air conditioning; installation of insulation and double-glazed doors to reduce the effects of the sun and heat; movable, controlled openings for ventilation at opportune times; and possibly automated room occupancy sensors. Solid waste related air pollution could likely be reduced somewhat by the promotion of conservation and recycling programs within the proposed development.

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Table 1  
 SURVEY OF STATE OF HAWAII AND NATIONAL  
 AMBIENT AIR QUALITY STANDARDS

Pollutant	Units	Averaging Time	Hawaii Ambient Concentration		National Ambient Concentration of Hawaii	
			50	50	National Primary	National Secondary
Particulate Matter <sup>a</sup>	$\mu\text{g}/\text{m}^3$	Annual	50	50	50	50
		24 Hours	150 <sup>b</sup>	150 <sup>b</sup>	150 <sup>b</sup>	150 <sup>b</sup>
Sulfur Dioxide	$\mu\text{g}/\text{m}^3$	Annual	80	-	-	80
		24 Hours	365 <sup>b</sup>	-	-	365 <sup>b</sup>
		3 Hours	-	1300 <sup>b</sup>	1300 <sup>b</sup>	1300 <sup>b</sup>
Nitrogen Dioxide	$\mu\text{g}/\text{m}^3$	Annual	100	100	100	70
		8 Hours	10 <sup>b</sup>	-	-	5 <sup>b</sup>
Carbon Monoxide	$\text{mg}/\text{m}^3$	1 Hour	40 <sup>b</sup>	-	-	10 <sup>b</sup>
		1 Hour	235 <sup>b</sup>	235 <sup>b</sup>	235 <sup>b</sup>	100 <sup>b</sup>
Ozone	$\mu\text{g}/\text{m}^3$	1 Hour	1.5	1.5	1.5	1.5
Lead	$\mu\text{g}/\text{m}^3$	Calendar Quarter	-	-	-	-
Hydrogen Sulfide	$\mu\text{g}/\text{m}^3$	1 Hour	-	-	-	35 <sup>b</sup>

11. Guidelines for Air Quality Maintenance Planning and Analysis; Indirect Sources, Volume 9 Revised, U.S. Environmental Protection Agency, September 1978.

12. Hawaii Air Quality Data for the Period of January 1985 to December 1987, State of Hawaii Department of Health.

13. Engineering Concepts, Inc., "Varona Village Phase II, Forecasted Electricity Consumption and Solid Waste Generation", June 4, 1996.

<sup>a</sup> Particles less than or equal to 10 microns aerodynamic diameter

<sup>b</sup> Not to be exceeded more than once per year

Table 4  
ANNUAL SUMMARY OF AIR QUALITY MEASUREMENTS  
FOR MONITORING STATIONS NEAREST  
VARONA VILLAGE PHASE II PROJECT

Parameter / Location	1989	1990	1991	1992	1993
<b>Sulfur Dioxide / Makaiwa Gulch</b>					
No. of 24-Hr Samples	-	-	329	327	284
Range of Daily Values (µg/m <sup>3</sup> )	-	-	0-38	0-27	0-47
Average Daily Value (µg/m <sup>3</sup> )	-	-	3	4	3
No. of State AQS Exceedances	-	-	0	0	0
<b>PM-10 / Kspolei</b>					
No. of 24-Hr Samples	-	-	39	48	54
Range of 24-Hr Values (µg/m <sup>3</sup> )	-	-	11-71	8-164	11-60
Average Daily Value (µg/m <sup>3</sup> )	-	-	26	27	24
No. of State AQS Exceedances	-	-	0	1	0
<b>Carbon Monoxide / West Beach</b>					
No. of Days of 1-Hr Samples	-	-	183	213	209
Range of Daily Max. 1-Hr Values (mg/m <sup>3</sup> )	-	-	0.1-0.9	0.0-1.7	0.0-2.9
Avg. Daily Maximum 1-Hr Value (mg/m <sup>3</sup> )	-	-	0.9	0.6	0.7
No. of State 1-Hr AQS Exceedances	-	-	0	0	2
<b>Ozone / Sand Island</b>					
No. of Days of 1-Hr Samples	342	340	312	298	290
Range of Daily Max. 1-Hr Values (ppb/m <sup>3</sup> )	0-36	4-116	9-120	9-128	21-118
Avg. Daily Maximum 1-Hr Value (ppb/m <sup>3</sup> )	15	36	50	58	46
No. of State AQS Exceedances	0	2	3	6	7
<b>Lead / Downtown Honolulu</b>					
No. of 24-Hr Samples	-	-	50	44	51
Range of 24-Hr Values (µg/m <sup>3</sup> )	-	-	0-0.1	0-0.1	0-0.1
Average Daily Value (µg/m <sup>3</sup> )	-	-	0.0	0.0	0.0
No. of State AQS Exceedances	-	-	0	0	0
<b>Nitrogen Dioxide / Kspolei</b>					
No. of 24-Hr Samples	-	-	-	-	131
Range of 24-Hr Values (µg/m <sup>3</sup> )	-	-	-	-	4-29
Average Daily Value (µg/m <sup>3</sup> )	-	-	-	-	12
No. of State AQS Exceedances	-	-	-	-	0

Source: State of Hawaii Department of Health

Table 5  
ESTIMATED WORST-CASE 1-HOUR CARBON MONOXIDE CONCENTRATIONS  
ALONG ROADWAYS NEAR VARONA VILLAGE PHASE II PROJECT  
(milligrams per cubic meter)

Location	1997		2005/Without Project		2005/With Project	
	PM	PH	PM	PH	PM	PH
Renton Road at Park Row	1.7	1.4	10.1	9.7	10.5	9.7
Renton Road at North-South Road	-	-	29.8	27.3	31.1	27.8
Area E Access Road at North-South Rd.	-	-	-	-	18.6	19.4

Hawaii State AQS: 10  
National AQS: 40





**VARONA VILLAGE PHASE II**

**APPENDIX B**

**Market Study**

Market Study of the  
PROPOSED VARONA VILLAGE EXPANSION  
PHASE II MASTER PLAN

Ewa/Kapolei, Oahu, Hawaii

Prepared for  
Mr. Vincent Shigekuni  
PBR Hawaii

June 1996

Market Study of the  
PROPOSED VARONA  
VILLAGE EXPANSION  
PHASE II MASTER PLAN  
Ewa/Kapolei, Oahu, Hawaii

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**EXECUTIVE SUMMARY**

**Study Conclusions**

Based on our investigation of the subject site, its environs, and analysis of its standing in the Oahu real estate market, we have reached the following conclusions regarding the proposed Phase II expansion of the Varona Village community:

- The Ewa/Kapolei and Central Oahu regions of Oahu, which respectively comprise the primary and secondary market sectors for the various planned Varona Village uses, have the fastest growing populations on the island. Between 1980 and 1995, the number of residents in these areas increased by nearly 40 percent to a total of 191,900, a period in which the population of the entire county grew by only 15 percent overall.<sup>(1)</sup>

An estimated 29,599 housing units have been constructed over the past two decades in these Development Plan Areas as land use patterns have moved from rural and/or uneconomical agricultural cultivation to integrated, urbanized communities. The units have been well-received by the Oahu residential market with more than 99 percent sold to date. The dominant product has been detached single-family homes which comprise more than 60 percent of the sector.

This fundamental land use transition has been a manufactured response by private interests and public agencies to relieve Oahu's chronic housing shortage, create additional quality

<sup>(1)</sup>

Several areas are delineated and/or discussed throughout the report. The Ewa Taxation District comprises the general economic region containing the subject property. The Ewa/Kapolei and Central Oahu areas are specific subregions of the district which respectively are the primary and secondary market sectors for the subject. To the extent possible, we have focused on the Ewa/Kapolei area, but have included data and discussion from Central Oahu and the entire Ewa district, where it was considered insightful or precise extrapolation of data to the primary study area was not possible. The Ewa/Kapolei area is also referred to as the Ewa Development Plan Area.

homeownership options, and move the focus of residential development beyond the oversituated central core of Honolulu.

In addition to the large numbers of residential product and support development made available in the study area over the last 25 years, it has also evolved into a major economic force on Oahu. An estimated 11,200 persons are presently employed in the region, many within the James Campbell Industrial Park (the location of much of Hawaii's "heavy" industries), and the emerging retail/service/commercial businesses of the community. Although the demise of cane production is affecting near-term employment in the agricultural sector, this job loss will be replaced by general business growth in the area. Most importantly, extensive economic infrastructure, including a deep draft harbor, destination resort, and arterial upgrades have been undertaken to support future economic development.

The westerly urbanization trend away from the historic Honolulu corridor is anticipated to continue unabated during the next several decades. Mid-point extrapolation using population estimates made by the City and County of Honolulu Planning Department indicate that up to 70,000 new housing units will be required in Ewa/Kapolei (44,000) and Central Oahu (26,000 units) by the year 2020 if the regional market is to be adequately serviced. A similar level of growth is projected for the decade thereafter as well. Approximately 75 percent of this demand would be oriented towards units having a current price of \$350,000 or less (as would be anticipated for virtually all of the subject inventory).

Some 31,204 units in Ewa/Kapolei and 19,617 additional units in Central Oahu have been approved for construction over the next 20-plus years in order to meet the housing demands of island residents, representing upwards of 70 percent of the housing inventory to be built in the county by 2020. An additional 20,000-plus units have been preliminarily discussed by landowners and public agencies. Virtually all are to be within master planned developments, which offer a range of land uses intended to promote integrated lifestyle opportunities.

A diversity of commercial real estate product is also proposed for the study region. An estimated 1,482 acres in business park and various intensity industrial lands have been approved, and demand for up to two million square feet of commercial floor area has been projected. The proposed construction of a West Oahu University of Hawaii campus would further enhance real estate demand. These uses could cumulatively create 25,000 to 30,000 total new jobs in the region by 2020. Central Oahu and Ewa/Kapolei now contain the largest reservoirs of vacant industrial, business, and office lands on the island, with the structured component design of the City of Kapolei and the campus setting of the Milliani Technology Park being prime examples of the comprehensive development envisioned. It is estimated that more than 60 percent of all new employment positions and 75 percent of new business ventures created on Oahu by 2020 will be located in the study area.

These new employment opportunities will more than offset the loss of direct and indirect regional employment due to the demise of the sugar industry. They will also be higher paying, more stable, and of greater diversity than the agricultural positions. These employees represent the prime purchase demographics for the proposed Varona Village Phase II housing units and associated uses.

The near-term slump in the Hawaii economy, while slowing private construction activity and business growth statewide and in the study area, has affected Ewa/Kapolei and Central Oahu to a lesser degree than many other areas of the islands. Several large space commercial tenants have relocated to the area in recent years, and there continues to be confidence in long-term demand forecasts despite cyclical impacts.

Ewa/Kapolei and Central Oahu have long been planned as areas for moderate priced, low to moderate density housing development. However, land and infrastructure economics, coupled with developer profit goals, have resulted in steadily increasing densities throughout the region, resulting in a greater building "weight" on the underlying land base than originally intended for the area.

Comprehensive surveys of home construction in the study area from 1978 through 1995 show that 18,402 single-family residences were built on lots averaging about 4,800 square feet in size.

Although lot sizes have uniformly decreased over time, the living areas of single-family residences have constantly increased in recent years. Since 1990, new homes in the study area have averaged circa 1,490 square feet in living space; this represents a 25 percent increase in average home size relative to those constructed between 1978 and 1987, which averaged less than 1,200 square feet.

The movement towards greater planning densities is evident in multi-family projects as well. Units have decreased in average sizes, from some 1,150 square feet in the early 1980s to between 650 to 1,000 square feet per unit in the more recent projects. Construction density has similarly increased from about 12 units per acre a decade ago to nearly 16 units per acre today.

The overall effect of increasing land use carrying capacities has been to create a relatively standardized density format throughout the competitive market area, with each project offering an exceptionally homogeneous, "narrow band" of inventory. For the most part, the market is dominated by competitive product featuring similar-sized units on similar-sized lots.

After peaking in 1989-90 and slumping during the early years of the decade, resales of residential units in the Ewa district have recovered strongly in the past 30 months. Activity was up nearly 20 percent and acreage prices by seven percent in 1995, relative to 1991, among single-family homes; and the number of sales and average prices were up 14 and 12 percent, respectively, for multi-family inventory.

The average time exposed on the market prior to sale and "selling price as a ratio to listing price" indicators have also returned to an up-cycle trend, and realtors report a resurgent interest in resale product.

The subject lands are appropriate for residential-oriented urban development. They are adjacent to existing housing subdivisions, will have frontage/exposure on the region's main thoroughfares, and have few other meaningful near- to mid-term use alternatives.

The subject properties are the natural in-fill/expansion areas for the Ewa Village community and the master plan is consistent with greater Ewa/Kapolei land use designs. Relative to the bulk acreage master planned communities nearby, the individual subject projects would support the proposed development, and it would have nominal impact on infrastructure resources in Ewa.

Further, the subject inventory would have the ability to come "on-line" much quicker than the vast majority of proposed Ewa/Kapolei units which will require extensive planning, approval, mitigation, and off-site improvements relative to the Varona Village Phase II sites. We consider these attributes, a smaller size to permit development by someone other than "major" builders, the ability to proceed at a faster pace, and the availability of infrastructure, as placing the subject holdings in a uniquely desirable market position.

We conclude each subject component would have the characteristics necessary to be competitive in the regional housing market.

We have quantified demand for the proposed subject inventory based on two approaches: the residential method and the market shares method. Our conclusions are as follows:

Subject Parcel	Proposed Use	Potential No. of Units	Price Range	Estimated Absorption Period (1)
Area E	Market to Upscale Single and Multi-Family	252 (max)	\$200,000 to \$500,000 (2)	Three to five years.
Village Expansion	Affordable to Market Single Family	157	\$175,000 to \$225,000	Three to four years.
Makal Parcel	Multi-Family or Institutional	110 (3)	\$100,000 to \$150,000	Within one year.

(1) From commencement of pre-sale program. Assumed to be commensurate with ground breaking for individual project.

(2) Condominium units would be priced from \$200,000 to \$300,000, single-family homes from \$285,000 to \$500,000.

(3) Based on density of 12 units per acre over the entire nine-acre site, of which about eight are available for development. Assumed to be a "directed" (affordable, senior) project.

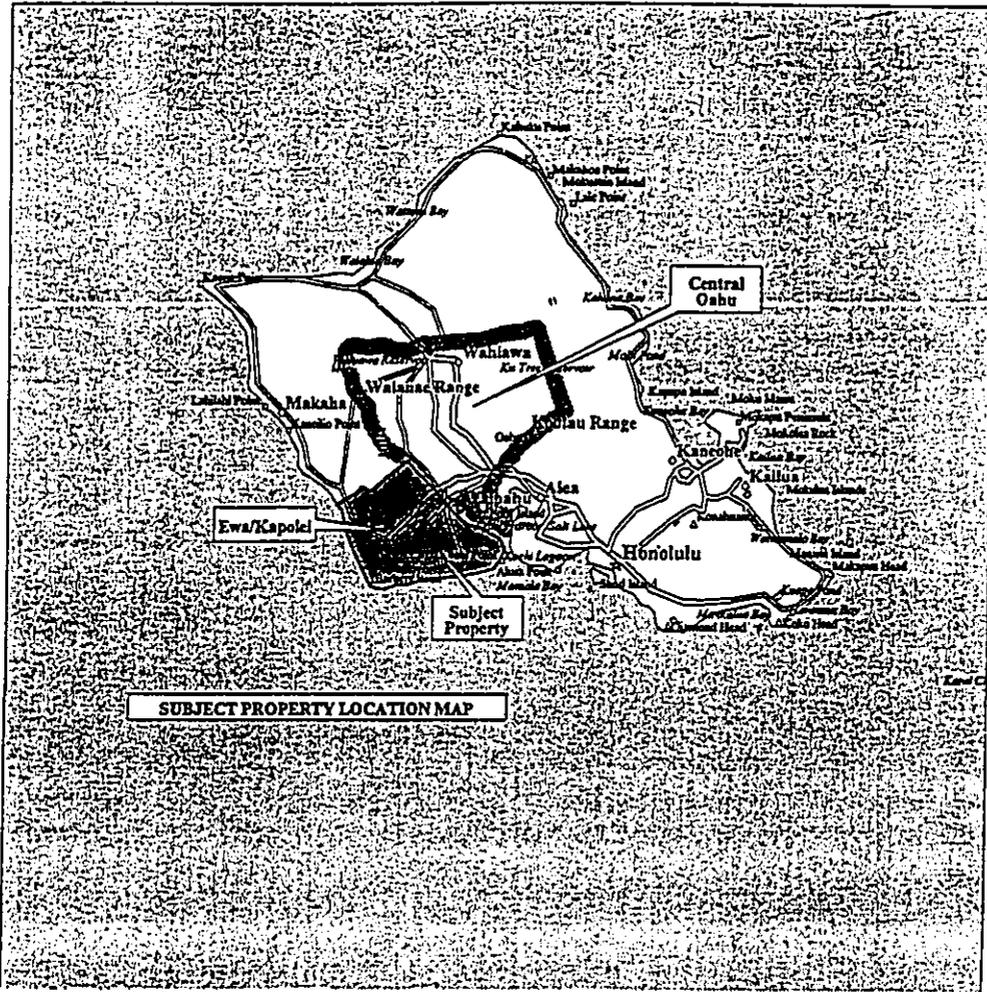
**Overview of the Ewa/Kapolei Region**

The proposed Varona Village Expansion holdings are located within the Ewa Taxation District of the City and County of Honolulu, a 200-square-mile region comprising the southwesterly quadrant of Oahu. The district, the island's largest, includes the Ewa/Kapolei and the majority of Central Oahu development plan areas.

Of specific concern in our analysis is the Ewa/Kapolei section, which spreads across the Ewa Plain from Pearl Harbor to Barber's Point and encompasses the subject property. This area is also identified as the Ewa Development Plan Area.

The map on the following page delineates the various regions investigated, analyzed, and discussed in our study.

Over the past two decades the Ewa district has experienced significant development, with the resident population more than doubling since 1970, expanding at a compounded annual rate of nearly three percent.



or twice the statewide average. Capital investment and economic opportunities have commensurately escalated.

By year end 1995, the population of the district was estimated at 272,500, roughly 31 percent of the Oahu total, and there were some 45,000 jobs in the area, or about ten percent of island employment.

At present, the Ewa/Kapolei sub-region boasts a population of circa 52,000 residents (about 5.9 percent of Oahu) and 6,500 jobs (about 1.3 percent of island totals). By 2020, the number of residents in this precinct is forecast to increase to as high as 195,000 and local employment to more than 32,000 positions.

In light of the exceptional expansion of Honolulu since statehood, the movement of urban uses towards Ewa was logical and anticipated. Being constrained between the mountains and the sea, Honolulu has absorbed virtually all the vacant acreage to the east (Kahala-Hawaii Kai), and is rapidly re-developing the older neighborhoods of the urban core. Westward movement into Central Oahu and the Ewa Plain presents the most reasonable growth alternative, and has thus become the focus of construction activity.

Although there is ongoing debate as to the intensity of urban uses which should be allowed throughout the Ewa district, all private and public parties concede the vast, historically cane and pineapple cultivated region holds the best promise of meeting the acute housing and increasingly congestive lifestyle problems currently facing Oahu.

Over the past 20 years, a series of master-planned, bulk acreage, suburban projects have been built in the district to service the demand for residential and supporting neighborhood commercial land uses—Weipio Centre, Milliani Town, and Makakilo provide prime examples.

For the most part, however, these communities were fundamentally oriented towards "bedroom" development, with residents anticipated to commute into Downtown Honolulu for work. While the projects have achieved notable sales success, the daily movement of workers to jobs has engendered significant traffic problems due to an overburdened freeway system plagued by rush-hour chokepoints in the urban center. Also, the limited availability of diverse commercial lands and services keep the projects from embodying the desirable, "self-contained" character of today's leading land use design concepts.

The Kapolei/Ewa Long-Range Master Plan represents an attempt by the Campbell Estate and regional landowners to break the cycle of dependent suburban neighborhood development through creation of a comprehensive urban community which not only meets the commercial and service needs of the populace, but provides economic infrastructure and employment centers for the entire island.

According to the plan support document,

"The principal development concept embraced by the master plan is to have Ewa develop as a self-contained "balanced" community providing a full range of urban services, housing, jobs, businesses and public facilities consistent with a true urban center. A major goal of the plan (and public policies supporting the plan) is to balance growth in the residential population with growth in the regional economy so that future residents of Ewa will have the opportunity to work within the Ewa area. The development concept is supported by long-standing General Plan policies concerning the establishment of a Secondary Urban Center in Ewa in order to reduce growth pressures on the rest of the island. Essential components of the master plan concept include the development of a city center/urban nucleus, within and around which higher density land uses such as commercial, office retail, public facilities, major traffic arterials, and other urban-type land uses aggregate, surrounded by a range of residential densities to accommodate the residential needs of the new urban economy." (Emphasis Added)

From the original 1988 document, page 15.

To date, this balanced, urban nucleus development has included numerous projects, with others under construction or in the advanced planning stages.

Outside of central Honolulu, no region statewide boasts of as complete or diverse an economic foundation as is emerging in Ewa/Kapolei. This infrastructure bodes well for the long-term market acceptance of the area.

In fact, Ewa/Kapolei will share many similar basic land use attributes with Honolulu, as noted on the chart below:

Land Use	Honolulu	Ewa/Kapolei
Deep Draft Harbor	Port of Honolulu	Barbers Point Harbor
Industrial Area	Iwilei, Kakaako, Maunapuna	Campbell Industrial Park and Kapolei Business Park
Financial Office Center	Downtown	City of Kapolei
Resort District	Waikiki	Ko Olina
Retail/Service Projects	Ala Moana Center, Kahaia Mall, Kakaako (Makai)	City of Kapolei, Kapolei Power Center
Lower to Moderate Housing	Makiki, Mollili, Kaimuki	Ewa Center, Kapolei Villages, Ewa Villages
Upscale Waterfront Housing	Kahala-Portlock	Ewa Marina
Moderate to Upscale Ridge-line Housing	Upper Makiki, Waialae Iki, Maunaloa Ridge	Makaha Hills
Recreation	Ala Wai Golf Course, Ala Moana Beach Park, Kapolei Park	Ewa Village Golf Course, West Loch Golf Course, Ko Olina Golf Course, Ondina Park, Kapolei Park
Rapid Transit Corridors	In Planning	In Planning
Small Boat Harbor (Recreational)	Ala Wai Yacht Harbor	Ewa Marina
Freeway Access	II-1	II-1

Given the well-prepared, fully-serviced nature of the Ewa/Kapolei economic structure, there is every reason to believe it will achieve a similarly high level of integrated market success as Honolulu (over time), far surpassing the draw of alternative Central Oahu or other bedroom/suburban developments if the envisioned highly diverse land base is actualized. The cumulative attraction provided by these inter-supporting land use types is the stimulus leading to increasing product demand and long-term market acceptance for all residential, commercial, and industrial uses.

A detailed discussion of the Ewa Taxation District and its Ewa/Kapolei and Central Oahu sub-regions is presented in Addendum I.

### Quantification of Ewa/Kapolei Housing Demand

Demand for up to 519 housing units of Varona Village Phase II(2) will be a function of two factors: population growth in the region and the competitiveness of the subject inventory relative to alternative projects. This baseline demand analysis provides a context for our investigation of supply trends and absorption forecasts for the proposed subject product.

We have quantified the demand for housing units in the Ewa/Kapolei market sector until the year 2020 through extrapolation of the published City and County of Honolulu Development Plan range of population estimates for the region in combination with derived market factors.

The *Development Plan Annual Report - Fiscal Year 1995*, presents four population estimate alternatives. The forecasts are defined as follows:

- **General Plan Population Guidelines for the Year 2010.** These low and high estimates are based on the state's Series M-K projections for Oahu according to the population distribution set forth in Population Objective C of the General Plan, Policy 4. Under these projections the resident population of Ewa/Kapolei (or the Ewa Development Plan Area) by 2010 will be in the range of 119,900 to 132,900 persons, and represent 12.0 to 13.3 percent of the total island population.
- **Likely Population in the Year 2010.** In this estimate, supply-side factors are taken into account along with demand-side factors. These variables include the Series M-K projections, historical development trends, market conditions and expectations, and land use policies of the Development Plan. In this forecast, the resident population of Ewa/Kapolei by the year 2010 would be 100,800 persons (or 15.9 percent below the low end of the General Plan guidelines).

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The maximum total number of subject units is based upon the PBR Hawaii land use plans calling for up to 252 mixed units (condominium and house lots) on the "Area E" parcel, 157 house lots on the "Village Expansion" parcel, and an assumption of 110 potential units (8 usable x 15 units per acre) for the "Makai" Parcel should it be put to directed multi-family use.

- **Population Capacity/Potential.** This estimate is determined by identifying all of the housing units which either the Development Plan explicitly allows or cannot prohibit. Market-based household sizes are applied to the unit count, with the result being the level of population which could occur in the year 2010 if the land use policies of the Development Plan were completely followed. This projection generates a study area population of 145,800 persons, or 9.7 percent above the high end of the published General Plan guidelines. Under these assumptions, Ewa/Kapolei would be the third most populous of Oahu's eight Development Plan Areas (trailing only the Primary Urban Center and Central Oahu), and house some 13.6 percent of the island's residents.

While we recognize the Ewa Development Plan estimates prepared by city and county agencies are defined public objectives, the reality is that market demand moves independently and cannot be strictly contained without the specter of adverse economic impacts if real property supply fails to meet demand trends. Under such conditions, which have historically been a part of Oahu's housing market, unit prices appreciate rapidly, competition for available homes results in lower-income families being displaced, and the local commercial sectors stagnate without the "new blood" necessary to keep it vitalized.

In the past, public agency population estimates have been generally conservative and understated relative to actual market movement. However, we have adopted these county agency figures for our forecast purposes while acknowledging their historically moderate nature.

Using these population projections as a range of minimum to maximum indicators, we have calculated the number of housing units which will be necessary to fully service the Ewa/Kapolei region over the next 25 years (1996 through 2020). In order to adapt the county population estimates to the extended time frame (as we consider the 15-year projection period to 2010 too brief for meaningful long-term projections), we have merely assumed the rate of population growth from 1996 through 2010 will continue through 2015, then drop by one-third over the last five years.

While a significant portion of the housing demand will be created by resident households (existing, newly formed, and in-migrating), there

are several other demand factors which must be considered when quantifying the total number of units required to create a healthy and stable regional market. They include:

- A vacancy allowance to account for units under repair, in transition between users, and as a margin to cushion against hyperappreciation during strong demand periods. We have tested vacancy rates ranging from three to five percent.
- A non-resident "investor/second home" allowance to account for the fact that upwards of seven percent of all Oahu units are held by off-island interests and generally kept out of the resident pool. While we do not consider Ewa/Kapolei to be a focus of such purchasers, Ko Olina will have significant resort/residential inventory that will attract non-resident purchasers. The Ewa Marina project will also attract many investors, second-home buyers. Further, the affordability of housing product and availability of numerous golf courses in the region will also attract this group. We have, therefore, tested non-resident allowances of four to six percent of total overall resident household demand.

While this demand component is depicted as a static factor, it historically has been highly cyclical, as evidenced by the influx of Southern California and Canadian purchasers in the late 1970s, and Japanese purchasers in the late 1980s—periods which were followed by years of substantially lessened activity for non-resident purchasers. We anticipate similar investor "spikes" will occur periodically over the projection period.

- A transient housing allowance to account for military users, students at the proposed West Oahu University of Hawaii campus, and other short-term needs for housing on a non-permanent basis. A minimal allowance of one to two percent of total resident demand was incorporated to account for this demand component.

While not considered as a separate factor, during the projection period some units will reach the end of their effective lifespan, becoming dilapidated and unavailable to service the resident population. We have assumed this minor loss component to be captured within the other factors comprising the model.

The average household size figure in the equation is based on historical trends evident in the Ewa region as taken from the *Neighborhood Statistics Program* covering the subject area. The study "neighborhoods" have among the highest average household sizes for any region on the island, currently estimated at 3.60 persons per unit. This compares with a countywide average of 3.01 persons.

However, in keeping with evident long-term demographic trends, we anticipate the average household size in Ewa/Kapolei will decline over the next 25 years, falling to between 2.90 and 3.10 persons, which would still be above the anticipated Oahu average of circa 2.75 persons per unit by that time.

The application of the housing demand formula to the subject region is shown on Table 1.

Based on our analysis, the actualization of a healthy and stable housing market in the Ewa Development Plan area will require the construction of some 44,071 additional units in the region by the year 2020 (using the average demand estimate), or an average of 1,763 new units finished annually.

In accordance with long-term trends, these future housing requirements can be stratified into probable percentile demand by sales prices at current dollar levels. Table 2 illustrates this estimated price division of forecast minimum, maximum, and average demand. Circa 72 percent of the entire market demand, having a current sales price of up to \$350,000, will be necessary over the next 25 years if all sectors of the market are to be filled. It is anticipated all of the Varona Village Phase II units will likely fall into this price range, with the exception of golf course fronting homes which could reach prices upwards of \$500,000.

Our analysis indicates there is more than sufficient demand to absorb the subject units under either the proposed master plan within a reasonable period, and the subject inventory will fall within the dominant portion of the demographic demand pyramid.

The housing quantification formula and statistical support for the constituent factors are summarized in Addendum II.

TABLE 1  
QUANTIFICATION OF HOUSING UNIT DEMAND FOR THE  
EWA DEVELOPMENT PLAN AREA, 1975 TO 2020  
Market Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii

	1975 (1)	2000	2005	2010	2015	2020	Additional Units Required by 2020 (2)
<b>Scenario One: Projections Using "Low" City &amp; County General Plan Guidelines and Conservative Allowance Factors</b>							
Resident Population (3)	18,000	21,000	24,000	27,000	30,000	33,000	
Average Household Size	3.60	3.50	3.40	3.30	3.20	3.10	
Total Resident Units Required	5,000	6,000	7,000	8,182	9,375	10,667	
Vacancy Allowance	415	443	471	500	531	562	
(1% of resident unit demand)	50	60	70	82	94	106	
(2% of resident unit demand)	100	120	140	164	188	212	
(3% of resident unit demand)	150	180	210	246	282	318	
<b>TOTAL MARKET UNIT DEMAND</b>	<b>5,415</b>	<b>6,443</b>	<b>7,471</b>	<b>8,682</b>	<b>9,913</b>	<b>11,145</b>	<b>3,482</b>
<b>Scenario Two: Projections Using "High" City &amp; County General Plan Guidelines and Optimistic Allowance Factors</b>							
Resident Population (3)	18,000	21,000	24,000	27,000	30,000	33,000	
Average Household Size	3.60	3.45	3.30	3.15	3.00	2.90	
Total Resident Units Required	5,000	6,100	7,273	8,571	10,000	11,379	
Vacancy Allowance	406	422	438	454	471	487	
(1% of resident unit demand)	50	61	73	86	100	114	
(2% of resident unit demand)	100	122	146	172	200	228	
(3% of resident unit demand)	150	183	219	258	300	342	
<b>TOTAL MARKET UNIT DEMAND</b>	<b>5,556</b>	<b>6,725</b>	<b>7,960</b>	<b>9,361</b>	<b>10,871</b>	<b>12,460</b>	<b>3,961</b>
<b>Scenario Three: Projections Using City &amp; County "Early Population" Guidelines and Conservative Allowance Factors</b>							
Resident Population	18,000	21,000	24,000	27,000	30,000	33,000	
Average Household Size	3.60	3.50	3.40	3.30	3.20	3.10	
Total Resident Units Required	5,000	6,000	7,059	8,182	9,375	10,667	
Vacancy Allowance	415	443	471	500	531	562	
(1% of resident unit demand)	50	60	70	82	94	106	
(2% of resident unit demand)	100	120	140	164	188	212	
(3% of resident unit demand)	150	180	210	246	282	318	
<b>TOTAL MARKET UNIT DEMAND</b>	<b>5,715</b>	<b>6,803</b>	<b>7,950</b>	<b>9,272</b>	<b>10,675</b>	<b>12,083</b>	<b>3,668</b>
<b>Scenario Four: Projections Using City &amp; County "Population Capacity" Guidelines and Optimistic Allowance Factors</b>							
Resident Population	18,000	21,000	24,000	27,000	30,000	33,000	
Average Household Size	3.60	3.45	3.30	3.15	3.00	2.90	
Total Resident Units Required	5,000	6,100	7,273	8,571	10,000	11,379	
Vacancy Allowance	406	422	438	454	471	487	
(1% of resident unit demand)	50	61	73	86	100	114	
(2% of resident unit demand)	100	122	146	172	200	228	
(3% of resident unit demand)	150	183	219	258	300	342	
<b>TOTAL MARKET UNIT DEMAND</b>	<b>5,656</b>	<b>6,755</b>	<b>7,926</b>	<b>9,261</b>	<b>10,671</b>	<b>12,063</b>	<b>3,663</b>

CONCLUDED HOUSING UNIT DEMAND RANGE  
MINIMUM 37,410  
MAXIMUM 59,710  
AVERAGE 44,071

(1) Year-end estimate.  
(2) There were no estimated 1975 housing units in Ewa at year-end 1975, resulting in a linear market demand for a minimum of 100 units needed to achieve market stability.  
(3) Assuming zero weight loss population growth from present to Development Plan Annual Report 2010 forecasts.  
Source: CAC of Honolulu Dept. of General Planning, Varona and The Hilliroom Group, Inc.

**Analysis of the Historic Ewa Taxation District New Housing Market**

Prior to 1970, the Ewa housing market was limited to Ewa Beach and scattered villages, gathered around employment and commercial centers—primarily involving cane production/processing and servicing nearby military installations. Subsequently, Makakilo, a first generation master planned residential community, was developed on a bulk acreage holding in the upland mauka portion of the area. Over the past decade, residential construction in the region has "boomed" in response to acute housing and land shortages on Oahu, the demise of the sugar industry and the coordinated efforts by landowners to master plan the 30,000-acre plain for urban uses.

By 1978, there were an estimated 43,000 total housing units in the Ewa Taxation District (which incorporates the Ewa/Kapolei and Central Oahu Development Plan Areas), most being of an older vintage, but with newer construction beginning its emergence towards domination of the market. Ewa and Central Oahu were no longer viewed as undesirable, outlying locales but as moderately priced, less intense lifestyle alternatives to urban Honolulu neighborhoods.

Since that time, some 29,599 units have been constructed in the study regions, almost all within large-scale developments. Demand for both single- and multi-family units were extraordinarily high until late 1992, with absorption being dampened in 1993-94 by the prolonged Hawaii economic slump. Over the past 18 months, original sales have begun to pick up again, and the market appears poised to enter another growth cycle.

From 1978 through 1995, the majority of units built in Ewa/Kapolei and Central Oahu have been single-family homes totaling 18,402 residences, or about 61 percent of the units constructed. Some 11,557 multi-family units were finished during the same time frame, or 39 percent of the residential construction activity.

A comprehensive annualized project-by-project summary of the single-family homes built in the study region since 1978 is shown on Table 3. Of primary concern in our investigation was the average lot and unit sizes and the way in which these factors may have impacted speed of product absorption.

TABLE 2

**STRATIATION OF PROJECTED HOUSING UNIT DEMAND ACCORDING TO CURRENT PRICE LEVELS IN THE EWA DEVELOPMENT PLAN AREA**  
Market Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii

**ADDITIONAL HOUSING UNITS REQUIRED BY YEAR 2020**

Current Sales Price	Minimum		Average		Maximum	
	Number of Units	Percent of Total Demand	Number of Units	Percent of Total Demand	Number of Units	Percent of Total Demand
Under \$175,000	7,339	27.00%	11,899	27.00%	16,133	27.00%
\$175,000 to \$350,000	12,232	45.00%	19,832	45.00%	26,889	45.00%
\$350,000 to \$500,000	5,437	20.00%	8,814	20.00%	11,951	20.00%
\$500,000 to \$750,000	1,631	6.00%	2,644	6.00%	3,585	6.00%
Over \$750,000	544	2.00%	881	2.00%	1,195	2.00%
<b>Totals</b>	<b>27,183</b>	<b>100.00%</b>	<b>44,071</b>	<b>100.00%</b>	<b>59,753</b>	<b>100.00%</b>

Source: US Dept. of Housing & Urban Development, Honolulu Board of Realtors, and The Hallstrom Group, Inc.

TABLE 3

SUMMARY OF SINGLE FAMILY HOUSING DEVELOPMENT AND ORIGINAL SALES IN THE CENTRAL OAHU & EWA / KAPOLEI REGIONS 1978 TO 1995  
 Initial Study of the Proposed Varona Village Phase II Expansion  
 Ewa/Kapolei, Oahu, Hawaii

Year	Project	Tenure	Typical Size (SF)		Total Units Completed	Sales				Sales as a Percent of Completions	Sales Price		
			House	Lot		2br	3br	4br	Total		Minimum	Maximum	Average
1978	Palehua Vista (1-4)	Fee	1,551	5,000	108	0	46	23	89	63.89	\$82,800	\$115,850	Data
	Kapele Neighborhood	Fee	1,086	5,500	100	2	28	17	47	47.00	\$86,400	\$91,273	Not Available
	Puu Palehua (1-4)	Fee	1,297	5,000	84	0	36	15	51	78.89	\$78,280	\$93,470	For 1978
	Waipahu Terrace	Fee	1,200	5,000	85	0	0	55	55	57.89	\$82,000	\$100,000	
	Milani Town 28A	Fee	1,350	6,195	27	1	15	11	27	100.00	\$74,025	\$96,135	
	Milani Town 37	Fee	1,350	6,500	87	8	30	7	45	51.72	\$78,700	\$98,535	
	Milani Town 35	Fee	1,350	6,500	83	0	18	6	24	28.82	\$76,900	\$103,800	
	Milani Town 38	Fee	1,350	6,520	93	13	27	23	63	100.00	\$70,275	\$109,865	
	Milani Town 39	Fee	1,350	6,500	88	11	39	39	89	100.00	\$73,315	\$110,825	
	Milani Town 40	Fee	1,350	6,500	55	2	31	22	55	100.00	\$79,275	\$120,225	
	Milani Town 41	Fee	1,350	6,500	41	2	24	15	41	100.00	\$82,230	\$121,205	
	Milani Town CL35	Fee	1,350	5,000	137	6	31	20	57	41.81	\$69,310	\$95,180	
	Milani Town CL38	Fee	1,400	5,000	90	10	34	48	90	100.00	\$78,505	\$110,360	
	Momiani Villa 1	Fee	1,200	4,500	67	-	-	-	59	88.08	\$72,000	\$79,000	
	Harbor Terrace	Fee	1,200	4,500	140	0	140	0	140	100.00	\$86,500	\$100,000	
	Newtown Estates IV	Fee	1,500	6,000	210	0	184	16	210	100.00	\$97,500	\$138,000	
	Kahana	Fee	1,200-1,945	3,093-6,850	40	0	N/A	N/A	40	100.00	\$93,900	\$122,800	
	Lelepu I	Fee	1,637-2,464	5,000-7,000	60	0	30	29	59	99.33	\$114,400	\$139,700	
	Lelepu II	Fee	1,637-2,464	5,000-7,000	79	0	N/A	N/A	59	74.68	\$114,400	\$139,700	
	ANNUAL TOTALS					1,865			1,310	78.68			
1979	Palehua Heights	Fee	1,350	5,500	70	0	52	11	63	90.00	\$99,200	\$163,500	\$131,350
	Palehua Heights II	Fee	1,350	5,500	172	0	11	31	42	24.42	\$112,500	\$174,000	\$143,250
	Palehua Vista	Fee	1,551	5,000	57	0	45	12	57	100.00	\$82,800	\$130,900	\$106,750
	Waipao by Gentry I	Fee	1,895	6,826	100	0	51	49	100	100.00	\$111,400	\$138,700	\$123,215
	Waipao by Gentry II	Fee	1,817	5,760	112	0	78	36	112	100.00	\$120,500	\$158,800	\$148,215
	Waipao by Gentry III	Fee	1,531	4,273	67	0	53	14	67	100.00	\$93,800	\$122,800	\$109,983
	Milani Town	Fee	1,350	4,150	73	10	17	46	73	100.00	\$85,565	\$121,375	\$92,500
	Milani Town	Fee	1,475	6,050	154	7	33	51	91	59.08	\$96,800	\$141,500	\$123,900
	Milani Town	Fee	1,330	5,300	180	21	42	49	112	70.00	\$74,440	\$137,400	\$108,000
	Village Park	Lease	1,100	4,000	477	0	200	82	282	54.93	N/A	N/A	\$120,000
	Village Park I	Lease	1,100	4,000	130	0	97	33	130	100.00	\$77,000	\$86,000	\$78,000
	Village Park II, IV	Lease	1,100	4,000	113	0	56	27	77	68.14	\$85,000	\$100,000	\$82,000
	Newtown Estates IV	Fee	2,500	6,000	61	0	41	20	61	100.00	\$94,000	\$115,000	\$104,000
	Newtown Villa I, II	Fee	1,300	3,000	134	0	73	18	91	67.91	\$112,000	\$126,000	\$122,000
	Harbor Terrace -HV	Fee	1,200	4,000	170	0	140	0	140	82.35	\$86,900	\$91,000	\$89,000
	ANNUAL TOTALS					2,050			1,478	72.10			

TABLE 3 (continued)

SUMMARY OF SINGLE FAMILY HOUSING DEVELOPMENT AND ORIGINAL SALES IN THE CENTRAL OAHU & EWA / KAPOLEI REGIONS 1978 TO 1995  
 Initial Study of the Proposed Varona Village Phase II Expansion  
 Ewa/Kapolei, Oahu, Hawaii

Year	Project	Tenure	Typical Size (SF)		Total Units Completed	Sales				Sales as a Percent of Completions	Sales Price		
			House	Lot		2br	3br	4br	Total		Minimum	Maximum	Average
1980	Palehua Heights	Fee	1,350	5,500	7	0	10	11	21	(1)	\$89,200	\$163,500	\$131,350
	Palehua Heights II	Fee	1,350	5,500	52	0	24	8	32	61.54	\$112,500	\$174,000	\$143,250
	Milani I	Fee	1,400	3,000	70	38	32	0	68	97.14	\$130,000	\$180,000	\$145,000
	Milani II	Fee	1,350	4,000	75	0	60	15	75	100.00	\$130,000	\$185,000	\$145,000
	Village Park III	Lease	1,100	4,000	180	-	-	-	180	94.74	\$112,500	\$129,000	\$120,000
	Waipahu Estates	Fee	1,320	5,000	61	0	40	21	61	100.00	\$112,500	\$130,000	\$121,000
	Milani	Fee	1,410	6,240	0	8	71	39	118	(1)	\$115,000	\$175,000	\$143,000
	Newtown Villa II	Fee	1,300	3,000	35	-	-	-	35	100.00	\$112,000	\$127,000	\$123,000
	ANNUAL TOTALS					480			590	120.41 (1)			
1981	Palehua Heights	Fee	1,350	5,500	0	0	2	3	5	(1)	\$139,000	\$143,000	\$140,850
	Palehua Heights II	Fee	1,350	5,500	31	0	18	8	26	83.87	\$130,000	\$180,000	\$141,895
	Puuh in Waipao	Fee	1,700	5,000	20	0	27	8	35	(1)	\$140,000	\$180,000	\$180,000
	Village Park	Lease	1,250	4,500	40	0	27	7	34	85.00	\$107,000	\$145,000	\$120,000
	Milani	Fee	1,410	6,240	207	18	85	66	169	81.64	\$115,000	\$175,000	\$143,800
ANNUAL TOTALS					298			269	80.27				
1982	Palehua Heights II	Fee	1,350	5,500	5	0	3	5	8	(1)	\$134,500	\$150,000	\$142,500
	Village Park	Lease	1,000	4,500	35	0	69	9	78	(1)	\$108,000	\$145,000	\$115,000
	Puuh in Waipao	Fee	1,280	3,500	50	0	40	10	50	100.00	\$105,000	\$145,000	\$125,000
	Milani 48	Fee	1,250	4,500	3	3	12	31	46	(1)	\$97,200	\$148,500	\$115,700
	Milani 49	Fee	1,300	6,100	2	5	48	31	84	(1)	\$104,800	\$178,200	\$142,000
	Milani 50	Fee	925	4,500	68	4	43	21	68	100.00	\$100,800	\$118,800	\$111,700
	Royal Summit	Fee	1,700	6,000	18	0	14	4	18	100.00	\$225,000	\$300,000	\$250,000
	Royal Summit	Fee	N/A	6,000	97 (2)	-	-	-	97	100.00	\$87,500	\$135,000	\$85,000
	ANNUAL TOTALS					278			449	161.51 (1)			
1983	Ahioe 1 and 2	Fee	1,008	6,500	16	0	16	0	16	100.00	\$122,847	\$136,700	\$129,487
	Palehua Heights II	Fee	1,350	5,500	25	0	24	4	28	(1)	\$117,000	\$194,800	\$150,733
	Lutes, Nohoa, Kautana	Fee	1,220	3,200	140	10	230	40	280	(1)	\$115,000	\$160,000	\$135,000
	Village Park	Lease	1,000	4,500	180	0	150	0	150	83.75	\$112,000	\$120,000	\$116,000
	Milani CL36	Fee	915	4,490	31	8	47	24	79	(1)	\$104,200	\$132,400	\$120,800
	Milani 47	Fee	1,300	5,820	0	3	12	10	25	(1)	\$130,000	\$189,000	\$155,100
	Milani 48	Fee	1,250	4,500	47	0	2	4	6	12.77	\$105,000	\$168,500	\$156,200
	Milani 49	Fee	1,300	6,100	97	1	10	12	23	23.71	\$112,800	\$174,500	\$155,200
	Milani 50	Fee	1,415	6,200	101	5	39	35	79	78.22	\$120,800	\$181,800	\$155,100
	Royal Summit	Fee	1,700	6,000	64	0	10	44	54	100.00	\$188,500	\$290,000	\$210,000
	ANNUAL TOTALS					671			740	110.28 (1)			

TABLE 3  
(continued)

SUMMARY OF SINGLE FAMILY HOUSING DEVELOPMENT AND ORIGINAL SALES IN THE CENTRAL OAHU & EWA / KAPOLEI REGIONS 1978 TO 1996  
Artist Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii

Year	Project	Tenure	Typical Size (SF)		Total Units Completed	Sales				Sales as a Percent of Completions	Sales Price			
			House	Lot		2br	3br	4br	Total		Minimum	Maximum	Average	
1984	Ahikoe	Fee	1,350	6,500	28	0	10	0	10	38.48	\$123,000	\$135,838	\$129,100	
	Palehua Heights II	Fee	1,350	6,500	12	0	6	0	6	50.00	\$118,000	\$200,218	\$182,452	
	Palehua Heights III	Fee	1,350	6,500	0	0	3	1	4	(1)	\$141,000	\$170,000	\$155,000	
	Village Park	Lease	1,000	5,000	147	0	148	0	148	(1)	\$112,500	\$134,000	\$125,000	
	Hoheia	Fee	1,200	3,100	0	10	130	14	154	(1)	\$112,500	\$180,000	\$138,000	
	Kaulana	Fee	1,200	3,380	230	14	186	24	224	97.38	\$117,000	\$182,000	\$140,000	
	Launa	Fee	1,200	3,300	0	4	42	7	53	(1)	\$117,000	\$182,000	\$140,000	
	Milani	Fee	1,200	3,810	154	24	189	122	315	(1)	\$113,745	\$186,800	\$142,000	
	Ke Kumuhani	Fee	1,205	3,600	58	0	42	0	42	72.41	\$140,000	\$180,000	\$165,000	
	Royal Summit	Fee	1,500	6,000	38	0	38	10	48	(1)	\$180,000	\$280,000	\$220,000	
	Royal Summit	Fee	N/A	6,000	77 (2)	-	-	-	77	100.00	\$115,000	\$115,000	\$115,000	
	ANNUAL TOTALS					742				1,082	145.82 (1)			
	1985	Palehua Heights II	Fee	1,350	5,500	7	0	3	1	4	57.14	\$153,000	\$265,000	\$188,000
Palehua Heights III		Fee	1,350	5,500	1	0	13	2	15	(1)	\$141,800	\$212,200	\$164,700	
Ahikoe		Fee	1,008	6,500	23	0	20	0	20	86.96	\$123,000	\$138,947	\$130,000	
Village Park		Lease	1,200	4,000	200	0	230	30	260	(1)	\$120,000	\$130,000	\$125,000	
Milani		Fee	1,200	5,000	373	52	184	157	573	100.00	\$113,745	\$279,500	\$154,562	
Ke Kumuhani		Fee	1,205	3,500	54	0	62	0	62	(1)	\$140,000	\$170,000	\$152,258	
Heights at Waialua		Lease	1,300	4,000	31	0	25	6	31	100.00	\$148,000	\$189,000	\$165,000	
Royal Summit		Fee	N/A	6,500	50 (2)	-	-	-	50	(1)	\$97,500	\$105,700	\$102,500	
ANNUAL TOTALS					738				825	125.17 (1)				
1986		Ahikoe	Fee	1,008	6,500	3	0	8	0	8	(1)	\$127,500	\$138,000	\$131,433
	Colony Ridge 1 and 2	Fee	1,584	5,400	52	0	52	0	52	100.00	\$140,800	\$186,055	\$154,720	
	Palehua Heights II	Fee	1,350	5,500	8	0	7	2	8	(1)	\$151,000	\$273,892	\$183,844	
	Palehua Heights III	Fee	1,350	5,500	15	0	15	7	22	(1)	\$154,800	\$188,561	\$178,782	
	Village Park	Lease	1,300	4,500	310	0	250	60	310	100.00	\$129,000	\$144,000	\$138,800	
	Milani	Fee	1,000	4,800	434	-	-	-	434	(1)	\$118,700	\$202,000	\$156,000	
	Hookumu	Fee	1,100	4,800	12	0	12	0	12	100.00	\$127,800	\$130,000	\$128,500	
	Ke Kumuhani	Fee	1,200	3,600	65	0	65	0	65	100.00	\$135,000	\$170,000	\$153,000	
	Heights at Waialua	Lease	1,300	3,500	66	-	-	-	66	84.85	\$153,000	\$207,000	\$175,000	
	Nahalekua	Fee	1,584	6,500	29	5	24	0	28	100.00	\$235,000	\$315,000	\$280,000	
	ANNUAL TOTALS					894				1,083	108.85 (1)			

TABLE 3  
(continued)

SUMMARY OF SINGLE FAMILY HOUSING DEVELOPMENT AND ORIGINAL SALES IN THE CENTRAL OAHU & EWA / KAPOLEI REGIONS 1978 TO 1996  
Artist Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii

Year	Project	Tenure	Typical Size (SF)		Total Units Completed	Sales				Sales as a Percent of Completions	Sales Price			
			House	Lot		2br	3br	4br	Total		Minimum	Maximum	Average	
1987	Palehua Heights II	Fee	1,350	5,500	4	0	11	1	12	(1)	\$151,000	\$273,892	\$186,584	
	Palehua Heights III	Fee	1,350	5,500	28	0	8	14	22	84.82	\$141,800	\$198,250	\$171,139	
	Colony Ridge I	Fee	1,584	5,400	28	0	27	0	27	96.43	\$140,800	\$180,800	\$151,868	
	Colony Ridge II and III	Fee	1,584	5,400	30	0	13	0	13	43.33	\$140,800	\$186,805	\$153,800	
	Colony Ridge IV and V	Fee	1,584	5,400	7	0	2	0	2	28.57	\$140,800	\$186,805	\$153,800	
	Village Park	Lease	1,300	4,000	350	0	230	117	347	89.14	\$130,000	\$154,000	\$142,000	
	Milani Pines	Fee	1,500	6,500	46	0	46	0	46	100.00	\$180,000	\$300,000	\$190,000	
	Milani 45 and 60	Fee	1,200	5,000	250	0	250	0	250	100.00	\$120,000	\$200,000	\$150,000	
	Heights at Waialua	Lease	1,742	3,500	12	0	28	6	35	(1)	\$186,000	\$212,000	\$173,000	
	Crest at Waialua	Lease	1,428	3,800	37	0	25	12	37	100.00	\$148,000	\$178,400	\$159,700	
	Fernandez Village (2)	Fee	1,100	3,750	30	0	30	0	30	100.00	\$85,000	\$118,000	\$80,000	
	ANNUAL TOTALS					820				821	100.12 (1)			
	1988	Village Park	Lease	1,250	5,000	208	0	208	0	208	100.00	\$14,000	\$180,000	\$160,000
Soda Creek		Fee	1,300	3,200	210	48	263	77	389	(1)	\$121,750	\$180,000	\$138,550	
Milani		Fee	1,200	5,000	359	39	280	40	359	100.00	\$150,000	\$350,000	\$185,000	
Crest at Waialua		Lease	1,174	3,500	98	0	86	58	124	(1)	\$155,700	\$236,750	\$187,389	
Colony Ridge		Fee	1,150	5,000	80	0	80	0	80	100.00	\$182,000	\$190,000	\$170,000	
Parade		Fee	1,000	4,000	50	0	50	0	50	100.00	\$148,000	\$195,000	\$163,000	
Fernandez Village (2)		Fee	1,100	3,750	14	0	12	2	14	100.00	\$81,750	\$110,000	\$88,000	
ANNUAL TOTALS					1,000				1,205	120.50 (1)				
1989	Highlands @ Makaha	Fee	1,750	6,700	49	0	20	26	46	93.88	\$208,000	\$340,000	\$258,000	
	Soda Creek	Fee	1,100	3,500	180	0	0	180	180	100.00	\$121,000	\$154,000	\$140,000	
	Royal Kunia	Fee	1,300	5,000	274	0	178	274	453	(1)	\$167,000	\$252,000	\$213,000	
	Milani Town	Fee	1,400	5,400	204	20	96	183	309	(1)	\$185,000	\$380,000	\$243,000	
	Crest at Waialua	Lease	1,174	3,500	33	0	21	42	63	(1)	\$187,230	\$314,000	\$271,830	
	Parade	Fee	998	4,200	50	0	50	9	50	100.00	\$148,900	\$194,350	\$183,150	
	West Loch Estates (2)	Fee	1,400	5,000	0	8	81	24	113	(1)	\$89,000	\$270,000	\$178,000	
	ANNUAL TOTALS					782				1,214	153.28 (1)			
1990	Milani Makai	Fee	1,400	5,000	175	0	115	60	175	100.00	\$200,000	\$410,000	\$283,750	
	Westcott	Fee	1,500	4,000	28	0	43	0	43	(1)	\$355,000	\$434,500	\$370,750	
	Villages of Kapolei I (2)	Fee	1,500	5,000	88	0	0	0	88	89.71			\$305,000	
	Villages of Kapolei II (2)	Fee	1,150	4,000	102	0	0	0	102	90.20			\$109,000	
	West Loch Estates I (2)	Fee	1,550	4,500	168	0	129	39	168	100.00	\$225,000	\$425,000	\$285,000	
	West Loch Estates II (2)	Fee	1,200	4,000	288	44	185	59	288	100.00	\$109,000	\$125,000	\$115,000	
	West Loch Flanerys (2)	Fee	1,800	5,500	10	0	0	0	10	0.00				
ANNUAL TOTALS					837				827	96.81				

TABLE 3  
(continued)

SUMMARY OF SINGLE FAMILY HOUSING DEVELOPMENT AND ORIGINAL SALES IN THE CENTRAL OAHU & EWA / KAPOLEI REGIONS 1978 TO 1995  
arket Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii

Year	Project	Tenure	Typical Size (SF)		Total Units Completed	Sales				Sales as a Percent of Completions	Sales Price			
			House	Lot		2br	3br	4br	Total		Minimum	Maximum	Average	
1991	Sunset Pointe @ Waialeale	Fee	1,100	4,500	5	0	0	0	233	(1)				
	Makani Mauka 100	Fee	1,800	5,500	47	0	63	30	83	(1)	\$349,000	\$448,500	\$389,753	
	Makani Mauka 102	Fee	1,782	5,000	83	0	56	27	83	100.00	\$348,100	\$442,400	\$388,342	
	Makani Mauka 104	Fee	1,836	5,500	135	0	80	55	135	100.00	\$346,200	\$490,800	\$387,080	
	Palehua Pointe (2)	Fee		6,200	0	0	0	0	18	(1)	\$228,100	\$337,900	\$281,100	
	Westcliff	Fee	1,554	6,000	51	0	43	8	81	100.00	\$320,000	\$434,400	\$366,800	
	Westcliff (2)	Fee		6,000	0	0	0	0	18	(1)	\$185,000	\$208,500	\$195,300	
	Villages of Kapolei I (1)	Fee	1,500	5,000	140	12	65	55	132	84.29	\$210,000	\$370,000	\$305,000	
	Villages of Kapolei II (1)	Fee	1,150	4,000	209	28	190	0	218	104.31	\$39,000	\$120,000	\$109,000	
	Villages of Kapolei III (1)	Fee	2,000	6,000	0	0	4	18	22	(1)	\$375,000	\$495,000	\$424,000	
	West Loch Farways (1)	Fee	1,400	5,000	3	0	1	0	1	33.33	\$404,000	\$404,000	\$404,000	
	ANNUAL TOTALS					673				1,002	148.89 (1)			
1992	Golf Club Estates @ Waialeale	Fee	1,750	5,000	1									
	Aias Park Place	Fee	1,600	4,000	34				34	100.00	\$350,000	\$425,000	\$375,000	
	Sun Terra	Fee	1,360	3,555	137	4	95	38	137	100.00	\$252,000	\$313,000	\$285,000	
	Westcliff @ Makakalo Heights	Fee	1,648	7,756	9				7	77.78	\$321,250	\$437,800	\$344,800	
	Makani Village 3, Villages of Kapolei	Fee	1,989	5,500	28	5	5	10	20	71.43	\$340,000	\$485,000	\$350,000	
	Makani Village 3, Villages of Kapolei	Fee	1,133	4,500	45	5	5	10	20	44.44	\$95,000	\$140,000	\$110,000	
	West Loch Farways	Fee	1,400	5,500	123		83	40	123	100.00	\$275,000	\$375,000	\$347,000	
	West Loch Farways	Fee	1,250	4,300	1		1		1	100.00			\$130,000	
	ANNUAL TOTALS					378				342	90.48			
	1993	Golf Club Estates @ Waialeale	Fee	1,779	5,400	71		60	7	87	94.37	\$360,875	\$575,000	\$459,247
Champions @ Waialeale		Fee	1,500	5,000	70				101	144.29	\$328,000	\$445,000	\$385,000	
Sunset Pointe @ Waialeale		Fee	1,396	5,301	18		38		39	260.00	\$320,000	\$370,100	\$351,789	
Makani Mauka		Fee	985	3,995		26	7		33		\$187,500	\$237,870	\$207,683	
Aias Park Place		Fee	1,600	4,000	330	63	222	20	305	92.42	\$256,450	\$336,400	\$344,739	
Sun Terra		Fee	1,360	3,555	50		47	3	50	100.00	\$355,000	\$425,000	\$378,000	
Sun Terra on the Park		Fee	1,380	3,555	288	25	225	38	309	107.29	\$252,000	\$319,000	\$282,000	
Westpark at Makakalo Heights		Fee	1,657	4,224	67		18	9	28	41.79	\$289,000	\$334,000	\$297,000	
Westcliff at Makakalo Heights		Fee	1,648	7,490	53		20	15	35	68.04	\$317,000	\$358,700	\$338,229	
Makani Village 3, Villages of Kapolei		Fee	1,989	5,500	96		10	14	24	109.09	\$318,250	\$355,000	\$334,444	
Makani Village 3, Villages of Kapolei		Fee	1,133	4,500	82	10	53		83	78.83	\$96,000	\$185,000	\$150,548	
West Loch Farways		Fee	1,400	5,854	120		69	51	120	100.00	\$275,000	\$340,000	\$328,380	
West Loch Farways		Fee	1,200	4,268	283	28	195	60	283	100.00	\$104,000	\$153,652	\$137,058	
ANNUAL TOTALS					1,547				1,501	97.03				

TABLE 3  
(continued)

SUMMARY OF SINGLE FAMILY HOUSING DEVELOPMENT AND ORIGINAL SALES IN THE CENTRAL OAHU & EWA / KAPOLEI REGIONS 1978 TO 1995  
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Ewa/Kapolei, Oahu, Hawaii

Year	Project	Tenure	Typical Size (SF)		Total Units Completed	Sales				Sales as a Percent of Completions	Sales Price		
			House	Lot		2br	3br	4br	Total		Minimum	Maximum	Average
1994	Aias Park Place	Fee	1,700	4,000	26		27	3	30	115.38	\$350,000	\$450,000	\$390,000
	Champions @ Waialeale	Fee	1,400	5,000	56		56		56	100.00	\$325,000	\$425,000	\$380,000
	Highland View Estates	Fee	1,800	5,000	6		2	3	5	83.33	\$414,000	\$448,000	\$442,800
	Makani Mauka	Fee	1,321	5,815	222	31	169	53	253	113.96	\$258,550	\$686,575	\$379,026
	Royal Kuna Phase I	Fee	1,363	5,232	90	15	30	19	64	71.11	\$258,000	\$425,000	\$325,700
	Royal Pines at Waialeale	Fee	1,300	5,000	83		50	33	83	100.00	\$311,000	\$413,000	\$358,223
	The Signatures at Waialeale	Fee	1,500	5,000	35		18	13	31	88.57	\$358,000	\$425,000	\$378,087
	Royal Ridge-Phase I	Fee	1,607	5,500	7		3	4	7	100.00	\$352,200	\$401,800	\$378,000
	Summerville	Fee	1,310	4,234	32		6		8	18.75	\$280,000	\$294,000	\$278,000
	Sun Terra on the Park	Fee	1,380	4,224	119	1	103	48	153	130.77	\$280,000	\$335,000	\$296,000
	Sun Terra South	Fee	1,251	4,365	47	1	23	9	33	70.21	\$258,000	\$325,000	\$290,000
	Village Pointe Bay-Phase II	Fee	1,100	4,000	36	9	18	2	27	300.00	\$178,900	\$290,000	\$208,240
	Westcliff at Makakalo Hts	Fee	1,648	5,800	13		8	5	13	100.00	\$236,800	\$384,400	\$355,800
	Westpark at Makakalo Hts	Fee	1,657	7,490	31		24	7	31	100.00	\$317,000	\$389,200	\$344,100
	Makani Village 3, Villages of Kapolei	Fee	2,000	5,500	61	5	30	26	61	100.00	\$265,000	\$325,000	\$285,000
	Makani Village 3, Villages of Kapolei	Fee	1,185	4,500	39	5	34		39	100.00	\$143,000	\$185,000	\$175,000
	Kakulani, Villages of Kapolei	Fee	1,238	3,198	135		95		95	70.37	\$156,000	\$197,800	\$176,800
	Kakulani, Villages of Kapolei	Fee	1,343	3,200	186		83		83	44.82	\$239,000	\$332,000	\$285,500
	West Loch Farways	Fee	1,750	5,854	29		16	10	26	89.66	\$280,000	\$488,000	\$372,864
	West Loch Farways	Fee	1,100	4,268	15	4	21	6	31	206.67	\$104,000	\$153,652	\$137,058
ANNUAL TOTALS					1,264				1,127	89.18			
1995	Makani Mauka	Fee	1,700	5,770	235	5	170	43	218	92.77	\$280,000	\$599,000	\$383,000
	Royal Kuna	Fee	1,300	4,500	49	8	59	18	85	173.47	\$256,000	\$425,000	\$325,700
	Royal Kuna	Fee	972	3,650	66		26		26	38.24	\$218,000	\$248,000	\$234,000
	Waialeale Single Family Executive Series	Fee	1,450	6,000	20		33	50	83	415.00	\$338,000	\$438,000	\$375,000
	Ewa by Gentry, Firsta	Fee	1,088	3,750	70	9	50	11	70	100.00	\$208,000	\$245,000	\$237,000
	Ewa by Gentry, Summerville	Fee	1,310	3,750	187	22	105	60	187	100.00	\$255,000	\$205,000	\$278,000
	Ewa by Gentry, Sun Terra South	Fee	1,251	3,750	17	2	10	5	17	100.00	\$280,000	\$295,000	\$285,000
	Makai Kai	Fee	1,100	3,200	30	20	45	20	85	283.33	\$199,000	\$227,000	\$212,000
	Royal Ridge-Phase I	Fee	1,600	6,800	5		4	4	8	150.00	\$339,000	\$411,000	\$382,000
	Village Pointe Bay-Phase II	Fee	1,000	4,000	93	41	47	4	92	98.82	\$177,000	\$264,000	\$201,630
	Westcliff at Makakalo Hts	Fee	1,608	6,900	35		15	16	31	88.57	\$318,000	\$401,000	\$358,000
	Aloha Village 2	Fee	1,495	5,500	83		46	20	66	79.87	\$275,000	\$485,000	\$330,197
	Aloha Village 2	Fee	1,205	4,500	53		64		64	101.59	\$180,000	\$230,000	\$213,644

We note the tendencies evidenced by the data extracted from 1978 through 1995 from Bank of Hawaii publications have continued into 1996, according to discussion with the bank's survey personnel and information compiled by the City and County of Honolulu Planning Department. The most notable change of the last 18 months has been in the rate of sales for finished inventory. This base indicator rose strongly in 1995 following successive years of decline in 1993-94, reaching 103.7 percent of units completed during the year (many unsold homes built in previous years were also sold). The first two quarters of 1996 have been similarly active.

In 1995, a total of 1,061 single-family residences were built, with sales reported at 1,100 homes for the year. The number of units constructed was down from the 1994 total of 1,264, an expected trend given the economic conditions when development decisions were made in 1993-94. Overall, despite the downturn at the beginning of the decade, the unit completion figures are well above the annual average over the study period of 894 units finished each year.

To date more than 99 percent of all finished inventory has been sold and average prices have nearly tripled since the late 1970s, moving upward from an average of \$102,479 in 1978 to \$302,000 by year-end 1995.

In comparison with the entirety of Oahu, the proportion of single- to multi-family units is heavily weighted towards the former in the study regions. According to the 1990 census, 155,467 units, or 55 percent of the island's total housing inventory of 281,683 units, were classified as "1 unit, detached" or "1 unit, attached," virtually all of the remaining 45 percent being considered as one of several multifamily-type structures.

The average home size has increased by several percent over the study period, reaching 1,490 square feet in 1995--the second highest annual mark among the data. The move to larger houses in recent years is a recovery from the mid-1980s when homes averaged less than 1,200 square feet.

The average lot size has shown continuing decline, falling to less than 5,000 square feet in 1995. In 12 of 17 years since 1979, the average lot size has decreased, with the most current figures 10 to 20 percent below levels of 15 years ago.

TABLE 3  
(continued)

SUMMARY OF SINGLE FAMILY HOUSING DEVELOPMENT AND ORIGINAL SALES IN THE CENTRAL OAHU & EPA / KAPOLEI REGIONS 1978 TO 1995  
Market Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii

Year	Project	Tenure	Typical Size (SF)		Total Units Completed	Sales				Sales as a Percent of Completions	Sales Price		
			House	Lot		2br	3br	4br	Total		Minimum	Maximum	Average
	Iwani Village 5	Fee	1,460	4,500	83	-	36	18	54	101.88	\$273,000	\$337,000	\$314,870
	Iwani Village 6	Fee	1,281	4,250	15	-	15	-	15	100.00	\$204,000	\$228,000	\$218,027
	Kakulani Village 4	Fee	1,343	3,200	20	1	54	38	91	455.00	\$241,490	\$365,000	\$277,982
	Makana Village 3	Fee	2,000	8,500	2	1	14	13	28	1400.00	\$290,000	\$485,000	\$419,836
ANNUAL TOTALS					1,061				1,220	85.16			

(1) "Sales as a Percentage of Completions" figure is greater than 100 percent due to absorption of units in years subsequent to construction or due to pre-sales of units to be built in subsequent years.

(2) Lots only.

(3) Government sponsored project.

Source: Bank of Hawaii, and The Malstrom Group, Inc.

TABLE 4

SUMMARY OF MULTI-FAMILY HOUSING DEVELOPMENT AND ORIGINAL SALES IN THE CENTRAL OAHU & EWA / KAPOLEI REGIONS 1978 TO 1995  
Market Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii

Year	Project	Tenure	Typical Unit Size (SF)	Total Units Completed	Sales			Sales as a Percent of Completions	Sales Price			
					2br or Less	3br	4br		Minimum	Maximum	Average	
1978	Palehua Gardens	Fee	1,245	98	8	19	5	30	30.81	\$47,200	\$67,600	Data
	Palehua Hale 1-3	Fee	1,230	87	7	51	24	82	94.25	\$55,000	\$80,800	Not
	Milani MF-26	Fee	1,100	82	24	38	0	62	100.00	\$55,000	\$89,900	Available
	Milani MF-33	Fee	1,000	90	82	28	0	90	100.00	\$48,215	\$81,230	For 1978
	Loko	Fee	1,000	85	44	44	0	88	100.00	\$73,850	\$81,750	
ANNUAL TOTALS				423				322	82.82			
1979	Palehua Gardens	Fee	1,245	0	16	41	11	68	(1)	\$47,200	\$67,600	N/A
	Palehua Hale 1-3	Fee	1,230	0	0	4	1	5	(1)	\$55,000	\$80,800	N/A
	Palehua Hale	Fee	1,330	96	0	21	4	25	26.04	\$100,500	\$127,500	\$114,000
	Waialua	Lease	1,400	184	18	38	0	56	34.15	\$82,000	\$112,000	\$102,000
	Waialua by Gentry	Fee	1,072	88	36	52	0	88	100.00	\$68,700	\$96,250	\$77,710
	Waialua Garden Villa	Lease	1,100	291	156	21	0	177	60.82	\$77,000	\$89,000	\$84,000
ANNUAL TOTALS				639				418	65.57			
1980	Palehua Hale	Fee	1,330	0	0	61	10	71	(1)	\$100,500	\$127,500	\$114,000
	Waialua Garden Villa	Lease	1,100	64	53	52	0	105	(1)	\$77,000	\$89,000	\$84,000
	Lilo	Fee	1,050	88	32	56	0	88	100.00	\$74,000	\$92,000	\$84,000
	Penaki	Fee	1,050	85	24	26	0	50	100.00	\$96,000	\$104,000	\$100,000
	Waialua Garden Court	Lease	980	177	158	21	0	177	100.00	\$78,500	\$103,000	\$90,000
	Waialua	Lease	1,350	128	40	71	0	111	89.52	\$102,000	\$138,000	\$120,000
ANNUAL TOTALS				503				802	112.72 (1)			
1981	Waialua Garden Villa	Lease	1,100	165	91	70	0	161	87.58	\$75,000	\$104,500	\$89,051
	Waialua	Lease	1,350	80	9	32	0	41	51.25	\$108,000	\$143,000	\$123,000
ANNUAL TOTALS				245				202	82.45			
1982	Waialua Garden Villa	Lease	1,100	0	46	31	0	77	(1)	\$75,000	\$104,500	\$89,051
	Waialua	Lease	1,350	0	13	35	0	48	(1)	\$108,000	\$143,000	\$115,000
	Kuaoa	Fee	750	50	50	0	0	50	100.00	\$79,000	\$79,000	\$78,000
ANNUAL TOTALS				80				175	350.00 (1)			
1983	Waialua	Lease	1,350	0	33	80	0	112	(1)	\$108,000	\$143,000	\$115,000
	Waialua II	Lease	1,450	24	6	18	0	24	100.00	\$130,000	\$159,000	\$145,000
	College Gardens	Lease	840	105	0	105	0	105	100.00	\$115,000	\$160,000	\$125,000
	Kuaoa, Ilioma, Hano	Fee	850	100	100	0	0	100	100.00	\$49,000	\$83,000	\$70,000
	Penaki II	Fee	820	120	120	0	0	120	100.00	\$78,250	\$78,250	\$78,250
ANNUAL TOTALS				349				481	132.09 (1)			

The Hillman Group, Inc. Proposed Varona Village Expansion Phase II

As shown on Table 4, the original sales multi-family sector in Ewa/Kapolei and Central Oahu have experienced construction and sales activity highly similar to the single-family market. Following subdued years in 1992-94, absorption surged in 1995, with 823 new unit sales. Virtually all of the 701 units built last year were sold, as were nearly 130 units remaining from prior construction efforts.

Development of multi-family units has escalated rapidly in the study area, much being a function of the area becoming sufficiently established to attract all purchaser groups and also as the size, quality, and value of Ewa units are superior to those found elsewhere on the island. The 823 units built in 1995 is the third highest total on record (surpassed only by 1993 and 1994), and well above the annual average constructed since 1978 of 608 units per year.

The average original sales price for Ewa/Kapolei and Central Oahu multi-family residences has grown more than 250 percent since 1978, reaching \$210,448 through 1995. The average unit size has decreased during the same period, falling by nearly a quarter to 845 square feet last year.

The indicators drawn from the data are clear; the study region is in the midst of a long-term residential construction expansion cycle, with greater numbers and increasing prices typifying the sector. Following the economic slowdown earlier in the decade, the speed of finished unit absorption has moved into a recovery cycle.

Identification of Proposed Ewa/Kapolei Inventory Additions

Our investigation revealed some 45,748 additional housing units proposed for the Ewa/Kapolei area to be contained in a dozen major projects, most of which have yet to break ground.(3) Of these, 32,571

(3) This total does not include any units proposed for the 1,100-acre "State Land Bank" area controlled by HFDIC. At this time, no specific unit count, infrastructure needs, project time-line, or potential developer have been identified. Some 200 acres of the property may be given to the Department of Hawaiian Home Lands as part of the on-going settlement process. The actualization of these units is considered beyond the study period of our analysis.

TABLE 4  
(continued)

SUMMARY OF MULTI-FAMILY HOUSING DEVELOPMENT AND ORIGINAL SALES IN THE CENTRAL OAHU & EWA / KAPOLEI REGIONS 1978 TO 1995  
Market Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii

Year	Project	Tenure	Typical Unit Size (SF)	Total Units Completed	Sales				Sales as a Percent of Completions	Sales Price		
					2br or Less	3br	4br	Total		Minimum	Maximum	Average
1984	Palehua Villas	Fee	800	22	22	0	0	22	100.00	\$78,700	\$104,200	\$87,700
	Palehua Nani	Fee	1,142	8	8	3	0	8	100.00	\$99,400	\$124,800	\$113,200
	Ihona	Fee	500	132	132	0	0	132	100.00	\$50,000	\$69,000	\$60,000
	Haono & Palua	Lease	700	124	124	0	0	124	100.00	\$50,000	\$68,000	\$70,000
	Kuaka	Fee	750	18	18	0	0	18	100.00	\$81,000	\$88,000	\$84,000
	Milani Terrace	Lease	837	60	60	0	0	60	100.00	\$53,000	\$68,400	\$60,360
	Waikua II	Lease	1,375	36	6	21	0	36	100.00	\$132,000	\$185,000	\$147,000
ANNUAL TOTALS				401				401	100.00			
1985	Palehua Nani	Fee	1,142	8	8	1	0	8	100.00	\$75,500	\$124,800	\$99,400
	Palehua Villas	Fee	800	15	15	0	0	15	100.00	\$78,700	\$105,000	\$91,000
	Milani Terrace	Lease	723	60	60	0	0	60	100.00	\$53,000	\$68,400	\$62,800
	AM Plantation	Lease	800	152	105	0	0	105	89.06	\$49,000	\$102,900	\$93,078
ANNUAL TOTALS				233				196	79.83			
1986	AM Plantation	Lease	800	0	47	0	0	47	(1)	\$89,000	\$102,900	\$93,078
	Palehua Nani II, III	Fee	1,142	36	35	6	0	36	100.00	\$75,700	\$124,000	\$99,400
	Palehua Villas II-IV	Fee	800	42	26	6	0	32	78.18	\$78,700	\$110,800	\$92,231
	Milani Terrace III	Lease	723	133	133	0	0	133	100.00	\$58,200	\$72,000	\$65,400
	Newtown Meadows	Fee	885	122	122	0	0	122	100.00	\$103,500	\$117,500	\$111,700
	Crosspointe	Lease	750	213	-	-	-	213	100.00	\$81,000	\$130,000	\$105,500
ANNUAL TOTALS				548				583	106.78 (1)			
1987	Palehua Nani IV	Fee	1,150	38	36	2	0	38	100.00	\$75,500	\$125,000	\$81,220
	Palehua Villas II-IV	Fee	800	18	24	2	0	26	(1)	\$79,700	\$110,800	\$88,355
	Citrus Villages	Fee	750	63	63	0	0	63	100.00	\$86,900	\$119,900	\$108,900
	Newtown Meadows	Fee	847	100	142	0	0	142	(1)	\$105,000	\$120,000	\$112,500
	Crosspointe	Lease	750	88	165	0	0	165	(1)	\$81,000	\$130,000	\$105,500
	Sunpoint	Fee	750	144	-	-	-	144	100.00	N/A	N/A	N/A
	ANNUAL TOTALS				451				480	128.60 (1)		
1988	Citrus Villages	Fee	750	184	119	0	0	119	64.87	\$96,900	\$125,900	\$98,800
	Milani	Fee	700	11	11	0	0	11	100.00	\$68,400	\$68,400	\$68,400
	Palehua Villas V	Fee	790	30	21	9	0	30	100.00	\$105,000	\$120,000	\$110,000
ANNUAL TOTALS				225				160	71.11 (1)			

TABLE 4  
(continued)

SUMMARY OF MULTI-FAMILY HOUSING DEVELOPMENT AND ORIGINAL SALES IN THE CENTRAL OAHU & EWA / KAPOLEI REGIONS 1978 TO 1995  
Market Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii

Year	Project	Tenure	Typical Unit Size (SF)	Total Units Completed	Sales				Sales as a Percent of Completions	Sales Price		
					2br or Less	3br	4br	Total		Minimum	Maximum	Average
1989	Palm Villas	Fee	716	218	218	0	0	218	100.00	\$72,700	\$117,125	\$108,900
	Palm Court	Rental	716	112	-	-	-	112	100.00	\$450/mo.	\$850/mo.	
	Milani	Fee	834	32	0	32	0	32	100.00	\$110,350	\$116,940	\$114,760
	Palehua Villas	Fee	800	226	140	8	0	148	65.49	\$78,000	\$225,000	\$90,000
	Palehua Nani	Fee	743	52	36	16	0	52	100.00	\$83,000	\$122,000	\$111,800
	Palehua Nani	Fee	638	25	0	25	0	25	100.00	\$85,000	\$90,500	\$87,400
ANNUAL TOTALS				665				567	86.27			
1990	Palm Court II	Fee	845	282	324	0	0	324	(1)	\$130,000	\$164,400	\$144,200
	Royal Kurie	Rental	780	130	-	-	-	130	100.00	\$480/mo.	\$775/mo.	
	Milani Makai	Fee	1,050	48	-	-	-	48	100.00			\$202,000
	Milani Makai	Fee	850	131	-	-	-	131	100.00			\$183,500
	Waialeale	Fee	880	0	344	0	0	344	(1)	\$101,000	\$174,000	\$128,700
	Cambridge Park	Rental	875	112	-	-	-	112	100.00	\$825/mo.	\$900/mo.	
ANNUAL TOTALS				703				1,089	154.91 (1)			
1991	Hoomali @ Waialeale	Fee	750	54	54	0	0	54	(1)	\$125,000	\$181,000	\$159,000
	Hoomali @ Waialeale	Fee	750	244	244	0	0	244	100.00	\$78,500	\$179,800	\$134,000
	Palm Villas II	Fee	853	338	338	0	0	338	100.00	\$125,000	\$184,000	\$163,500
	Palm Court II	Fee	842	27	27	0	0	27	100.00	\$180,000	\$188,000	\$184,500
	Palm Court III	Fee	842	178	164	0	0	164	83.18	\$181,000	\$186,000	\$184,500
	Arbors at Ewa	Fee	1,018	0	181	20	0	201	(1)	\$216,000	\$315,000	\$280,000
	Makaloa Cifs	Fee	717	112	81	0	0	81	72.32	\$182,900	\$186,900	\$179,900
ANNUAL TOTALS				951				1,288	135.44 (1)			
1992	Farway Village at Waialeale	Fee	1,100	25	25	-	-	25	100.00	\$170,000	\$197,000	\$180,000
	Parview at Waialeale	Fee	750	80	80	-	-	80	100.00	\$79,000	\$170,000	\$148,000
	Hortumu at Waialeale	Fee	750	136	136	-	-	136	100.00	\$78,000	\$178,000	\$140,000
	Evergreen Terrace	Fee	1,130	130	83	-	-	83	63.38	\$199,900	\$240,000	\$218,000
	Palm Villas I and II	Fee	850	50	50	-	-	50	100.00	\$124,000	\$183,000	\$161,000
	Arbors at Ewa	Fee	1,150	251	190	81	-	251	100.00	\$208,000	\$296,000	\$240,000
	Palm Court I and II	Fee	840	12	12	-	-	12	100.00	\$186,000	\$187,000	\$182,000
	West Loch Farways	Fee	1,200	20	-	20	-	20	100.00	\$283,000	\$322,000	\$283,000
ANNUAL TOTALS				704				859	83.81			

TABLE 4  
(continued)

SUMMARY OF MULTI-FAMILY HOUSING DEVELOPMENT AND ORIGINAL SALES IN THE CENTRAL OAHU & EWA / KAPOLEI REGIONS 1978 TO 1995  
Market Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii

Year	Project	Tenure	Typical Unit Size (SF)	Total Units Completed	Sales				Sales as a Percent of Completions	Sales Price		
					2br or Less	3br	4br	Total		Minimum	Maximum	Average
1993	Mani Ko at Waikale	Fee	795	228	228	--	--	228	100.00	\$95,000	\$182,000	\$182,000
	Milani Mauka	Fee	801	291	178	14	--	190	65.29	\$88,100	\$219,000	\$133,770
	Milani Mauka	Fee	1,493	100	57	23	--	80	80.00	\$238,500	\$370,400	\$284,529
	Sun Rise	Fee	820	354	328	--	--	328	82.08	\$124,000	\$195,000	\$173,000
	Arbors at Ewa	Fee	1,150	11	20	13	--	33	300.00	\$218,000	\$294,000	\$253,000
	Malani Iki, Villages of Kapolei	Fee	712	88	14	7	--	21	23.86	\$110,000	\$129,000	\$116,381
	West Loch Fairways	Fee	1,200	98	--	98	--	98	100.00	\$259,000	\$327,000	\$282,755
ANNUAL TOTALS				1,170			978	83.42				
1994	The Crowne at Waialae	Fee	1,325	35	--	15	15	30	85.71	\$365,000	\$450,000	\$408,200
	Milani Mauka	Fee	757	244	131	110	--	241	98.77	\$105,800	\$218,000	\$181,340
	Royal Kuna—Phase I	Fee	808	160	86	10	--	96	60.00	\$94,000	\$203,500	\$174,000
	The Highlands at Waikale	Fee	950	38	8	6	--	14	38.89	\$204,000	\$245,000	\$224,429
	Parlyan at Waikale	Fee	850	204	201	--	--	201	98.53	\$198,000	\$243,000	\$217,061
	Garrison	Fee	820	54	78	--	--	78	144.44	\$128,000	\$200,000	\$173,000
	Coronado	Fee	878	28	10	--	--	10	35.71	\$90,000	\$117,000	\$104,000
	Malakalo	Fee	850	150	149	--	--	149	99.33	\$105,000	\$217,000	\$183,068
	Malakalo	Fee	850	20	20	--	--	20	100.00	\$105,000	\$148,000	\$132,000
	Malakalo-Duplex	Fee	1,100	40	30	50	22	102	255.00	\$180,000	\$251,384	\$210,233
	Malani Iki, Villages of Kapolei	Fee	690	87	58	9	--	67	100.00	\$95,000	\$130,200	\$110,000
	Iwalei, Villages of Kapolei	Fee	806	128	77	20	--	97	75.78	\$93,000	\$132,000	\$112,500
	Kakalani, Villages of Kapolei	Fee	907	112	101	--	--	101	90.18	\$100,000	\$132,000	\$126,000
	Kakalani, Villages of Kapolei	Fee	907	40	27	--	--	27	67.50	\$169,900	\$234,900	\$202,418
	ANNUAL TOTALS				1,318			1,233	83.65			

TABLE 4  
(continued)

SUMMARY OF MULTI-FAMILY HOUSING DEVELOPMENT AND ORIGINAL SALES IN THE CENTRAL OAHU & EWA / KAPOLEI REGIONS 1978 TO 1995  
Market Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii

Year	Project	Tenure	Typical Unit Size (SF)	Total Units Completed	Sales				Sales as a Percent of Completions	Sales Price		
					2br or Less	3br	4br	Total		Minimum	Maximum	Average
1995	The Crowne at Waialae	Fee	1,325	94	--	70	16	86	148.28	\$355,000	\$450,000	\$377,000
	The Highlands at Waikale	Fee	850	70	80	24	--	104	148.57	\$183,000	\$230,000	\$203,000
	Milani Mauka	Fee	1,400	--	--	4	--	4	--	\$325,000	\$345,000	\$334,000
	Milani Mauka	Fee	749	265	221	40	--	261	98.49	\$108,000	\$235,000	\$173,000
	Royal Kuna—Phase I	Fee	725	80	75	44	--	119	148.33	\$93,000	\$208,000	\$172,000
	Village on the Green	Fee	1,000	60	18	11	--	29	48.33	\$222,000	\$315,000	\$270,000
	Westview at Malakalo	Fee	750	60	70	25	--	95	158.33	\$171,000	\$214,000	\$190,000
	Pae Ko Gardens Village 6	Fee	778	128	93	32	--	125	87.86	\$94,000	\$133,000	\$123,788
ANNUAL TOTALS				701			823	117.40				

(1) "Sales as a Percentage of Completions" figure is greater than 100 percent due to absorption of units in years subsequent to construction or due to pre-sales of units to be built in subsequent years.

Source: Bank of Hawaii, and The Halstrom Group, Inc.

have been "approved" according to the City and County of Honolulu Planning Department and other available data sources (including the Ewa Villages and the subject units).

A summary of these developments is displayed on Table 5.

In analyzing the proposed supply totals, numerous factors must be considered:

- Several of the projects remain tentative to preliminary, others have encountered major approval/environmental problems, and some are government-sponsored developments which will be subject to funding and construction concerns outside the marketplace.
- It is rare that a project is developed to the absolute density allowable, particularly for upper-end communities such as envisioned at Ewa Marina, Ko Olina, and Makaiwa Hills.
- It is not highly probable that all the units could or would be developed as proposed during the study time frame, despite current intentions. While the subject sites are readily developable with the majority of land use, mitigation and utility availability concerns accounted for, most of the proposed units do not enjoy such timeliness. The planning, approval, and (often adversarial) community response efforts required will all extend envisioned project time lines.
- The need for massive new infrastructure systems to support the projects could pose significant obstacles, especially for those oriented towards the lower end of the market which have less sales revenues to offset utility costs.
- About 3,700 of the units are to be mid- to high-rise "resort/residential" units at Ko Olina Resort and Ewa Marina, which for the most part will be used for transient (vacation) rental purposes and are not considered to be directly competitive with the subject. By incorporating these units into the potential inventory base, we have likely overstated actual Ewa/Kapolei residential supply.

TABLE 5

**SUMMARY OF PROPOSED HOUSING INVENTORY ADDITIONS  
PROPOSED IN THE EWA DEVELOPMENT PLAN AREA  
Market Study of the Proposed Various Village Phase II Expansion  
Kapolei/Ewa, Oahu, Hawaii**

Project	Affordable Units (1)		Units Remaining to be Built (1)		Total Units
	Number	Percent of Project	Number	Percent of Project	
Ewa Marina	523	10.78%	4,327	89.22%	4,850
Ewa Grassy	2,147	46.16%	2,504	53.84%	4,651
Kapolei Villages	1,915	58.05%	1,384	41.95%	3,299
Kapolei Keolu	125	29.90%	293	70.10%	418
City of Kapolei	0	0.00%	2,750	100.00%	2,750
Ko Olina Resort (2)	3,120	63.41%	1,800	36.59%	4,920
Ko Olina Expansion	2,100	50.00%	1,400	50.00%	3,500
Makaiwa	301	13.79%	1,882	86.21%	2,183
Makaiwa Hills (4)	1,404	34.16%	2,706	65.84%	4,110
Ewa Villages (5)	643	49.96%	644	50.04%	1,287
Lualaba (6)	1,000	50.00%	1,000	50.00%	2,000
East Kapolei (7)	2,400	30.00%	5,600	70.00%	8,000
Kaala by Grady (8)	1,750	30.00%	1,750	70.00%	3,500
State Land Bank Area (9)					N/A
Other (10)	100	50.00%	100	50.00%	200
<b>TOTALS</b>	<b>17,548</b>	<b>34.60%</b>	<b>28,180</b>	<b>61.40%</b>	<b>45,728</b>

(1) As of Year-End 1993.  
 (2) Based on public documents and published announcements.  
 (3) Includes 3,500 multifamily units which will be in high-rise condominiums oriented specifically towards resort/vacation (tourist rental) use.  
 (4) Only 1,066 units approved to date.  
 (5) Includes proposed subject units. Affordable unit ratio estimated.  
 (6) Public-sponsored development. Affordable unit ratio estimated.  
 (7) Proposed by Schuler Homes; project plan approved by Planning Commission.  
 (8) Recently proposed development outside urban zone of Ewa Development Plan. Strong opposition and extended approval process likely. Affordable units estimated.  
 (9) Public-sponsored development covering 1,100 acres in very initial stages. Timing and total unit counts unknown at this time.  
 (10) Allowances for built units on undeveloped or under-built lots, and other minor projects.

Source: Various EIS and public agencies, and The Halibron Group, Inc.

Although there are thousands of units proposed for the study region, the supply will be widely varied in regards to price, quality, and targeted purchaser demographics. Our study indicates that no single buyer group in the demographic pyramid will be overwhelmed; this will allow all projects to compete in their individual sectors.

Addendum III provides a current statistical overview of the Ewa/Kapolei and Central Oahu new construction and resale residential markets.

We have correlated the demand and supply conclusions drawn from our study. There were an estimated 17,575 total residential units in the Ewa/Kapolei area at year-end 1995. Based on our analysis, this means the subject region is at present undersupplied by some 308 units in comparison with the desired, fully serviced level.

The total number of units required to establish a stable housing market in Ewa/Kapolei over the next 25 years, servicing all demand sectors, will be in the range of 27,183 to 59,753 new homes, with an average calculated demand of 44,071 units.

If all of the presently approved (including Ewa Villages/subject) units are developed during the forecast period to 2020, including the 3,700 residential/resort units at Ko Olina and Ewa Marina, a highly unlikely prospect, the total number of new units added to the inventory in the area would be 32,571. This will be insufficient to meet all but the minimum anticipated demand requirements, and be some 30 percent less than the concluded average demand level.

Only if all of the presently proposed (but not yet approved) units are constructed in a timely manner would supply begin to match demand totals. However, the 8,000-unit East Kapolei project has been previously opposed by planning agencies; 1,677 units envisioned for Makaiwa Hills were denied in initial applications; and the 3,500 units at Kunia by Geniry are outside the established development plan urban boundaries and very preliminary at this time.

It is our conclusion that supply will fall to meet demand in regards to timeliness or quantitative manner.

### The Proposed Subject Project

The existing 61-acre subject holding is comprised of two separate properties located south of the existing Ewa Villages Golf Course adjacent to the existing 122-lot Varona Village subdivision. The sites lie at the westerly edge of the developed central Ewa area, about 15 miles west of Honolulu. Presently they are only accessible via Renton Road which stretches westerly through the Ewa Villages community, terminating near the subject properties.

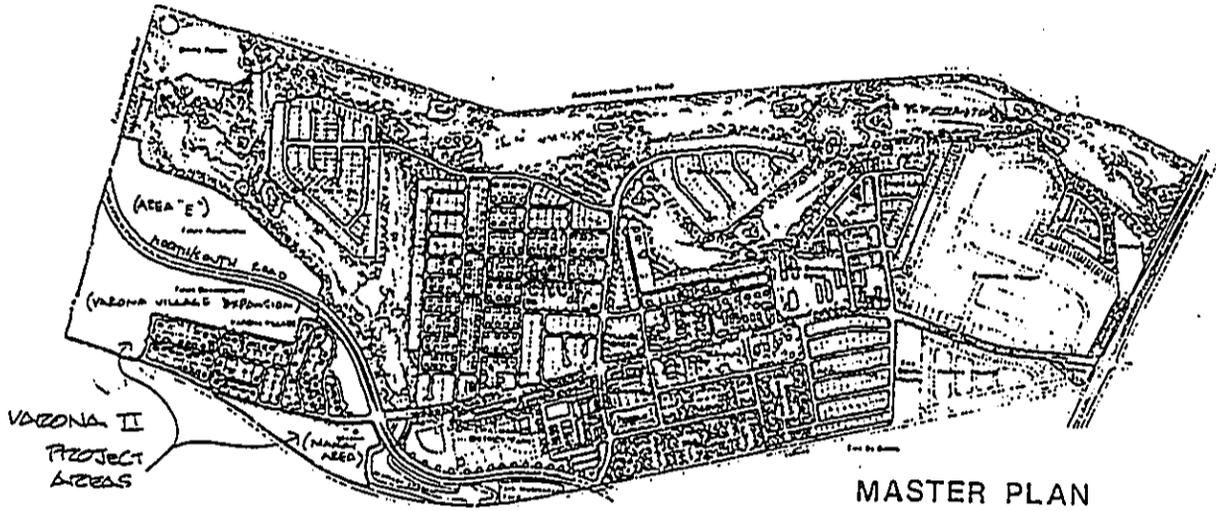
Maps displaying the location of the subject properties and their placement within the Ewa Villages Revitalization Project master plan are shown on the following pages.

The larger parcel is irregularly shaped, generally level to slightly sloping, and currently comprises some 60.2 gross acres. The proposed North/South Road right-of-way will bisect the site, dividing it into a 25-acre lot identified as "Area E" and the 27-acre "Varona Expansion Area."

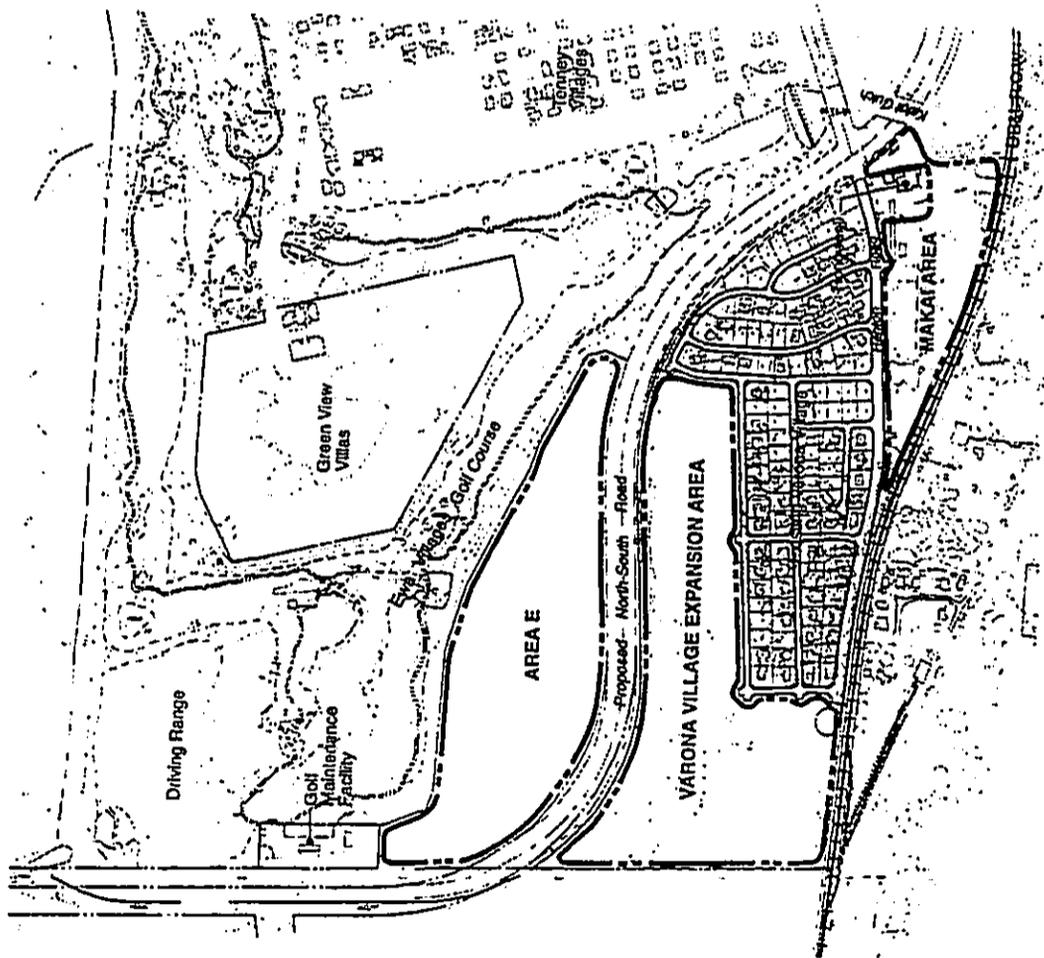
Area E possesses excellent development characteristics. It has extensive frontage along the fourth and fifth holes of the Ewa Villages Golf Course, with the terrain providing for quality view planes mauka across the fairways. The parcel will have access onto the North/South Road (which will be a limited access thoroughfare), and the roadway and golf course serve to buffer the site from other uses, creating the potential for an exclusive enclave.

The Village Expansion Area will be accessed from Renton Road and through the existing Varona Village. Owing to its location, its uses will be reasonably constrained so to be consistent with the homes in the neighborhood. The makai half of this parcel is within the identified Barbers Point Naval Air Station AICUZ area, which limits the density and height of allowable development. The development characteristics of this holding are fair to good.

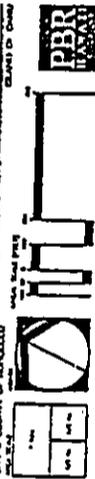
These subject components are highly appropriate for subdivision into single-family house lots, as they are within an expanding market area creating demand for such uses, adjacent to existing residential development, and have no other reasonable use alternatives.



**MASTER PLAN**  
**EWA VILLAGES REVITALIZATION PROJECT**  
FOR CITY & COUNTY OF HONOLULU • DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT



**LOCATION MAP**  
**VARONA VILLAGE, PHASE II**  
CITY & COUNTY OF HONOLULU



Project Name	Phase	Area (Acres)	Units
Green View Villas	Phase I	25	125
Green View Villas	Phase II	37	137
Varona Village Expansion Area	Phase I	0	125
Varona Village Expansion Area	Phase II	21	125



The nine-acre Makai Parcel holding is a generally level, triangularly shaped site which fronts the makai side of Renton Road opposite the existing Varona Village neighborhood. The property is wedged between the roadway (725 lineal feet of frontage) and the abandoned Oahu Railroad right-of-way (800 feet). The site will have circa 100 feet of frontage along the North/South Road.

The diamond head (easterly) circa one-acre portion of the parcel contains a Hongwanji developed under a long-term lease. Church activity and parking appear to have spread onto the remainder acreage of the site. Minor areas near Renton Road are also being used for open materials storage.

At present, the makai subject property is quite literally at "the end of the road," on the very edge of development in Ewa. The only traffic passing by is generated by the 70 existing homes of Varona Village. The neighborhood improvements are generally old, with many showing signs of deferred maintenance.

The completion of the North/South Road will significantly enhance the standing of all of the subject properties, as accessibility, recognition factor, and traffic counts will all increase due to the thoroughfare. The extension of Renton Road will also enhance the Makai Parcel visibility.

However, regardless of neighborhood development and roadway improvements, the Makai Parcel will remain an elongated, narrow, triangular lot with the most desirable area (where it is widest and has corner frontage) being encumbered by an extended ground lease. The tenant's special use of the property is one which must be considered in making development decisions for the remainder acreage. Further, the required 40-foot set-back from the existing (though abandoned) railroad right-of-way will additionally hamper the developability of the site.

On the positive side, the makai holding is generally level, is assumed to have sufficient infrastructure nearby to support development, and will enjoy comparatively good access once Renton Road is extended and the North/South Road is completed.

Project Description(4)

The Varona Village Phase II master plan area encompasses approximately 61 acres, comprised of three development areas--Area E, Varona Village Expansion Area, and Makai Area.

Area E is located between the proposed North/South Road and the Ewa Villages Golf Course and consists of approximately 25 acres. It should be noted that since the alignment of the North/South Road has not been finalized, the area and boundaries of Area E will not be accurately defined until the North/South Road alignment is finalized. With its golf course frontage, Area E is intended to be developed for approximately 252 market single-family and/or multi-family residential units.

If developed as single-family residential, units in this project would likely average between 1,200 to 1,400 square feet. The average single-family lot size would be 5,000 square feet, or five units per acre (gross). The estimated sales price of these units would be about \$265,000 to \$350,000 in 1996 dollars. A comparable type of project is Green View Villas, a newly developed single-family subdivision surrounded by the Ewa Villages Golf Course. The sale of housing within Area E will have no City and County imposed restrictions on affordability. No other uses are planned to occur in this area, with the exception of a possible access road to serve the Ewa Villages Golf Course maintenance facility and driving range.

The Varona Village Expansion Area consists of approximately 27 acres and is located immediately north and west of the existing Varona Village. The Varona Village Expansion Area is bounded by the proposed North/South Road, the western boundary of Ewa Villages, and the 75-foot wide 138kV Hawaiian Electric Company power line easement, and the OR&L railroad right-of-way. As with Area E, since the alignment of the North/South Road has not been finalized, the boundaries of the Varona Village Expansion Area will not be accurately defined until the North/South Road alignment is finalized. Approximately 157 single-family units are planned to be developed in the Varona Village Expansion Area. Based upon the restrictions of the AICUZ easements, a portion of the area is restricted in the allowable units permitted. The average size of each house will be approximately 1,000 to 1,100 square feet on an average lot size of 5,000 square feet, or five units per acre (gross). The approximate sales price of these

<sup>4)</sup> Excerpted from PBR Hawaii narrative materials.

Homes will be about \$175,000 in 1996 dollars. The Varona Village Expansion Area will be comparable to the new housing in Tenny Village, although these latter lots are slightly larger. The sale of housing within the Varona Village Expansion Area will have income qualification restrictions and 10-year buy-back and shared appreciation provisions. Development of the Varona Village Expansion Area is intended to meet the standards to qualify for Hula Mae and FHA financing.

The Makai Area is located south of the existing Varona Village and is bounded by Renton Road, the recently channelized Kalo'i Gulch, and the OR&L railroad right-of-way. The Makai Area surrounds the Ewa Hongwanji and comprises nine acres (not including the Hongwanji). This area will be used for community-type facilities (such as a YMCA) and/or residential use. Typically, a YMCA-type facility includes program, administration and support spaces, a 25-meter pool, and parking. What may also be desirable in this area is a gymnasium. Alternative community-type facilities may include facilities to provide service to special needs groups, educational facilities, or other community service institutions.

If the Makai Area is developed entirely for residential use, similar to what is proposed for the Varona Village Expansion Area, it would yield approximately 52 single-family units at a gross density of 5.8 units per acre, or 110 multi-family residential units at a gross density of 12 units per acre.

New residents of the Varona Village Expansion Area, Area E, and Makai Area (if wholly or partially developed for residential use) developments will be required to join the existing community association who is responsible for the maintenance of common areas.

We believe the PBR description of the proposed subject project is in keeping with the highest and best uses for the three subject properties, and concur with their conclusions with three minor comments:

- The market appears to support price ranges extending higher than those described for Area E and Village Expansion single-family inventory. We agree the interior homes of Area E would reach a maximum of \$350,000, but premium golf course

fronting residences could reach upwards of \$500,000. Similarly, for larger, well-placed units in the Village Expansion subdivision, top prices approaching \$225,000 would be achievable.

- Although it would be necessary to include multi-family development in Area E in order to capture the total allowable density of 252 units for the site, the mixing of residential use types (single and multi-family) and maximizing densities may not result in the most desirable project design of highest land returns. Area E is a site of exceptional quality which may offer substantial premiums for low-intensity, upscale product. A series of optimization analyses of specific development scenarios would be required to determine the best product mix. Based on our analysis, we conclude that interior condominium units within an upscale project would achieve prices ranging from \$200,000 to \$300,000, with golf course fronting (or view) units having an additional premium of 10 to 20 percent.

- As discussed in the following section, we do not endorse single-family subdivision of the Makai Parcel, due to a variety of site specific and external characteristics.

Our subject use analysis conclusions are based on the assumptions the AICUZ boundary does not impact the developability and/or marketability of the Village Expansion parcel homes; the 138kV power lines abutting a portion of Area E will be mitigated through master planning, placement of selected units and other means to limit any damage to their marketability; and the 40-foot railroad set-back does not pose an exceptional detriment to the developability of the Makai Parcel.

#### Analysis of Potential Makai Parcel Uses

Following our initial investigation of the regional market and the subject property, we identified five general types which might be considered by developers for the Makai Parcel. The use categories included residential, retail/service, industrial/storage, elemosynary/institutional, and park/public.

TABLE 6

POTENTIAL USE ANALYSIS MATRIX  
FOR THE SUBJECT "MAKAH PARCEL"  
Market Study of the Verano Village Phase II Project Area  
Ewa, Oahu, Hawaii

Potential Use	Value Return To Land Interest	Community Acceptance	Subject Site Appropriateness			Adhering to:						
			Compatible Physical Characteristics	Supporting Infrastructure	Integration With Surrounding User	Site C.C. Development Plan	Other C.C. Planning/Economic Objectives	SLU and Other Site Suitability	Economic Impacts Created	Public Cost/Benefit Issues	Private Developer Interest	Public/Charity Subsidy Requirement
Residential												
Single Family-Market	4	3	3	Necessary	4	Incongruent to Not Consider	Incongruent to Not Consider	3	4	4	4	1
Single Family-Alternative	3	4	3	Assumed	4	This is Issue	This is Issue	4	4	3	3	1
Multi-Family-Market	4	3	3	Available	3			3	4	3	4	1
Multi-Family-Alternative	2	3	3		3			1	4	2	3	1
Diary Housing	2	4	3		3			3	3	1	2	2
Specialized/Other	2	2	3		2			3	3	1	1	2
Retail/Service	3	2	3		1			3	3	3	3	1
Industrial/Storage	3	1	2		2			3	3	3	3	1
Community												
School	2	2	3		3			3	2	2	2	4
Church	2	3	3		3			3	1	1	2	3
Medical	2	3	3		3			3	3	3	2	3
Specialized/Other	2	2	3		2			3	3	2	2	3
Public												
Public-Private	1	3	4		4			3	1	1	1	3
Public-Active	1	3	4		3			3	1	1	1	3
General Use Facility	2	4	4		3			3	2	2	1	3
Specialized Use Facility	2	4	4		4			3	2	2	1	3

RATINGS SCALE: Based on relative scale of 1 to 5, with one being lowest and five being highest.

Source: The Habitat Group, Inc.

Proposed Verano Village Expansion Phase II

The Habitat Group, Inc.

Potential use analysis matrix was developed, an example is shown on Table 6. A total of 16 specific sub-types in the five general categories were analyzed based on 11 variables.

It became apparent that several of the categories were not feasible in light of community concerns, site characteristics, city and county objectives, and economic realities. Our study indicated there was meaningful market support for four specific uses:

**Single-Family Residential Subdivision** (similar to the abutting neighborhood). Existing and projected demand for this use is strong within the region. However, with more than 18,000 additional homes proposed for Ewa/Kapolei in coming decades, competition will be fierce, and a subject subdivision would suffer from not being part of a new master planned project, being adjacent to older (less valuable) homes, and being too small to mount an effective mass media marketing campaign. An affordable single-family subdivision could find a market niche, but the land returns associated with such development is very low, and typically "subsidized" by market product within a larger project.

**Affordable Multi-Family Residential.** Condominium sector demand is also quite favorable in the study area and can offer favorable market land returns. But as with the single-family homes, the level of proposed inventory is exceptionally high (with more than 12,000 units planned), and the subject property is less competitive than many other available sites. Because "market" and "low/moderate and moderate affordable" prices for multi-family units are moving into sync, it would be difficult for the subject product to obtain an effective market share among "for sale" inventory unless offered to low and very low income groups. The "very low" and "low" income rental apartment market is an undersupplied sector and demand throughout Oahu is strong. However, as the rent approaches market levels, the amount of demand lessens considerably. The returns to the underlying site in a subsidized rental project are nominal unless density is very high (an unlikely alternative for the subject property), and tenant instability increases long-term ownership risk.

**Elderly Multi-Family Housing.** Numerous studies by ourselves and others indicate there is an acute need for elderly housing units in the state, with an existing demand in the Islands for an estimated 3,500 units and a need for 12,000 total new residential opportunities by the

year 2010. Hawaii has one of the highest proportions of senior citizens among the United States and the longest average life-span. Although having widely disparate individual circumstances, the elderly control significant wealth and generally spend a higher percentage of their income on housing than other age groups. Despite the level of demographic demand and governmental/community support for elderly housing, the development of age-restricted living units and assisted care facilities has been overlooked by private developers in recent years in face of higher return opportunities. This stance is beginning to change, and there is increasingly greater interest on the part of investors, builders, and lenders. Absorption of all offered product from low-income to upper-market units has been rapid in the state during this decade. Of the uses analyzed, this possesses the strongest demand (high/supply (low) characteristics).

**Ecclesynary/Institutional Facility.** The urbanization of the Ewa Plain has created significant demand for private community-oriented development. Such uses would include meeting halls (for churches, community groups, or other interests), educational campuses (private, parochial, or special needs schools), non-profit institutions (clinics/hospitals, specialized medicine, or group living), and youth/recreational facilities. Major landowners in the region, specifically Campbell Estate, report they are inundated with requests for available sites—most often by churches, private schools, and specialized institutions. It has been asserted the YMCA is looking for a circa five-acre site in the area to build a club. However, virtually all expect a below-market price/rent, many have inherent mortgaging difficulties, and others are dependent upon the seller financing of the purchase. Upon completion of the North-South Road, the subject will be more accessible, but will remain somewhat removed from the newly emerging communities where such users would choose to be located. Also, the size of the non-leased area of the subject, approximately 7.5 acres, presents problems. There are very few private institutions which presently need or could readily support a development of that size, and it is questionable whether the market and community would support a series of such uses on a single property, particularly given the existence of the Hongwanji. This does represent a baseline use, as the site could undoubtedly be "sold" to an institution, but it would offer returns at the very low end of the potential value range, 25 to 50 percent less than residential opportunities.

Secondary uses analyzed included a working/retail nursery, building on the huge demand for landscaping products created by the thousands of new homes in the area; a self-storage project, for which demand exists in virtually every community and particularly expanding ones; and an activity park offering some form of fee recreational use.

We were informed that agricultural and retail uses (which would be embodied by a nursery) were not favored by the community; further, there are water availability limitations, and unless highly successful, the return to land offered by this use is limited. A storage development would also be unacceptable to the neighborhood, create additional traffic burdens, and be out of character with the area; yet the use may be in high demand and would offer competitive land returns. We were unable to identify a specific user or use type for the property under an activity park concept which would be both in high demand and able to provide a meaningful return. Any such park would have to be a destination (likely tourist-oriented) facility with commensurate retail and traffic concerns in order to be a profitable enterprise, and would be out of place in the Varona Village community.

Although the market subject site is lacking competitively, relative to the many available "open market" development opportunities in Ewa/Kapolei, it is highly suitable for many atypical uses for which there is substantial regional demand. We conclude an age-restricted (elderly) or income-restricted (very low to low-income household) multi-family project would be an imminently reasonable use of the subject property. Private ecclesynary or institutional uses are also considered as primary alternatives.

#### Market Capture Rates and Absorption Estimates

We have quantified the probable market demand for the subject units by correlating statistical housing "needs" and subjective competitive insights using two analytical methods:

**The Residual Method.** In this technique, all of the major proposed projects in Ewa/Kapolei are placed on a time-line depicting the sales absorption anticipated by the developers (as published by the City and County Planning Department, the updated spring 1996 Ewa Regional Transportation Plan, stated in their EIS or in interviews). To the extent these projects fall

TABLE 7

QUANTIFICATION OF SUBJECT UNIT DEMAND USING THE RESIDUAL METHOD BASED ON  
 TOTAL DEMAND FOR RESIDENTIAL HOUSING IN THE EWA DEVELOPMENT PLAN AREA  
 Market Study of the Proposed Varona Village Phase II Expansion  
 Ewa/Kapolei, Oahu, Hawaii  
 Approved Units Only, Assuming Average Demand Trends

Project	Cumulative Number of Units	Periodic Unit Additions				
		1996-2000	2001-2005	2006-2010	2011-2015	2016-2020
Ewa Marina	4,850	1,500	1,500	1,500	350	
Market Share Percentage		20%	17%	19%	9%	
Ewa Gentry	4,651	2,000	2,000	651		
Market Share Percentage		27%	23%	8%		
Kapolei Villages	3,299	1,500	1,500	299		
Market Share Percentage		20%	17%	4%		
Kapolei Knolls	418	418				
Market Share Percentage		6%				
City of Kapolei	2,750		750	1,500	500	
Market Share Percentage			9%	19%	12%	
Ko Olina Resort & Expansion	8,420	1,175	1,500	2,000	2,000	1,245
Market Share Percentage		16%	17%	25%	49%	100%
Makalalo	2,183	700	700	783		
Market Share Percentage		10%	8%	10%		
Makaiwa Hills	1,066		600	466		
Market Share Percentage			7%	6%		
Ewa Villages	1,367	SUBJECT PROPERTY				
Laulani	2,000			800	1,200	
Market Share Percentage				10%	29%	
Other	200	50	50	50	50	
Totals	31,204	7,343	8,600	8,049	4,100	1,245
Periodic Regional Demand	44,071	8,814	8,814	8,814	8,814	8,814
Shortage or (Excess) Supply	12,867	1,471	214	765	4,714	7,569
Potential Residual Subject Demand						
at 90% Capture Rate		1,324	193	689	4,243	6,812
at 80% Capture Rate		1,177	171	612	3,771	6,055
at 75% Capture Rate		1,030	150	536	3,300	5,298

Source: C&C Planning Dept., Ewa Regional Transportation Master Plan, Developer, & The Hallstrom Group, Inc.

The Hallstrom Group, Inc. Prepared Varona Village Expansion Phase II

short of the forecast demand for units in the study region or exceed the total, an undersupply or oversupply situation exists.

Having accounted for the proposed units for the market, it can be reasonably asserted the subject development will "capture" a significant portion of any residual demand. This approach is generally conservative, as it assumes the subject will capture only what is leftover after the other projects garner their share.

The tabular presentation of this method is shown on Table 7. The source data for the non-subject absorption estimates are presented in Addendum III. Generally, we consider those forecasts optimistic from a historical market perspective and have made some minor modifications based on actual market experience.

The annual forecast housing unit demand is shown along the bottom of the tables, with the yearly and cumulative over/under supply totals and the probable demand level for the subject under several residual capture rate assumptions.

In each of the five-year forecast periods of the model, there will be a regional supply shortfall. Based on the residual method, the 390 subject units could be readily absorbed within a three- to five-year marketing period.

The Market Shares Method accounts for the probable competitiveness of the subject residential product regardless of the total level of other inventory being offered. In essence, it is an estimate of how much of the total new unit demand in Ewa/Kapolei the subject could expect to achieve on an annual basis in light of its locational, pricing, and amenity characteristics.

This "pure competitiveness" technique is generally moderate in application and requires some subjective variables, but is perhaps the most appropriate and "classic" approach.

As indicated by the foregoing residual table, annual market shares of 5 to 20 percent are envisioned by developers for the competitive projects. Our analysis indicates the Varona

Village Phase II homes should be able to obtain stabilized average market shares in the range of five to 6.5 percent.

Applying these market share rates against the subject during an annualized offering period, as shown on Table 8, results in full inventory absorption within five to seven years.

Based on our analysis, we have reached the following conclusions regarding the probable absorption and pricing levels for the residential components of the Varona Village Expansion Phase II master plan.

**Multi-family --** Were the "Makai Parcel" to be improved with directed multi-family units (either designated for affordable or elderly groups), it is estimated the 110 "low density apartment" units would be absorbed within two years from initial offering, or approximately six to ten months following completion. The anticipated current price range for finished units would equate to \$100,000 to \$150,000, or less if specific low income or subsidized elderly housing is pursued.

If market to upscale condominiums are included in the Area E development in order to maximize allowable densities, we estimate absorption would be at the rate of two to four units per month. The projected prices would be from \$200,000 to \$300,000, depending upon the size, type, and amenities offered, with premium units (golf course fronting or view units) achieving 10 to 20 percent higher prices.

**Single Family --** We forecast the single-family homes within "Area E" could be absorbed at a rate of about two to four homes per month. The projected sales prices for the finished homes would be most appropriately in the range of \$285,000 to circa \$500,000. The "Village Expansion" homes (157 total) will require two to four years to achieve full absorption, with projected sales prices of \$175,000 to \$225,000.

If the "Makai Parcel" is used by community-oriented institutional uses, the absorption of the property would be essentially immediate as the end user would occupy the premises on purchase.

TABLE 8

**QUANTIFICATION OF POTENTIAL SUBJECT DEMAND  
USING THE MARKET SHARES METHOD**  
Market Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii  
Assuming 390 Total Subject Units and Average Demand Trends (1)

Scenario One: Using Conservative Market Share Rates				
Sales Year	Total Regional Demand	Estimated Subject Share	Total Subject Demand	
1	1,763	3.00%	53	
2	1,763	4.00%	71	
3	1,763	4.50%	79	
4	1,763	5.00%	88	
5	1,763	5.00%	88	
6	1,763	5.00%	88	
7	1,763	2.95%	52	
Totals	12,341	4.21%	519	

Scenario Two: Using Optimistic Market Share Rates				
Sales Year	Total Regional Demand	Estimated Subject Share	Total Subject Demand	
1	1,763	4.50%	79	
2	1,763	5.50%	97	
3	1,763	6.50%	115	
4	1,763	6.50%	115	
5	1,763	6.45%	114	
Totals	8,815	5.89%	519	

Source: The Hallstrom Group, Inc.

As noted previously, we believe a strength of the Varona Village Phase II holding is its ability to be developed in a timely manner using existing infrastructure and requiring nominal land use classification adjustments. This "ease" of development is superior to most proposed projects in Ewa/Kapolei which are bulk acreage, unserviced and unentitled holdings. The residual and market shares method may not fully reflect these benefits.

### ADDENDUM I: THE PRIMARY MARKET AREA - EWA/KAPOLEI AND CENTRAL OAHU

The Varona Village community is located within the Ewa Taxation District of the City and County of Honolulu, a 200-square-mile region comprising the southwesterly quadrant of Oahu. The district, the island's largest, includes the Ewa/Kapolei and the majority of Central Oahu development plan areas.

Of specific concern in our analysis is the former section, which spreads across the Ewa Plain from Pearl Harbor to Barbers Point and encompasses the subject property.

Over the past two decades the Ewa district has experienced significant development, with the resident population more than doubling since 1970, expanding at a compounded annual rate of nearly three percent, or twice the statewide average. Capital investment and economic opportunities have commensurately escalated.

By year end 1995, the population of the district was estimated at 272,500, roughly 31 percent of the Oahu total, and there were some 18,176 jobs in the area, or about four percent of island employment.

At present, the Ewa/Kapolei sub-region boasts a population of circa 58,000 residents (about 6.6 percent of the Oahu total) and 6,500 jobs (about 1.3 percent of island totals). By 2020, the number of residents in this precinct is forecast to increase to as high as 195,000 and local employment to more than 32,000 positions.

In light of the exceptional expansion of Honolulu since statehood, the movement of urban uses towards Ewa was logical and anticipated. Being constrained between the mountains and the sea, Honolulu has absorbed virtually all the vacant acreage to the east (Kahala-Hawaii Kai), and is rapidly re-developing the older neighborhoods of the urban core. Westward movement into Central Oahu and the Ewa Plain presents the most reasonable growth alternative, and has thus become the focus of construction activity.

Currently, the district has perhaps the widest variety of land use types of any region in the state, including agricultural (pineapple and sugar), military (Pearl Harbor and Barbers Point stations), resort (Ko Olina), marine (Barbers Point Harbor), residential, commercial, industrial, and vast conservation/open tracts. The effective utilization of this area to meet expanding island needs is the biggest challenge facing Oahu planners.

As noted foregoing, the defined taxation district is divided between two distinct sub-regions, both geo-physically and in common recognition, which can be summarized as follows:

1. Ewa/Kapolei is a low lying, arid coastal plain stretching southwesterly from the flanks and foothills of the Waianae Mountains. It constitutes the southwesterly quarter of the district, and is generally defined by the Waianae Mountains and the H-1 Freeway to the north, Pearl Harbor and Waipahu to the east, and the Ewa Beach/West Beach shoreline to the south and west, respectively. County planners consider this an independent planning area, and this circa 30,000 acres are the subject of the Kapolei/Ewa Long-Range Master Plan developed by the Campbell Estate in conjunction with area landowners. Varona Village is near the center of this sub-region.
2. Central Oahu encompasses the sloping terrain rising from Pearl Harbor along the southwesterly flanks of the Koolau Mountains and southeasterly flanks of the Waianae Range towards the island's central plateau. It comprises the east and northeasterly portions (75 percent) of the Ewa district, and is bounded by Pearl Harbor/Red Hill to the south, the crest of the Koolau and Waianae Ranges to the east and west, respectively, and the US Waianae Uka Military Preserve to the north. From a county planning perspective, "Central Oahu" includes the greater Wahaiwa community, which is outside the Ewa Taxation District, but excludes the Aiea/Halawa area. While not the subject of a comprehensive public/private planning process as Ewa/Kapolei, major landowners have nonetheless developed a series of multi-decade master plans calling for numerous bulk acreage urban projects in the area.

Although there is ongoing debate as to the intensity of urban uses which should be allowed throughout the Ewa district, all private and public parties concede the vast, historically cane and pineapple cultivated region holds the best promise of meeting the acute housing and increasingly congestive lifestyle problems currently facing Oahu.

Over the past 25 years, a series of major second-generation suburban projects have been built in the district to service the islandwide demand for residential and supporting neighborhood commercial land uses--Waipio Gentry, Milliani Town, Ewa by Gentry, and Makakilo provide prime examples.

For the most part, however, these communities were fundamentally oriented towards "bedroom" development, with residents anticipated to commute into Downtown Honolulu for work. While the projects have achieved notable sales success, the daily movement of workers to jobs has engendered significant traffic problems due to an overburdened freeway system plagued by rush-hour chokepoints in the urban center. Also, the limited availability of diverse commercial lands and services keeps the projects from embodying the desirable, "self-contained" character of today's leading land use design concepts.

Although the Ewa/Kapolei area is the ultimate focus of our study, the interplay between the two constituent regions of the district are important from a market perspective. Central Oahu will have residential and retail opportunities directly competitive with Ewa/Kapolei inventory for islandwide market shares.

In an effort to provide an overview of the study area, moving from general to specific analysis and description, the remainder of this addendum is divided into five sections.

#### Geography and Climate of the Ewa District Economic History of the Ewa District Proposed Ewa District Development

#### Geography and Climate of the Ewa District

The Ewa Plain area of the subject district, which contains the Ewa/Kapolei planning area and the subject property, is an arid, low-lying shelf which fans outward from the Waianae Mountains to the

shoreline. The plain was formed by alluvial deposits atop extinct coral reefs and lava upthrusts.

Most of the plain (the region extending makai from the H-1 Freeway) is less than 100 feet above sea level, although the planning area extends upslope to Makakilo at the 2,000-foot elevation. The topography is flat and unbroken in the makai area, uniformly sloping upward into the etched foothills of the mountains.

Containing circa 30,000 acres, the roughly rectangular 10- by 5-mile section offers excellent views of the interior of Oahu, particularly the southerly stretches of the two mountain ranges which form the island. Superior makai (or ocean) panoramas, across Pearl Harbor to Honolulu or towards the open sea, are available from the shoreline and upper reaches of the region (from the freeway right-of-way upslope). However, the level lay of the coastal plain results in most interior sites being unable to view the ocean.

Average daytime temperatures range from 73 to 83, and "Ewa" is generally considered among the consistently warmest locations on Oahu. The plain is one of the "kekaha" (or deserts) in the islands, with annual rainfall averaging less than 12 inches, and is well-protected from the tradewinds. The lack of cooling breezes combined with high humidity levels (resulting from being surrounded on three sides by water), often create less desirable conditions.

Owing to the low precipitation levels and day-long sunlight exposure of the region, feral lands are not heavily forested; vegetation being limited to grasses, shrubs/brush, and haole koa and kiawe thickets mostly along roadways, watercourses, and in developed areas. Contributing to this condition was clearing of vast acreages for sugar cane, the Barbers Point Naval Air Station, and the Campbell Industrial Park. The flanks of the Waianae Mountains forming the northerly boundary of the study region are for the most part sparsely vegetated relative to the remainder of the range and the Koolaus.

Although Ewa/Kepoiei enjoys more than 20 miles of shoreline, its quality is poor to fair. Along Pearl Harbor, the waterfront is marshy, subject to tidal fluctuations, substantially restricted to military use and generally of insignificant recreational value.

The ocean frontage extending from the mouth of Pearl Harbor westerly towards and then north from Barbers Point has numerous long strands of white-sand beaches. Yet, most are narrow, with few quality beach parks, and access/use is limited by Barbers Point Naval Air Station, Campbell Industrial Park, the Barbers Point Harbor, and lack of roadways. A significant beach enhancement and lagoon construction program was completed at the Ko Olina Resort which will serve to significantly increase the marketability of that project.

Owing to the presence of extensive near-shore coral reefs, the beaches are somewhat protected from seasonal surf; however, the coral and rock formations impair ease of access to the water for swimming and other recreational uses.

The Central Oahu portion of the Ewa district contains more numerous and diverse land forms than found in the Ewa Plain, stretching from the marshes and swampy lowlands encircling Pearl Harbor to heavily wooded rain forests in the upper valleys of the Koolau and Waianae Mountains. The area includes large isolated tracts comprising the Ewa and Honouliuli Forest Reserves.

Generally, "Central Oahu" is considered to be the interior slopes of the Koolau and Waianae Ranges and the central "plateau" (a misnomer) which connects them. Elevations range from sea level to 3,300 feet at the crest of the Koolaus, with most development confined to the areas below 800 feet.

The land rises from Pearl Harbor at a relatively consistent slope, increasing in severity at the foothills and lower flanks of the respective defining mountain ranges. The central section, which continues a gradual grade in elevation to the most northerly area of the district, is cut by deep ravines (or gulches) leading down from the mountains.

Excellent mauka and makai views are available from many points throughout the 70,000-acre (9 by 12 miles) Central Oahu region, a result of the sloping topography. Even for those locations on the central plateau which have no ocean view, the panorama provided by the defining mountains is one of the most scenic in the islands.

Average temperatures range from 72 to 81 at Waipahu, decreasing to 70 to 78 at Milliani Town, and down to 55 to 65 at the crest of the Koolaus. Regional rainfall has similar variance--less than 20 inches

annually occur at Waipahu, 40 inches at Mililani, and over 200 inches in some of the cloud-shrouded mountain valley. The mountains additionally provide shelter from the tradewinds, however, only greater Waipahu experiences the warm and humid conditions of the Ewa Plain. The elevational benefits of the inland remainder of the area brings cooler temperatures and less humidity.

Most of Central Oahu has good to excellent soil conditions, which in combination with the precipitation levels, results in extensive and diverse vegetation on feral lands, particularly in the mountains.

#### Economic History of the Ewa District

Prior to the arrival of Western "discoverers," the Ewa district was well-populated by native Hawaiians. Specifically, the lush estuary of Pearl Harbor provided vital commodities, and the mountain valleys fertile fields.

As a result, numerous fishing villages were located adjacent to Pearl Harbor and on the leeward (Ewa) plain. The excellent off-shore fishing grounds remain an integral community asset.

For a short period, Honouliuli, a village on the West Loch shore of Pearl Harbor was the capital of the united Hawaiian islands.

With the coming of Caucasian settlers, activity moved to Honolulu, which offered better anchorage and a less stifling climate. The areas of Central Oahu and Ewa were left feral due to their distance from the city and lack of water to support agricultural or other development.

James Campbell, a haole (Caucasian) born in Ireland, purchased the 41,000-acre kiawe covered coral plain known as the Honouliuli Ranch/Homestead in 1877 for \$95,000. This purchase represents a significant portion of Central Oahu and Ewa; and to this day, the Campbell Estate is the district's major private landowner. Two years after purchasing this tract of land, Campbell arranged for James Ashley to drill Hawaii's first artesian well (September 1879). The Hawaiians called the well "Wai-Aniani" or crystal waters. Other wells soon followed and the dry, barren "waste" of Ewa was opened for sugar cane cultivation.

The Oahu Sugar Company, founded in the late 1890s, operated a mill in Ewa and quickly became the area's main employer. Despite large-scale diverse land uses, the accent of this coastal plain remains to this day overwhelmingly agricultural with many thousands of acres in sugar cane. Subsequent mills were constructed, and cane fields soon spread throughout the district. Plantation-worker villages were built around the mills, forming the nucleus of today's communities; Aiea, Waipahu, and Waimalu being the most prominent examples.

Workers were brought in from the Pacific Basin to staff the sugar operations. For Ewa, the Philippines and Japan provided the most immigrants.

Commensurate with the development of the sugar industry, Dole began cultivating pineapple in the upper elevations of the central plateau (the northerly portion of the district).

While once the sole employer in the area, erratic world markets, competition from low-cost third world countries, and the increase in demand for more intensive land uses have contributed to the recent decline of agriculture in the area. Yet, despite the demise of a sugar hauling train line direct to the mills of Ewa and Waipahu, the sugar industry remains a prominent, though floundering, employer.

The dredging of Pearl Harbor, the nation's largest natural harbor by the Navy in the post World War I era, and its later expansion into Pacific Fleet headquarters, created a need for nearby employee and service personnel housing, and substantial inventory was developed in the easterly portion of the Ewa district (Aiea/Red Hill). Additionally, the opening of Barbers Point Naval Air Station, within the heart of the Ewa Plain, further accelerated the gradual transition of the region from cane fields to residential and other "urban" land uses.

In the mid 1950s, the area's major landholder, the James Campbell Estate, created The Ewa Master Plan, a long-range development plan for the estate's holdings on the Ewa Plain. An updated revised master plan was released in 1974, and again in the present Ewa/Kapolei form in 1988, while recognizing that further reevaluation and revisions will be necessary before the plan is fully implemented, which may be 50 or more years from now.

Concurrent with statehood, numerous projects were proposed to gradually provide the infrastructure necessary for easing the district from a rural agrarian-based economy to an urban/suburban mixed-use environment. Among the more critical components completed are:

1. The Hawaii "Interstate" Freeway System (H-1 and H-2), which stretches from Honolulu into the Ewa district, opened the area for residential and support development servicing the expanding Oahu community. The completion of the H-3 link will make the Aiea/Waimalu area the focal point of the system.

Access is the traditional barrier to development pressures, and the freeways enabled some uses in Ewa which were considered undesirable closer to Honolulu, such as the oil-burning Kahe Point generating station, and the following two items.

2. The Campbell Industrial Park, begun in 1958, has grown to just over half of its planned 2,400 acres, and will undoubtedly become Oahu's primary industrial area over the long term. Improvement types include commercial/office, light industrial, bulk refinery operations, and a cattle feed lot. There are over 120 diverse companies represented at the park, such as Chevron, Panasonic Hawaii, Hawaiian Independent Refinery, and the Hawaii Meat Company among the many locally and internationally recognized firms.

The infrastructure of the park is comprehensive, with wide asphalt paved roads and all parking off street. These factors along with generous building setbacks and expansive landscaping features provide an atypical alternative to the congested, cluttered, disparate and dated industrial development in Honolulu.

The Campbell Industrial Park is the only industrial development site on Oahu suitable for bulk acreage and some heavy industrial operations. Due to its relative distance from Honolulu, the cost of the land (purchase or lease) at the park is significantly less than at other areas. Yet, because of the H-1 Freeway, commute time to Civic Center and Waikiki distribution sites has been cut to less than 45 minutes.

The park is designated a "Foreign-Trade Zone," allowing international businesses to streamline their operations with respect to U.S. Custom duties, taxes, bonds, import quotas, and other requirements.

3. Dredging for Barbers Point Harbor was completed in 1985. This harbor, which was constructed by the U.S. Army Corp. of Engineers and has a depth of 55 feet, abuts the Campbell Industrial Park. The two projects are complementary, each increasing the economic vitality of the other.

The State of Hawaii and private landowners have begun to construct shoreside facilities that will enable the harbor to be commercially efficient. When fully completed, the Harbor will become Oahu's second protected anchorage capable of servicing deep draft commercial shipping, and it is anticipated to relieve some congestion and competing use concerns currently being experienced at Honolulu Harbor.

However, shipping sources now contend the harbor may not be deep enough for all the proposed intensive uses. Regardless, it remains a prime asset of the region.

Residential development in the Ewa district was focused on the existing communities until the late 1960s and early 1970s. Infilling and expansion occurred at Aiea, Waipahu, Waimalu, and Ewa Beach. Homes began an inexorable climb up the highly desirable hillsides above Aiea and Pearl City.

As quality bulk acreage sites became scarce and demand continued to increase, developers began serious efforts to actualize master-planned projects in the district. Makakilo and Mililani Town were among the first examples, with Waipio Gentry and Village Park following shortly thereafter.

Though marginally sufficient to meet community needs, there has been meaningful commercial development in the district, with the 1.25 million square foot Peatridge Shopping Center (second largest in the state) being the main facility. Other major neighborhood centers include:

Waimalu Shopping Center  
 Waimalu Plaza  
 Newtown Square  
 Pearl City Shopping Center  
 Tropicana Square  
 Westgate Shopping Center  
 Stadium Mall

Waipahu Shopping Center  
 Parkview Gem Shopping Complex  
 Waipahu Shopping Village  
 Ewa Beach Center  
 Pearl Kai Shopping Center  
 Waipahu Town Center  
 Harbor Center

Additional projects have been recently completed, are under construction, or proposed for development at Kapolei, Village Park, Waikale, and Mililani. In general, vacancy rates have historically been less than two percent in the centers, with the newer ones achieving full occupancy within reasonable exposure time.

Pertinent economic indicators for the overall Ewa district over the past three decades are somewhat irrelevant. Historic data, which shows Ewa as a minor component of the Oahu market, provides little insight into the level of growth anticipated for the region into the next century.

**Proposed Ewa District Development**

A series of land use decisions have paved the way for long-term economic expansion and development of the Ewa and Central Oahu areas. Most recently the implementation and on-going revisions of the county Regional Development Plans have provided an accepted basis for determining escalating urban land use patterns.

Caught between the sea and the Koolaus, Honolulu has become a heavily congested city center, with scarce property available to meet burgeoning market use demands. The Ewa district is acknowledged by public and planners alike to provide the most reasonable solution to the acute residential land crisis.

The historically acute lack of housing supply, in light of heavy demand levels, has resulted in the price of Oahu homes escalating far beyond the reach of most families on the island given conventional mortgage qualification criteria during the past two decades. An immensely desirable climate, coupled with choice lifestyle characteristics and a low unemployment rate virtually guarantees continued in-migration and non-resident investment on the island. This high demand for units created both by local resident population growth and other buying segments will continue into the next decade.

Based on the success of past developments, prevailing planning trends, and the various efficiencies possible, master-planned residential communities, which incorporate several complementary uses into a neighborhood environment, are the evident and projected trends in the Ewa district market.

Adroitly located master-planned projects provide well-rounded residential developments at competitive prices and promise the best solution to Oahu's current housing, service, and public system shortages. Within such communities, the myriad of land uses necessary to meet internal and regional needs can be comprehensively addressed in a unified, homogeneous manner, thus avoiding the disparate strip-type development which plagues many expanding urban areas.

By virtue of their size and ability to amortize necessary infrastructure and other centralized expenditures over a large number of residential units and other uses, master-planned communities possess integral support systems, with the developer and public agencies working in concert--thus relieving public coffers from most capital costs of economic development.

In conjunction with the primary economic assets provided by the freeway, Campbell Industrial Park, Barber's Point Harbor, and the Ko Olina Resort, these master-planned residential communities will fuel a wide variety of development types through the district.

The major trends we foresee in the Ewa district over the long-term are:

- The preponderance of residential development will be within master-planned bulk acreage communities providing favorable lifestyles through incorporation of various land use types;
- A large increase in the resident population of the district will create a wide-ranging demand for supporting urban, public, and open space improvements and commensurate acreage, with the effect peaking over the next decade; and
- The availability of workers; quality transportation infrastructure; and adequate-sized, reasonably priced sites will attract major businesses (new and expanding) to Ewa, away from the congested Honolulu core areas.

Some of the major proposed residential subdivisions, mixed-use communities, and other real estate projects in the Ewa district are individually addressed in the following paragraphs. We note some descriptions of Ewa Plain communities are adapted from master-plans prepared by the Campbell Estate.

Existing Projects

Makakilo

Located mauka of the H-1 Freeway on the foothills of the Waianae Range, Makakilo is a fee simple community of single-family and multi-family units that started development in 1961. To date, there have been approximately 4,200 units constructed, with an additional 2,183 units planned. Development of new phases has been in conjunction with market demand, and long-term absorption has averaged about 120 units per year, although escalating sharply during the late 1980s upcycle.

Makakilo is being developed by Finance Realty.

Milliani Town

During the 27 years of its development, Milliani has sold more than 9,500 fee simple units, indicating a long-term absorption rate of approximately 385 units annually. Up to a maximum of 6,600 additional units are planned as part of the "Milliani Mauka" community.

The community was developed by Milliani Town Developers/Oceanic Properties.

Village Park

This leasehold subdivision located mauka of the Ewa area of Waipahu, has offered a total of 1,620 units. Opened in 1978, the original plans called for a total of 1,800 residences, but the developer now seeks further expansion to a total of 600 acres containing 4,000 homes. Absorption at Village Park has been at about 125 units per year.

A 4.76-acre parcel at the entrance to the project has been re-zoned for commercial use, and plans are for a 70,000- to 85,000-square-foot shopping center. There are no other commercial sites in the subdivision.

Village Park is being developed by WAITEC.

West Loch Estates

The 491-acre West Loch Estates residential community is located between Waipahu and Honouliuli, adjacent to the West Loch of Pearl Harbor. The project is being developed by the City and County of Honolulu's Department of Housing and Community Development (DHCD) as part of its commitment to provide affordable housing for Oahu's residents. Major elements of the master plan consist of 1,599 housing units on 260 acres, a 40-acre shoreline park, and a 175-acre municipal golf course which spans the Fort Weaver Bypass highway and includes some lands in the vicinity of Honouliuli. The golf course will also function as a major drainage/flood control facility.

The project was developed in two phases. The first phase was effectively completed by the end of 1991 and included the golf course, shoreline park, and 593 residential units on an 86-acre site adjacent to the Farrington Highway/Fort Weaver intersection. Phase two is nearing completion and involves the development of approximately 1,000 housing units, a district park, elementary school, park and ride/day care facility, and a small commercial area.

"Approved" Proposed Projects (Excluding the Subject)

Ko Olina

This master-planned 1,000-acre destination resort/residential community is located on the western Ewa shore, north of Barbers Point Harbor, south of Farrington Highway, and west of Kalaheo Boulevard. The project is comprised of two major phases: a 620-acre first phase, which is currently being developed; and a 350-acre second phase, which would come on-line towards the turn of the century. First phase development plans call for a total of 5,200 housing units of which 3,700 will be apartment/condominium units, primarily in high-rise buildings, along the central oceanfront, and 1,500 will be low-rise, lower density "planned unit developments" located around the golf course and having a mixed resort and residential appeal. Up to four thousand hotel rooms and other transient units grouped around man-made lagoons are also planned within the first phase.

Major long-term envisioned amenities for the resort include: a 500-slip marina sharing the same entrance as the Darbers Point Harbor, an 18-hole resort golf course, four created sandy beach lagoons, a Hawaiian cultural center, two shopping centers (one akin to a Fisherman's Wharf), and a number of dinner house restaurants. The

first commercial complex is intended to service tourists; a second 18-acre shopping center will be for residents of the community. Second phase development plans call for an additional 18-hole championship golf course, up to 3,500 residential units and the local-servicing commercial center.

City of Kapolei

Kapolei "City," a vital component of Ewa's economic future is to be developed on approximately 890 acres in the area roughly bounded by Barbers Point Access Road to the east, the Naval Air Station to the south, the Ko Olina expansion area to the west, and the lower slopes of the Makakilo community on the north. The heart of this site is a triangular-shaped 570-acre parcel. It is intended for the city to provide a financial mixed-use commercial nucleus in and around which secondary urban and suburban land uses can be located. The City of Kapolei will be a self-contained economic entity creating employment opportunities for Oahu's growing population.

Although refinements to the plan are constantly being forwarded in conjunction with evolving market, community, and land planning needs, recent development programs call for approximately 3.4 million square feet of office space on approximately 100 acres of land; over two million square feet of commercial space on 113 acres of land; public facilities; approximately 2.5 million square feet of light industrial (business park) uses; 173 acres of park; and 127 acres of open space/circulation. Negotiations are also underway with the University of Hawaii to develop a major institution on 100 acres in the area, further enhancing a spectrum of student, staff, and support development demand.

Extensive descriptions of the planning process and its current status are presented in a variety of Campbell Estate documents on file.

Within the City of Kapolei, a total of 2,750 residential units are proposed, according to a recent City and County study, primarily in moderate to high-density, multi-family projects. A significant portion would be "affordable" priced units.

Additional housing opportunities will be provided by the Kapolei residential villages, comprising some 880 acres which are located easterly of the proposed City Center.

Kapolei Village is a major mixed public-private residential community originally proposed by the state Housing Finance and Development Corporation (HFDC) in conjunction with the City and County Department of Housing Community and Development. Major elements of the 800-acre project under the current plan include up to 3,299 homes, of which approximately 58 percent will be "affordable"; an 18-hole municipal golf course that will double as a major retention basin for on-site drainage purposes; several public school facilities; and a number of parks and recreation centers. Absorption is expected to take approximately 15 years with about 220 homes developed and sold each year.

Kapolei Knolls is a smaller residential development within the Second City area. The project will comprise circa 418 homes on about 80 acres. This "market housing" is expected to provide for the middle income demands of the proposed Kapolei City and should come on-line in mid-decade.

Ewa Marina

The 721-acre Ewa Marina mixed-use community is a master planned resort and residential development focusing a variety of uses around a 115-acre marina basin. The marina is the dominant physical element in the design, providing over 4.5 miles of water frontage for thematic hotel, condominium, other residential, and commercial development.

Of the total site area, 456 acres are allocated for residential uses. Upon completion, the project will support a total of 4,850 dwelling units within a score of defined neighborhoods. A range of residential unit types is planned in order to achieve maximum market penetration. Anticipated unit densities range from a low of 5 to a maximum of 33 units per acre. Generally, the higher densities are concentrated in areas offering the greatest locational and visual amenities (marina and oceanfront sites). An estimated ten percent of the residential program will be geared toward affordable housing prices. In addition to the marina, the master plan also calls for 55 acres of commercial pods, parks, and a school.

Adaptations to the original plan now seek up to 1,500 resort units to be developed between 1998 and 2006. Three hotels would house some 900 guest rooms and three resort condominium projects would contain 600 apartments.

*Ewa by Gentry*

The center point of the proposed 700-acre Ewa Gentry project is the intersection of Fort Weaver, Geiger, and Iroquois Point Roads in east Ewa. Current master plans for the project provide for a total of 8,500 residential units; an 11-acre neighborhood retail center; a 30-acre light industrial park; an 18-hole golf course; and community facilities including schools, parks, and greenways. Housing will cover nearly 70 percent of the site. Recreation and open space comprise an additional 25 percent of the site. The remainder is devoted to public facilities, an elementary school (K-6), public parks, and the commercial and support acreage.

Began in late 1988, some 3,900 units were completed or under construction by the end of 1995, achieving strong market acceptance. The project is expected to be completed by 2005 with up to a maximum of 750 single-family and multi-family homes being produced each year.

*Waialeale*

Located just north of Waipahu, this fully serviced suburban community is expected to provide an estimated 2,400 housing units; a 50,000-square-foot community shopping center; a 58.5-acre power center and retail/business park; recreation areas; elementary school, and an 18-hole golf course.

*Mililani Mauka*

A 1,200-acre holding intended to provide the long-term expansion acreage for the successful Mililani community. The site is located across the H-1 Freeway from Mililani Town, and will contain up to 6,500 housing units and supporting mixed uses. The initial phase includes a 17-acre parcel for a regional shopping center.

The 723-acre first phase of the development is nearing build-out. The remainder of the site would come on-line by 2000 to 2005 if sufficient demand can be demonstrated.

*Makahaiva Hills*

To be developed on a 1,915-acre Campbell Estate holding on the flanks of the Waianae Range westerly adjacent to Makahaiva, this project is envisioned as containing up to 4,110 housing units, two-thirds of which will be upscale single-family view homes. The remainder will be low density apartments located near a 78-acre commercial area and a 28-acre park. Only 1,066 units have been approved to date. The project is not anticipated to come on-line until after the turn of the century.

*Waianua Ridge*

Envisioned as encompassing up to 2,500 acres over the multi-decade development period, the first stage of this community will contain 1,675 homes on 761 acres; 115 of which will be used for commercial and light industrial development and other amenities. A portion of the units are intended to form a retirement community.

A five-acre site will be provided for a neighborhood shopping center, with an additional 110 acres of mixed-use (commercial/industrial) zoned acreage also available.

Only portions of the first phase, including the mixed-use component, has received land use approvals to date.

*Royal Kunia*

A 1,300-acre site located on the east fringe of Kunia Road just north of Village Park, this potential 4,000-unit community is well underway, with 931 units in Phase I and water source development undertaken to date. The subdivision will include two golf courses and is expected to be primarily developed and absorbed during the mid to later years of the decade.

*Melenamu Woodlands III*

This planned unit development will have 1,028 units spread across a narrow 70-acre parcel adjacent to the Hawaii Technology Park.

First phase roadways are in place and final infrastructure approvals are pending. The project anticipates building and sales of up to 150 units per year beginning in 1993.

The tables comprising the remainder of this Addendum section are intended to statistically illustrate the historic population and economic trends which have contributed to growth in the study area, to provide projections which help define the parameters of future land use demand, and to identify the vast lands which have been approved/proposed for development. The tables are titled as follows:

- Table I-1: Summary of Historic Population and Economic Indicators for Oahu
- Table I-2: Summary of Historic Population and Economic Indicators for Ewa/Kapolei and Central Oahu

Table I-3: Projected Population and Economic Indicators for Ewa/Kapolei and Central Oahu

Table I-4: Summary of Existing and Approved/Proposed Land Uses in Ewa/Kapolei and Central Oahu

Table I-5: Summary of Proposed Housing Inventory Additions Approved in the Central Oahu Development Plan Area

Table I-1

## STATISTICAL APPENDIX

### THE ECONOMY OF THE STATE

Year	Employment*	Per-Mile Population*	Contribution Per Ha Place (\$ Millions)	Retail Trade (\$ Millions)	Bank Deposits (\$ Millions)	Dividend Payers (\$ Millions)	State Production (Tons)	Hotel Room Occupancy Rates	Housing Inventory (Number)
1969	317,899	348,000	605.6	21,217.4	58.7	1,182,311	23,250	61.3	2,915,886
1970	305,650	371,670	781.8	22,046.0	21,801.9	1,163,011	26,921	71.1	2,102,724
1971	313,450	401,400	691.0	22,722.2	24,376.0	1,229,976	32,318	58.9	2,287,749
1972	321,050	474,300	714.3	23,623.3	27,006.7	1,118,853	33,787	70.0	2,867,770
1973	318,400	511,600	711.0	24,024.4	31,801.1	1,128,339	36,601	73.2	2,967,742
1974	315,400	548,000	1,010.0	24,163.9	38,493.1	1,040,742	38,655	71.5	2,664,812
1975	331,000	586,200	1,140.0	25,507.7	42,198.2	1,107,199	39,612	74.1	2,841,100
1976	370,000	602,200	1,012.0	25,946.5	41,908.1	1,020,163	42,845	76.9	2,983,339
1977	384,000	618,300	840.0	26,400.0	50,493.0	1,013,318	45,968	77.4	3,066,989
1978	381,000	611,600	1,050.9	26,912.3	58,264.3	1,028,931	47,070	79.3	3,153,113
1979	378,750	613,300	1,342.1	27,558.2	72,492.7	1,039,332	49,812	73.8	2,542,461
1980	418,000	642,500	1,569.7	28,336.6	84,336.7	1,033,335	54,216	69.3	3,142,335
1981	437,000	678,200	1,584.6	28,442.2	90,381.2	1,017,311	56,769	68.3	3,417,764
1982	430,000	691,800	1,324.0	28,434.4	89,381.3	927,913	57,965	70.4	3,463,726
1983	413,000	1,012,700	1,314.1	27,275.5	89,147.4	801,201	58,763	69.3	3,199,996
1984	411,950	1,027,900	1,237.3	28,233.9	91,803.9	701.1	60,141.8	76.9	3,144,484
1985	432,000	1,019,700	1,499.5	28,960.2	93,870.5	715.7	62,249	77.6	3,545,581
1986	468,000	1,051,400	1,810.1	29,182.2	109,927.8	331.2	1,032,352	81.2	3,634,416
1987	491,000	1,067,900	2,002.7	29,406.4	115,707.3	340.0	9,929.29	81.1	3,694,425
1988	507,000	1,099,800	2,579.0	30,010.0	120,012.5	265.2	9,281.95	78.5	3,754,334
1989	511,000	1,091,600	3,193.1	32,171.5	117,678.2	266.3	8,633.11	78.8	3,823,032
1990	537,000	1,122,900	4,121.5	33,674.5	117,609.4	274.9	8,196.81	79.0	3,543,337
1991	550,000	1,133,800	4,303.3	33,844.8	119,886.5	268.7	7,241.07	72.5	3,463,335
1992	540,000	1,151,000	3,950.4	34,192.1	NA	NA	6,523.30	73.7	3,076,606
1993	544,000	1,165,500	3,785.4	34,589.9	NA	NA	6,777.40	71.9	3,134,830
1994	548,000	1,178,600	3,317.3	35,237.7	NA	262.3	6,583.31	76.5	3,104,748

\*Data through 1989. Projections for 1990 based on the latest available information. As of April 1991, the 1991 Census Bureau report, total population was 1,178,600. The 1991 Census Bureau report, total population was 1,178,600. The 1991 Census Bureau report, total population was 1,178,600.

### THE ECONOMY BY COUNTY

#### CITY & COUNTY OF HONOLULU

Year	Employment*	Resident Population*	Contribution Per Ha Place (\$ Millions)	Retail Trade (\$ Millions)	Bank Deposits (\$ Millions)	Dividend Payers (\$ Millions)	State Production (Tons)	Hotel Room Occupancy Rates	Housing Inventory (Number)
1969	238,470	618,300	516.6	1,549.6	20,085.1	26.2	212,191	81.3	165,138
1970	236,400	631,600	711.6	1,772.6	21,513.7	28.2	212,367	71.1	121,242
1971	252,350	654,600	633.3	1,550.8	22,440.4	24.0	212,379	58.9	151,101
1972	260,800	674,900	641.3	2,048.2	24,896.8	30.9	215,402	70.0	190,973
1973	272,600	661,400	811.4	2,395.2	29,332.3	38.7	192,111	81.5	198,970
1974	278,400	707,600	936.1	2,817.1	35,587.1	43.0	163,191	82.0	210,940
1975	280,000	718,600	1,007.7	3,093.7	36,919.9	43.8	191,580	78.3	223,617
1976	293,750	728,300	874.0	3,416.1	41,318.0	47.1	182,783	82.2	232,609
1977	306,500	717,000	716.0	3,728.0	46,303.6	50.6	163,334	80.2	237,371
1978	305,950	742,600	912.6	4,229.0	53,232.2	51.2	173,072	82.1	243,101
1979	311,050	756,000	1,146.6	4,915.6	66,233.1	51.8	186,178	75.9	212,465
1980	322,800	764,600	1,311.5	5,400.8	71,182.1	61.7	167,267	72.3	252,018
1981	328,500	767,600	1,379.8	5,141.9	81,308.4	69.6	172,813	73.9	254,815
1982	328,600	776,100	1,146.8	5,141.9	81,308.4	69.6	172,813	73.9	254,815
1983	316,550	789,100	1,143.8	6,529.5	82,207.3	58.3	167,065	77.8	256,489
1984	318,050	792,800	1,051.4	7,128.6	81,004.6	70.2	160,631	76.3	259,149
1985	341,150	804,300	1,244.7	7,482.1	87,210.2	71.1	154,220	83.0	262,337
1986	337,500	810,400	1,345.7	7,940.1	99,846.6	74.3	169,157	81.9	265,412
1987	349,850	818,400	1,100.4	8,090.4	110,408.2	71.9	159,309	85.2	268,351
1988	333,500	824,100	1,031.7	9,086.1	117,645.9	76.3	140,551	83.8	272,124
1989	335,950	831,300	1,411.1	10,139.4	126,732.4	78.7	146,081	86.3	275,200
1990	391,000	838,200	2,415.2	11,436.6	198,833.1	81.0	139,100	86.6	278,191
1991	406,300	849,300	2,565.8	11,749.0	211,506.3	78.7	125,700	79.7	283,815
1992	400,350	861,000	3,343.2	12,098.5	NA	79.9	114,605	80.5	288,805
1993	406,600	866,900	3,108.3	12,173.0	NA	71.5	132,820	76.3	293,020
1994	403,900	872,500	2,730.9	13,016.7	NA	78.2	116,348	80.3	296,699

\*Data through 1989. Projections for 1990 based on the latest available information. As of April 1991, the 1991 Census Bureau report, total population was 1,178,600. The 1991 Census Bureau report, total population was 1,178,600. The 1991 Census Bureau report, total population was 1,178,600.

TABLE I-2

**SUMMARY OF PROJECTED POPULATION AND ECONOMIC INDICATORS  
OF THE EWA TAXATION DISTRICT  
Market Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii**

	<u>1970</u>	<u>1980</u>	<u>1990</u>	<u>1995</u>
Resident Population	132,299	191,051	230,189	272,500
Percent Change	%	44.41%	20.49%	18.38%
Housing Units	33,904	52,608	67,994	85,156
Percent Change	%	55.17%	29.25%	25.24%
Employment Positions	5,047	9,684	13,790	18,176
Percent Change	%	91.88%	42.40%	31.80%
Total Urbanized Acres	5,950	8,640	10,280	14,500
Percent Change	%	45.21%	18.98%	41.05%

Source: Various and The Hallstrom Group, Inc.

TABLE I-3

**SUMMARY OF PROJECTED POPULATION AND ECONOMIC INDICATORS  
OF THE EWA TAXATION DISTRICT  
Market Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii**

	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>	<u>2020</u>
Resident Population	233,000	269,000	305,000	345,000	386,000
Percent Change	%	15.45%	13.38%	13.11%	11.88%
Housing Units	69,148	85,183	99,254	117,949	133,103
Percent Change	%	23.19%	16.52%	18.83%	12.85%
Employment Positions	22,200	26,500	32,000	38,500	46,000
Percent Change	%	19.37%	20.75%	20.31%	19.48%
Total Urbanized Acres	17,000	18,700	21,000	23,000	25,000
Percent Change	%	10.00%	12.30%	9.52%	8.70%

Source: Various and The Hallstrom Group, Inc.

TABLE 1-5  
**SUMMARY OF PROPOSED HOUSING INVENTORY ADDITIONS  
 APPROVED IN THE CENTRAL OAHU DEVELOPMENT PLAN AREA**  
 Market Study of the Proposed Waiana Village Phase II Expansion  
 Ewa/Kapolei, Oahu, Hawaii

Project Name	Appraisal Status		Total Units		Anticipated Completion (2)	Planned Percentage Affordable
	Development Plan	Zoning	Build or LUC Through 9/95	Future		
Lanana Valley (1)	Yes	Yes	420	608	314 by 1997, rest not scheduled.	14.95%
AHUAHALEA	Yes	Partial	2,207	4,293	Full build-out by 2005.	49.62%
Royal Kania, Phase I	Yes	Yes	931	1,049	Full build-out by 2000.	37.45%
Royal Kania, Phase II	Yes	Partial	0	2,000	Begin by 1998, extending past 2005.	N/A
Waiana Center, Phase I	Yes	Pending	0	2,675	Begin by 1998, finish by 2005.	N/A
Waiana Center, Phase II	Yes	Yes	1,855	1,080	Full build-out by 2000.	50.02%
Koia Court (3)	Yes	Pending	0	262	Not yet scheduled.	19.05%
Crestview	Yes	Yes	63	63	Not yet scheduled.	N/A
AHUAHALEA	Yes	Yes	14	14	Not yet scheduled.	N/A
Waiana In-Fill	Partial	Partial	455	455	Various time frames.	N/A
Waipaha In-Fill	Partial	Partial	410	420	Various time frames.	N/A
Kaunala (4)	Yes	Yes	443	222	Full build-out by 2005.	100.00%
Manager's Drive (5)	Yes	Pending	400	400	Full build-out by 2000.	91.63%
Other In-Fill (6)	Partial	Partial	372	372	Various time frames.	N/A
<b>TOTALS (7)</b>			<b>19,817</b>	<b>5,716</b>	<b>13,883</b>	
Oahu Proposed (unapproved)	On-hold	On-hold	0	3,100	Removed from current consideration	
Waiana Development Corp.	Pending	Pending	0	12,300	To follow initial phase approval/development	

(1) Previously known as Nickmans.  
 (2) Based on developer submitted forecasts.  
 (3) Formerly Waiafirof Manor.  
 (4) State HUD project.  
 (5) CAC of Honolulu-sponsored project.  
 (6) As identified by CAC Planning Department, unspecified locations.  
 (7) Does not include 407 on-base military housing units proposed for Schofield Barracks and Wheeler Army Airfield to be built over next five years.

Source: CAC of Honolulu Planning Department, Various, and The Halliwell Group, Inc.

Table 1-4  
**LAND USE DESIGNATIONS BY DEVELOPMENT PLAN AREA**  
 (in acres, 6/30/85 and 6/30/94)

DESIGNATIONS ON THE DEVELOPMENT PLAN LAND USE MAPS	OAHU TOTAL		PUC		EWA		CENTRAL OAHU	
	1985	1994	1985	1994	1985	1994	1985	1994
Single-Family Residential	26,571	28,967	8,861	8,882	1,944	3,063	3,549	4,556
Low Density Apartment	1,926	2,677	641	597	590	1,037	412	762
Medium Density Apartment	1,771	1,806	906	892	140	199	424	401
High Density Apartment	122	94	122	94				
Residential Mixed Use		106		106				
Resort	524	479	104		81	62		
Resort Mixed Use		133		133				
Commercial	2,226	2,390	1,245	753	115	749	309	369
Commercial Mixed Use		497		466				
Industrial	3,564	3,969	1,334	969	1,615	2,311	391	448
Commercial-Ind. Mixed Use		727		381		93		253
Public	10,885	11,445	5,804	5,921	846	1,011	859	975
Military	39,444	49,143	8,294	8,343	7,178	7,169	12,505	15,865
Parks and Recreation	7,487	5,685	1,915	1,578	464	459	891	416
Park (Golf Course)		4,502		499		932		1,187
Agricultural	116,419	107,501	639	636	18,206	13,754	23,589	20,550
Preservation	161,130	153,185	34,801	34,540	1,799	1,992	26,155	23,007
Undesignated <sup>1</sup>	3,363	1,840	482	591	126	175	359	195
<b>OAHU TOTALS<sup>2</sup></b>	<b>375,432</b>	<b>375,146</b>	<b>65,148</b>	<b>65,381</b>	<b>33,104</b>	<b>33,026</b>	<b>69,443</b>	<b>68,984</b>

Source: 1994 City Planning Department Land Use File  
 Note: Most blank cells indicate that the land use category did not exist in the year in question. Examples include the various Mixed Use categories which did not exist in 1985 and Golf Course which was not a separate category in 1985. Others indicate that the land use designation was changed, such as Resort in the PUC, which became Resort Mixed Use in 1994.

<sup>1</sup>Undesignated Lands consists of parcels of roadways, areas under elevated roadways, submerged lands and streams.

<sup>2</sup>Total land areas do not remain constant over time because of re-surveys and loss of designated areas to roadways.

**ADDENDUM II: HOUSING DEMAND ANALYSIS FACTORS**

A foundation of every market analysis is an assessment of the level of demand for the subject product, as it must be determined whether the regional housing sector can absorb the finished units in a reasonable period.

Demand for residential units in the Ewa/Kapolei primary market area was quantified using a standardized projection formula as follows:

$$RP \times AHS = TRUR + VA + NRPA + THA = TMUD$$

Where:

RP	is the projected Resident Population of the study area.
AHS	is the projected Average Household Size.
TRUR	is the Total Resident Units Required.
VA	represents a Vacancy Allowance.
NRPA	provides for a Non-Resident Purchaser Allowance.
THA	provides for a Transient Housing Allowance.
TMUD	is the Total Market Unit Demand for the region over the projection period.

Deduction of the standing housing inventory as of the forecast date from the total market demand indicated the number of additional residential units which will be required by the end of the projection in order to adequately service the region.

The formula factors were determined through compilation of historic data and analysis of current demographic and economic trends. We tested numerous scenarios employing the various population estimates, growth rates, and allowance levels.

The unit demand total was stratified into probable selling price ranges based on several sources, including State of Hawaii Housing, Finance and Development Corporation calculations, data from major mortgage

financing providers on Oahu, Hawaii Board of Realtors Multiple Listing Service statistics, and discussions with Central Oahu and Ewa/Kapolei developer and selling agents.

Some of the information considered in our demand analysis is presented in the adjoining tables as follows:

Table II-1	Comparison of Development Plan Population Distribution With General Plan Guidelines (City and County of Honolulu Planning Department, 1995)
Table II-2	Characteristics of Oahu Neighborhoods (taken from U.S. Census materials presented in the State of Hawaii 1993-94 Data Book)
Table II-3	Households, Families and Group Quarters: 1940 to 1990 and Housing Units, Households and Persons in Households (various sources as presented in the State of Hawaii 1993-94 Data Book)
Table II-4	Households, Population in Households, and Population per Household (taken from U.S. Census materials presented in the State of Hawaii 1993-94 Data Book)
Table II-5	Vacancy Rates for Housing on Oahu and the Neighbor Islands (Hawaii State Department of Health as presented in the State of Hawaii 1993-94 Data Book)
Table II-6	Housing Affordability Guidelines, City and County of Honolulu (HFDC, Hawaii Housing Authority and U.S. Department of Housing and Urban Development)
Table II-7	Selected Housing Characteristics, By County (Census findings presented in the State of Hawaii 1993-94 Data Book)

Table II-2  
**CHARACTERISTICS OF OAHU NEIGHBORHOODS: 1990**

Neighborhood (see maps on pp. 26-27)	Land area (acres)	Resident population	House- holds	Average hhhd size	Housing units
Oahu total.....	384,112	836,231	265,304	3.02	281,683
1 Hawaii Kai.....	7,226	27,432	8,756	3.10	9,234
2 Kuliouou.....	6,051	15,451	5,041	3.06	5,436
3 Waialeale-Kahala.....	2,995	9,440	3,428	2.75	3,759
4 Kaimuki.....	1,317	20,471	6,942	2.89	7,158
5 Diamond Head/Kapahulu	1,519	17,877	7,079	2.50	7,608
6 Palolo.....	2,584	13,465	4,284	3.12	4,369
7 Manoa.....	3,571	22,345	6,945	2.79	7,209
8 McCully/Moiliili.....	593	28,466	13,459	2.07	14,046
9 Waikiki.....	500	19,768	11,408	1.72	17,198
10 Makiki/Tantalus.....	2,005	28,027	13,954	1.99	14,671
11 Ala Moana/Kakaako.....	905	10,650	6,088	1.72	6,555
12 Nuuanu/Punchbowl.....	4,687	17,097	6,235	2.72	6,469
13 Downtown.....	2,586	11,929	5,811	1.90	6,035
14 Liliha/Kapalama.....	1,609	21,445	6,703	3.02	6,893
15 Kaahi/Palama.....	2,433	40,147	10,877	3.46	11,107
16 Kalihi Valley.....	3,366	17,798	4,062	4.34	4,146
17 Moanalua.....	6,223	12,604	3,688	3.30	3,741
18 Aliamanu/Salt Lake.....	1,858	37,568	11,945	3.14	12,234
19 Airport.....	8,169	26,341	5,779	3.38	5,851
20 Aiea.....	10,943	32,323	10,536	2.95	10,821
21 Pearl City.....	12,547	47,033	13,700	3.41	13,882
22 Waipahu.....	18,854	51,153	13,837	3.68	14,219
23 Ewa.....	23,264	42,737	11,381	3.66	11,677
24 Waianae Coast.....	58,472	37,657	9,470	3.93	10,737
25 Māhānu/Waipio.....	9,290	34,817	10,613	3.28	10,785
26 Wahiawa.....	33,323	44,504	10,993	3.45	11,256
27 North Shore.....	76,800	15,729	4,825	3.18	5,287
28 Koolauloa.....	37,419	14,263	3,578	3.69	4,422
29 Kahaluu.....	13,225	15,885	4,758	3.33	4,900
30 Kaneohe.....	6,129	39,212	11,750	3.28	11,951
31 Kailua/Mokapu.....	14,514	53,542	15,289	3.22	15,709
32 Waimanalo.....	7,135	9,055	2,129	4.22	2,204

Source: Tabulations from U.S. Bureau of the Census, Summary, Tape File 1A, provided by Honolulu Department of General Planning.

Table II-1

**COMPARISON OF DEVELOPMENT PLAN POPULATION DISTRIBUTION WITH GENERAL PLAN GUIDELINES**

DEVELOPMENT PLAN AREA (1)	GENERAL PLAN POPULATION GUIDELINES FOR YEAR 2010		LIKELY POPULATION in Year 2010		POPULATION CAPACITY/ POTENTIAL		ACTUAL 1990	
	(2) %	(3) Persons	(4) %	(5) Persons	(6) %	(7) Persons	(8) %	(9) Persons
PRIMARY URBAN CENTER	45.1% - 49.8%	450,800 - 497,800	48.5	484,600	44.2	475,400	51.7	432,023
EWA	12.0% - 13.3%	119,900 - 132,900	10.1	100,800	13.6	145,800	5.1	42,983
CENTRAL OAHU	14.9% - 16.5%	148,900 - 164,900	16.7	166,700	16.4	176,700	15.6	130,474
EAST HONOLULU	5.3% - 5.8%	53,000 - 58,000	4.8	48,200	5.5	59,200	5.5	45,654
KOOLAUPOKO	11.0% - 12.2%	109,900 - 121,900	11.9	118,900	11.4	123,100	14.1	117,694
KOOLAULOA	1.3% - 1.4%	13,000 - 14,000	1.5	15,100	1.6	17,500	1.7	14,263
NORTH SHORE	1.6% - 1.8%	16,000 - 18,000	1.9	18,500	1.9	20,300	1.9	15,729
WAIANAE	3.8% - 4.2%	38,000 - 42,000	4.7	46,700	5.4	57,900	4.4	37,411
<b>TOTAL</b>	<b>95% - 105%</b>	<b>949,500 - 1,049,500</b>	<b>100.0</b>	<b>999,500</b>	<b>100.0</b>	<b>1,075,800</b>	<b>100.0</b>	<b>836,231</b>

Table II-3

HOUSEHOLDS, FAMILIES, AND GROUP QUARTERS: 1940 TO 1990

Year	Households	Persons in --			Average size	
		Families	Households	Families	Group quarters	Families
1940 <sup>1/</sup>	88,855	(NA)	387,223	(NA)	36,107	4.46
1950	111,858	96,460	483,230	(NA)	36,564	4.14
1960	153,064	129,481	592,807	555,894	39,965	3.87
1970	203,088	170,358	730,095	678,343	38,468	3.59
1980	294,052	226,035	925,092	814,983	39,599	3.15
1990	356,267	263,458	1,070,597	915,783	37,632	3.01

NA Not available.

<sup>1/</sup> Persons in households, persons in group quarters, and average household size assume average of 12 persons per household in households with 11 persons or more.

Source: U.S. Bureau of the Census, *10th Census of the U.S.: 1940, Housing, General Characteristics, Hawaii* (1943), table 8; *U.S. Census of Population: 1950, General Characteristics, Hawaii*, P-152 (1952), table 15; *U.S. Census of Population: 1960, General Population Characteristics, Hawaii*, PC (1)-13B, table 19; *1970 Census of Population, General Population Characteristics, Hawaii*, PC (1)-B13 (July 1971), table 22; *1980 Census of Population, General Population Characteristics, Hawaii*, PC80-1-B13 (July 1982), table 21; *1990 Census of Population, General Population Characteristics, Hawaii*, 1990 CP-1-13 (June 1992), table 39.

HOUSING UNITS, HOUSEHOLDS AND PERSONS IN HOUSEHOLDS: APRIL 1, 1990 AND JULY 1, 1993

Subject	1990	1993
Total housing units	389,810	418,000
Total households	356,267	379,000
Persons in households	1,070,597	1,152,000
Persons per household <sup>1/</sup>	3.01	2.99

<sup>1/</sup> The U.S. average in 1993 was 2.64. Hawaii ranked second among the 50 States. Source: Present report, tables 1.3 and 21.16; U.S. Bureau of the Census, *Census and You*, June 1994, p. 9.

Table II-4

HOUSEHOLDS, POPULATION IN HOUSEHOLDS, AND POPULATION PER HOUSEHOLD, BY COUNTIES AND ISLANDS: 1980 AND 1990

County and Island	Households		Population in households		Population per household	
	1980	1990	1980	1990	1980	1990
State total	294,052	356,267	925,092	1,070,597	3.15	3.01
Counties:						
Hawaii	29,237	41,461	90,436	118,632	3.09	2.86
Mauai	22,510	33,145	70,008	99,019	3.11	2.99
Kauai	71	62	104	85	1.46	1.37
Honolulu	230,214	265,304	725,865	802,338	3.15	3.02
Kauai	12,020	18,295	38,679	50,523	3.22	3.10
Islands:						
Hawaii	29,237	41,461	90,436	118,632	3.09	2.86
Mauai	20,162	30,272	62,134	90,031	3.08	2.97
Lanai	650	847	1,985	2,428	3.06	2.86
Molokai	1,769	2,088	5,992	6,647	3.39	3.18
Oahu	230,214	265,304	725,865	802,338	3.15	3.02
Kauai	11,979	16,253	38,453	50,283	3.21	3.09
Niihau	41	42	226	230	5.51	5.48

Source: U.S. Bureau of the Census, *1980 Census of Population, General Population Characteristics, Hawaii*, PC80-1-B13 (July 1982), table 21 and 47, and *1980 Census of Population and Housing, Census Tracts, Hawaii, Selected Areas*, PHC80-2-13 (June 1983), table P-1; U.S. Bureau of the Census, printouts transmitted February 21, 1991.

Table II-6

**1986 AFFORDABLE SALES PRICE GUIDELINES**

COUNTY	RE: HONOLULU	FAMILY SIZE										% of Median									
		20%	30%	40%	50%	60%	70%	80%	90%	100%	110%	120%	130%	140%	150%	160%	170%	180%	190%	200%	
Income		\$32,300	\$38,760	\$49,150	\$61,620	\$77,010	\$96,270	\$120,330	\$150,410	\$188,010	\$234,010	\$290,010	\$357,010	\$435,010	\$524,010	\$624,010	\$735,010	\$857,010	\$990,010	\$1,134,010	\$1,289,010
Single Family		6.375%	6.375%	6.375%	6.375%	6.375%	6.375%	6.375%	6.375%	6.375%	6.375%	6.375%	6.375%	6.375%	6.375%	6.375%	6.375%	6.375%	6.375%	6.375%	
Multi-Family		8.375%	8.375%	8.375%	8.375%	8.375%	8.375%	8.375%	8.375%	8.375%	8.375%	8.375%	8.375%	8.375%	8.375%	8.375%	8.375%	8.375%	8.375%	8.375%	

1. Based on 1986 median income established by HUD for various family sizes. Adjustments to the very low (30%) and low-income (60%) limits are made by HUD for areas with unusually high or low family income or housing costs. Most income limits are proportionately based on very low-income limits. Thus, the four-person 60% income limit is 120% (60x200%) of the four-person very low-income limit.

2. Mortgage term: 30 years

3. Housing expense of: 33% of annual income.

4. CTF of: \$250 for single family units (real property tax and homeowner's insurance); \$325 for multi-family units (property tax, maintenance, insurance and association dues).

5. Mortgage insurance payment: \$60 for those earning 80% and below the median; \$90 for those earning above 80% the median income.

6. Down payment of: 5% for those earning 140% and below median income; 10% for those earning 150-170% of median; 20% for those earning 180%-200% of median income.

7. Hahaione Rate: 8.375%  
Hahaione Rate: 0.000%

8. Effective 3/1/90, Hahaione Rate and new construction sales price limits are as follows:  
Income limits by family size:  
1 or 2: \$44,980  
3+: \$74,730  
Hahaione: \$44,980  
Other: \$74,730  
Countryside: \$83,720  
New construction price: \$21,480

\*CTF for homes priced for those earning more than 140% of median is higher (additional \$50 for 150-170% of median and \$100 for 180-200% of median).

Table II-5

**VACANCY RATES FOR HOUSING ON OAHU AND THE NEIGHBOR ISLANDS: ANNUAL AVERAGES, 1970 TO 1991**

[Based on housing units sampled for the Hawaii Health Surveillance Program survey. Units occupied by households temporarily absent were classified as occupied. The base excludes units occupied by transients.]

Year	Units sampled			Percent vacant		
	State total	Oahu	Other Islands	State average	Oahu	Other Islands
1970 1/1	6,107	3,217	2,890	3.2	3.5	3.0
1971	5,370	2,493	2,877	3.6	3.2	5.1
1972	7,177	5,423	1,754	3.9	-3.5	5.4
1973	6,735	5,456	1,279	3.1	2.6	5.0
1974	6,301	4,982	1,319	4.1	3.8	4.7
1975	6,632	5,360	1,272	5.6	5.2	6.9
1976 2/1	2,440	1,817	623	5.1	5.0	5.6
1977	6,899	4,528	2,372	5.9	6.1	5.1
1978	6,690	4,102	2,588	4.0	3.8	4.5
1979	5,936	3,519	2,417	3.2	2.8	4.4
1980	6,499	3,613	2,886	4.2	3.9	5.0
1981	6,174	3,195	2,979	4.8	4.4	5.8
1982	6,509	3,468	3,041	3.9	3.4	5.4
1983	6,139	3,147	2,992	3.8	3.1	5.8
1984 3/1	7,238	3,827	3,411	4.0	3.1	6.5
1985	7,485	3,872	3,613	5.0	4.7	5.7
1986	7,143	3,653	3,490	4.5	4.5	4.5
1987	7,441	3,738	3,703	4.8	4.3	6.1
1988	7,330	3,625	3,705	3.2	3.0	3.7
1989	7,679	3,734	3,945	3.0	2.6	4.0
1990	7,922	3,717	4,205	3.1	2.7	4.2
1991	6,833	3,586	3,247	3.4	2.6	5.4

1/ Neighbor Island data based on last 9 months of 1970.  
2/ Survey suspended during the first 6 months of 1976.  
3/ Sample excluded housing units on military bases, included in other years.  
Source: Hawaii State Department of Health, Hawaii Health Surveillance Program, records.

Table II-7

SELECTED HOUSING CHARACTERISTICS, BY COUNTIES:  
1990 - Con.

Subject	State total 1/	Hono- lulu	Hawaii	Kauai	Maul
<b>VALUE OF SPECIFIED OWNER- OCCUPIED HOUSING UNITS 2/</b>					
Total .....	144,431	98,541	21,910	8,414	15,566
Less than \$100,000 .....	16,450	4,056	9,414	1,184	1,816
\$100,000 to \$199,999 .....	37,825	19,781	6,159	4,028	5,857
\$200,000 to \$299,999 .....	39,679	30,702	2,500	1,854	4,623
\$300,000 or more .....	50,477	44,002	1,837	1,368	3,270
Lower quartile (dollars) .....	156,800	202,700	77,000	122,000	141,500
Median (dollars) .....	245,300	283,600	113,000	171,500	202,100
Upper quartile (dollars) .....	358,800	391,500	176,400	254,800	284,300
<b>RENTER-OCCUPIED HOUSING UNITS</b>					
Total .....	164,356	127,394	16,125	6,713	14,062
1 unit, detached or attached .....	71,634	47,233	9,677	5,039	9,423
Persons per unit .....	2.78	2.80	2.76	2.85	2.66
Mean number of rooms .....	3.7	3.6	3.8	3.9	3.6
<b>CONTRACT RENT OF SPECIFIED RENTER-OCCUPIED UNITS 3/</b>					
Total .....	139,266	107,256	13,941	5,822	12,243
Less than \$250 .....	15,119	9,653	2,841	1,253	1,368
\$250 to \$499 .....	36,779	27,231	5,797	1,392	2,359
\$500 to \$749 .....	43,763	35,258	3,154	1,473	3,878
\$750 to \$999 .....	25,164	20,019	1,414	1,092	2,639
\$1,000 or more .....	18,441	15,095	735	612	1,999
Lower quartile (dollars) .....	401	423	288	301	434
Median (dollars) .....	599	615	428	532	658
Upper quartile (dollars) .....	837	854	626	807	899

1/ Includes Kalawao County (101 housing units), not shown separately.

2/ House and lot. Data limited to one-family houses on less than 10 acres without a business or medical office on the property.

3/ Excludes one-family houses on 10 acres or more.

Sources: U.S. Bureau of the Census, 1990 Census of Population and Housing, Summary Population and Housing Characteristics, Hawaii, 1990 CP11-1-13 (August 1991), tables 8, 10, and 12.

ADDENDUM III: THE EWA/KAPOLEI AND CENTRAL OAHU HOUSING MARKET

Data regarding the primary (Ewa/Kapolei) and secondary (Central Oahu) residential real estate sectors was compiled from a variety of sources. The intent of our investigation was to provide an understanding of the historical trends of the market being studied in regards to type and speed of inventory offered, buyer demographics, and status of proposed developments.

In addition to the statistics contained in the tables of this exhibit, we have interviewed spokespersons for many of the leading developers in the region, reviewed marketing materials/summaries prepared for ongoing projects, and gathered information from timely public records and publications.

Among the major sources were:

- The Estate of James Campbell
- Schuler Homes
- Horita Development
- Gentry Pacific Limited
- Finance Realty Company Limited
- City and County of Honolulu Department of Housing and Community Development
- Castle & Cooke Homes
- Bank of Hawaii
- First Hawaiian Bank
- Honolulu Board of Realtors Multiple Listing Service
- REDJ Tax Map Data Service

The tables listed below contain primary data considered in our analysis. Brochures and additional materials for specific projects

TABLE III-1

**SUMMARY OF HISTORIC SINGLE FAMILY RESALE  
DATA IN THE EWA TAXATION DISTRICT**  
Market Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Number of Homes Sold	806	841	958	1005	872	649	669	677	703	702
Total Dollar Volume	\$128,597,400	\$141,517,700	\$180,697,600	\$244,628,200	\$304,009,400	\$210,341,500	\$229,060,400	\$225,641,000	\$236,282,000	\$259,378,900
Average Sales Price	\$159,550	\$168,273	\$188,620	\$243,411	\$348,635	\$324,101	\$327,697	\$333,295	\$336,105	\$340,392
Selling Price % of List Price	96.20%	96.80%	97.50%	97.60%	96.80%	95.10%	96.00%	96.60%	97.00%	96.40%
Average Days on Market	80	71	44	41	50	79	71	67	68	81

Source: Honolulu Board of Realtors and The Halstrom Group, Inc.

The Halstrom Group, Inc. Proposed Varona Village Expansion Phase II

currently being offered and marketing studies for many of the major existing and proposed communities are on file.

- Table III-1 Summary of Historic Single-Family Resale Data in the Ewa Taxation District
- Table III-2 Summary of Historic Multi-Family Resale Data in the Ewa Taxation District
- Table III-3 Summary of Historic Vacant Lot Resale Data in the Ewa Taxation District
- Table III-4 Potential Housing Units on Oahu
- Table III-5 Construction Schedule for Housing Projects in Ewa and Central Oahu
- Table III-6 Status of Large Scale Residential Projects in Ewa and Central Oahu
- Table III-7 Ewa Regional Transportation Master Plan Developer's Projected Absorption Schedule

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TABLE III-2

SUMMARY OF HISTORIC MULTI-FAMILY RESALE  
DATA IN THE EWA TAXATION DISTRICT  
Market Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Number of Units Sold	750	893	944	1733	1345	1045	1251	1197	1032	1189
Total Dollar Volume	\$68,345,000	\$83,396,000	\$120,700,000	\$266,900,000	\$295,300,000	\$213,450,000	\$264,580,000	\$258,657,000	\$234,200,000	\$272,430,000
Average Sales Price	\$91,127	\$93,389	\$127,860	\$155,184	\$219,554	\$204,258	\$211,495	\$216,068	\$226,938	\$229,125
Selling Price % of List Price	99.20%	98.30%	98.00%	98.90%	99.20%	95.60%	96.70%	95.70%	96.20%	96.80%
Average Days on Market	100	112	139	67	46	98	112	132	81	74

Source: Honolulu Board of Realtors and The Halstrom Group, Inc.

TABLE III-3

SUMMARY OF HISTORIC VACANT LOT RESALE  
DATA IN THE EWA TAXATION DISTRICT  
Market Study of the Proposed Varona Village Phase II Expansion  
Ewa/Kapolei, Oahu, Hawaii

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Number of Lots Sold	42	27	23	18	22	12	14	12	9	13
Total Dollar Volume	\$4,935,000	\$5,240,000	\$4,300,000	\$3,620,000	\$3,290,000	\$2,012,000	\$2,360,000	\$2,267,000	\$1,827,000	\$2,745,000
Average Sales Price	\$117,500	\$194,074	\$186,957	\$201,111	\$149,545	\$167,667	\$168,571	\$188,917	\$203,000	\$211,154
Selling Price % of List Price	122.00%	185.00%	98.70%	98.10%	92.10%	85.40%	82.20%	88.10%	92.20%	94.50%
Average Days on Market	108	124	96	88	112	98	134	78	64	70

Source: Honolulu Board of Realtors and The Halstrom Group, Inc.

Table III-4

**POTENTIAL HOUSING UNITS**  
(as of June 30, 1994)

Map Key No.	COMMUNITY	Housing Units	Acres	Map Key No.	COMMUNITY	Housing Units	Acres
	PRIMARY URBAN CENTER	20,313	658	EWA		31,423	4,156
	Kahala	89	20	17	Honouliuli	206	33
	Kaimuki	230	22		Ewa Villages	1,482	182
	Palolo	144	26	18	Ewa by Gentry	5,387	570
	Kapahulu	27	4	19	Ewa Marina	4,845	627
	Waikiki	1,238	19		Ewa Beach	42	5
	Moiliili	340	8	23	Villages of Kapolei	4,016	500
	Manoa	364	49	24	Kapolei Knolls	418	72
	Makiki	1,311	36	25	Makakilo	4,203	884
1	Kaakako	3,530	45	22	City of Kapolei	2,000	520
2	Downtown	2,044	28	20/21	Ko Olina	8,704	762
	Pauoa	258	90		Military	120	0
	Nuuanu	146	29		CENTRAL OAHU	14,153	2,221
	Kapalama	177	15				
	Kalihi Kai	31	3	14	Waipahu	895	93
3	Kalihi Uka	116	25	15	Royal Kunia	2,836	384
	Salt Lake	829	31	13	Waikaloa	1,296	274
4	Moanalua	26	4		Waiawa Ridge	2,675	405
	Halawa	52	7	6	Mililani Mauka	4,533	914
	Aiea	205	41	7	Melemanu	962	80
5	Waimaleo	215	39	8	Wahiawa	455	35
	Pearl City	355	23	9	Mililani	14	2
	Military	360	0	11	Crestview	63	11
	Other Redevelopable Sites	8,226	94	12	Others	322	24
					Military	102	0

Table III-5

**CONSTRUCTION SCHEDULE FOR HOUSING PROJECTS**

EWA Name of the Development Project	Total # of Units in the Project	Units Completed		# of Units to be Completed in Fiscal Year:				
		Before 7/1/94	7/1/94 - 6/30/95	1996	1997	1998-2000	2001-2005	After 2005
<b>SECONDARY URBAN CENTER</b>								
Barbers Point NAS (military)	236	116	120					
City of Kapolei, makai of K. Pkwy.	2,000					500	1,000	500
City of Kapolei, mauka of H-1 Fwy.	750					250	500	
Kapolei Knolls	418				100	318		
Ko Olina Fairways	280			280				
rest of Ko Olina, Phase I	4,920				1,175		3,145	600
Ko Olina, Phase II	3,500							3,500
Makaiwa Hills, Phase I (# approved)	1,066						1,000	66+
main area of Makakilo (post-1986)	2,553	856		40	70	600	987	
Makakilo Heights (Palailai Associates)	520	176	38	62	104	140		
Westview at Makakilo (Schuler)	500	148	172	90	90			
Villages of Kapolei (State HFDC)	4,962	903	760	844	168	731	1,556	
<b>REST OF EWA</b>								
Ewa by Gentry	8,300	2,925	332	625	700	2,700	1,018	
Ewa Marina	4,850				300	1,809	2,545	196
East Kapolei (State DHHL)	2,000					800	1,200	
City Housing Projects:								
Ewa Villages	1,480		113	133	327	907		
West Loch Estates/Fairways	1,596	1,421	175					

Source: Information is self reported by project developers based on a survey conducted by the Planning Department in July-August 1995.

Table III-5  
(continued)

CONSTRUCTION SCHEDULE FOR HOUSING PROJECTS

CENTRAL OAHU Name of the Development Project	Total # of Units in the Project	Units Completed		# of Units to be Completed in Fiscal Year:				
		Before 7/1/94	7/1/94 - 6/30/95	1996	1997	1998-2000	2001-2005	After 2005
Kau'olu Properties (State HFDC)	443	109	112				222	
Launani Valley (Melemanu, Phase III)	1,028	336	84	234	150	Rest not yet scheduled.		
Mililani Mauka (Phase I, IIA, IIB)	6,600	2,170	137	477	545	1,269	2,002	
Royal Kunia, Phase I	2,000	152	495	200	400	753		
Royal Kunia, Phase II	2,000					1,000	800	200
Waiawa Gentry, Phase I	2,675					1,500	1,175	
Waikale	2,935	1,376	479	153		927		
Schofield Barracks (additional units)	102		102					

Source: Information is self reported by project developers based on a survey conducted by the Planning Department in July-August 1995.

Table III-6

STATUS OF LARGE-SCALE RESIDENTIAL DEVELOPMENTS

DP AREA Name of Development Project	All Units in Project			Affordable Units			Acres for Hsg. on DP	Date of Approval		Infrastructure Built (%)	
	Total	Built	U/C	Total	Built	U/C		DP	Zoning	Offsite	Onsite
<b>PRIMARY URBAN CENTER</b>											
Aiea Park Place	184	110		0			30 ac.	11/25/81	n.a.	100%	100%
Aiea View Courts	59			0			12 ac.	11/25/81	n.a.	0%	0%
Country Club Village	832	204	232	0			14 ac.	11/25/81	n.a.	n.a.	100%
The Crowne at Wailuna	158	156	2	0			26 ac.	2/10/89	7/25/90	n.a.	100%
<b>EWA</b>											
City of Kapolei (hsg. areas) • 1989 Reconfiguration	2,750			0			239 ac.	6/13/86 12/1/89	no action no action		
Ewa by Gentry • 1989 Expansion/Reconfig. • 1991 Reconfiguration • 1992 Expansion • 1993 Expansion	8,300	3,257	392	2,943	467	329	720 ac.	6/8/83 2/10/89 2/27/91 12/17/92 12/13/93	9/26/84 3/21/91 6/14/93 7/29/94 no action	75%	46%
Ewa Marina (Phase I Resd.) • 1992 Reconfiguration	4,850			770			500 ac.	6/8/83 12/17/92	5/17/85 12/13/93		
Kapolei Knolls	418			125			80 ac.	2/10/89	6/29/92		
Ko Olina (Phase I)	5,200		280	3,120			189 ac.	11/25/81	3/11/86	100%	5%
Ko Olina (Phase II) • 1991 Reconfiguration	3,500			2,100			163 ac.	6/13/86 2/27/91	no action no action		
Makaiwa Hills (Phase I)	1,066			0			306 ac.	12/22/93	no action		
Makakilo (post-1986 phases)	3,573	1,390		301	227		447 ac.	11/25/81	8/24/82 5/23/84	100%	40%

Notes: All construction-related information is as provided by project developers based on Planning Department survey July-August 1995.

The abbreviation "n.a." means "not applicable" or "not available."

Table III-6  
(continued)

STATUS OF LARGE-SCALE RESIDENTIAL DEVELOPMENTS

DP AREA Name of Development Project	All Units in Project			Affordable Units			Acres for Hsg. on DP	Date of Approval		Infrastructure Built (%)	
	Total	Built	U/C	Total	Built	U/C		DP	Zoning	Offsite	Onsite
<b>CENTRAL OAHU</b>											
Kolea Cove (formerly Waterfront Manor)	unk.			50			16 ac.	5/10/83	n.a.	(New project plans are forthcoming.)	
Launani Valley (Melemanu Woodlands, Phase III)	1,028	420		154	83		70 ac.	6/8/84	6/12/86	70%	
Mililani Mauka • 1992 Expansion • 1993 Expansion	6,600	2,307	1260	3,300	830	855	760 ac.	2/10/89 1/16/92 12/13/93	10/4/89 3/16/93 pending	60%	60%
Royal Kunia, Phase I • 1989 Reconfiguration	2,000	647	35	748	248	35	217 ac.	2/10/89 12/1/89	2/28/91 2/28/91	90%	55%
Royal Kunia, Phase IIA	1,000						106 ac.	1/16/92	3/3/95	20%	0%
Royal Kunia, Phase IIB	1,000						112 ac.	10/5/94	no action		
Waiawa Gentry, Phase I • 1992 Expansion • 1992 Reconfiguration	2,675			unk.			395 ac.	2/10/89 1/16/92 12/17/92	pending pending pending		
Waikale	2,935	1,855	153	1,468	1,171		281 ac.	5/29/85	12/1/86	90%	
<b>EAST HONOLULU</b>											
Hawaii Kai Marina	1,780	323		178			97 ac.	5/10/83 6/8/84	n.a. 7/21/86	n.a.	18%
Hawaii Kai Retirement Apts.	252			0			20 ac.	6/8/84	10/8/87		
Walae Nui Ridge, Unit 5	14			0			20 ac.	5/22/86	7/25/90		

Notes: All construction-related information is as provided by project developers based on Planning Department survey July-August 1995.

The abbreviation "n.a." means "not applicable" or "not available."

Table III-7

EWA REGION TRANSPORTATION MASTER PLAN  
DEVELOPER'S PROJECTED ABSORPTION SCHEDULE  
(PLEASE SHOW CUMULATIVE VALUES IN EACH COLUMN.)

Developer/Project Name/Land Uses	Date as of	Parameter	Thru 1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2019	2020- Buildout
<b>Dept. of Housing &amp; Community Dev't</b>									
<b>Ewa Fairway (rev. Campbell Estates)</b>									
Single Family	7/94	Dwelling Unit		84	147	51			
Multi-Family	7/94	Dwelling Unit		274	533	169			
Commercial	7/94	Square Feet		---	---	---			
<b>Ewa Village (rev. Varua Village)</b>									
Single Family	7/94	Dwelling Unit	113	1303					
Multi-Family	7/94	Dwelling Unit		300					
Commercial	7/94	Square Feet		20000					
Golf Course (18 hole)	7/94	Acres		219					
District Park	7/94	Acres		25					
Low-Rise Elderly	7/94	Acres		6					
Ewa Elementary School	7/94	Students		200					
<b>Honolulu</b>									
Multi-Family	8/95	Dwelling Unit	DELETED						
<b>West Loch (Barris &amp; Fairways)</b>									
Single Family	7/94	Dwelling Unit	1310	(Construction completed 12/94 - incl 3 pp here)					
Multi-Family	7/94	Dwelling Unit	136	(construction completed 5/93)					
Commercial	7/94	Square Feet	35000	On 3.9 acres - estimated completion 1996					
Golf Course (18 hole)	7/94	Acres	187	(completed 10/89)					
Shoreline Park	7/94	Acres	29	(completed 4/94)					
Park	7/94	Acres	18.4	(estimated completion 1996)					
Elderly Housing	7/94	Dwelling Unit	150	(completed 4/94)					
Day Care Center	7/94	Square Feet	no details	On 2 acres - estimated completion 1996					
Church	7/94	Square Feet	no details	yet					
<b>GRI Land Development Company</b>									

Table III-7  
(continued)

EWA REGION TRANSPORTATION MASTER PLAN DEVELOPER'S PROJECTED ABSORPTION SCHEDULE (PLEASE SHOW CUMULATIVE VALUES IN EACH COLUMN.)									
Developer/Project Name/Land Uses	Date as of	Parameter	Thru 1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2019	2020- Buildout
<b>Kean Industrial Park</b>									
Industrial	8/95	Employees	0	40	125				
<b>Finco Realty Company, Ltd.</b>									
<b>Kaopoi Koola</b>									
Single Family	7/28/95	Dwelling Unit		425					
Park	7/94	Acres		3.1					
<b>Makaha</b>									
Single Family	(7/94)12/95	Dwelling Unit	2172	(550)2622	(550)3044	(460)3453			
Multi-family	(7/94)12/95	Dwelling Unit	1711	(350)2065	(500)2408	(70)2611			
Park (2)	7/94	Acres	22.3	4.5	3				
Golf Course (18 hole)	7/94	Acres	300						
Makaha Elementary School	7/94	Students	500						
Mauka Lani Elementary School	7/94	Students	600						
Service Station	7/94	Square foot	1344						
Mini-shopping center	7/94	Square foot	5435						
Sales office	7/94	Square foot	2382						
Commercial	(7/94)12/95	Square foot	DELETED						
<b>Gentry Pacific, Ltd.</b>									
<b>Ewa by Gentry</b>									
Single Family	(7/9)1/96	Dwelling Unit	1980	(4980)4506	4680				
Low-rise Residential Condos	(7/9)1/96	Dwelling Unit	1320	(3320)2064	3124				
Neighborhood Shopping Center	(7/9)1/96	(Sq Ft)Acres		7					
Light Industrial	(7/9)1/96	(Employee)Acres		(300)13					
Park(3)	7/94	Acres	10	28					
Golf Course(18 hole)	7/94	Acres		190					
Public Facility	7/94	Acres	---	---					
Elementary School(Holomua)	(7/9)1/96	Students		400	850		undetermined		

Table III-7  
(continued)

EWA REGION TRANSPORTATION MASTER PLAN DEVELOPER'S PROJECTED ABSORPTION SCHEDULE (PLEASE SHOW CUMULATIVE VALUES IN EACH COLUMN.)									
Developer/Project Name/Land Uses	Date as of	Parameter	Thru 1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2019	2020- Buildout
<b>Ewa by Gentry Mokai (formerly Lanika &amp; Peirce)</b>									
<b>(WEST)</b>									
Single Family	1/96	Dwelling Unit			180	510			
Multi-family	1/96	Dwelling Unit			120	480			
Commercial/Industrial	1/96	Acres			15	30			
<small>(This is not the Lanika Commercial Center (the subject of Joint Complaint # 89-0000) reported separately by the County)</small>									
<b>(EAST)</b>									
Single Family	1/96	Dwelling Unit				350			
Multi-family	1/96	Dwelling Unit				650			
<b>Kaopoi by Gentry</b>									
Single Family	1/96	Dwelling Unit				500	1500		1500
Multi-family	1/96	Dwelling Unit				1000	1500		1500
Commercial/Industrial	1/96	Acres				20	45		45
School	1/96	Acres				8			8
Park	1/96	Acres				22			22
Open Space	1/96	Acres				56			56
<b>Haleka (Hawaii), Inc.</b>									
<b>Ewa Marina</b>									
Single Family	7/94	Dwelling Unit	0	918	1264	1264	1264	1264	1264
Multi-family	10/6/95	Dwelling Unit	0	1192	3090	3586	3586	3586	3586
Marina	10/6/95	slips	0	1100	1400	1400	1400	1400	1400
Four Hotels	10/6/95	rooms	0	350	950	950	950	950	950
Retail Shops	7/94	Square Feet	0	0	40000	40000	40000	40000	40000
Restaurants (5)	7/94	Square Feet	0	0	18000	42000	42000	42000	42000
Exhibition Ctr./Conference Facilities	7/94	Square Feet	0	0	8000	8000	8000	8000	8000
International fitness center	7/94	Square Feet	0	0	16000	16000	16000	16000	16000
Yacht Club	7/94	Square Feet	0	0	18000	18000	18000	18000	18000
Tennis Complex	7/94	Courts	0	0	15	15	15	15	15
Golf course (27 hole)	7/94	Acres	0	272	272	272	272	272	272
District park	7/94	Acres	0	20	20	20	20	20	20

Table III-7  
(continued)

EWA REGION TRANSPORTATION MASTER PLAN DEVELOPER'S PROJECTED ABSORPTION SCHEDULE (PLEASE SHOW CUMULATIVE VALUES IN EACH COLUMN.)									
Developer/Project Name/Land Uses	Date as of	Parameter	Thru 1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2019	2020- Buildout
<b>Hoening Finance and Devt. Corp.</b>									
Villages of Kapolei									
Single Family	(7/94)1/96	Dwelling Unit	(1057)811	(1594)2310	2565	2565	2565	2565	2565
Multi-family Condominium	(7/94)1/96	Dwelling Unit	(368)22	(549)284	(134)1004	1006	1006	1006	1124
Park and Ride	7/94	Parking stalls	DELETED						
Golf Course	7/94	Acres	190						
Rental Units (4 or 5 bldgs)	(7/94)1/96	Dwelling Unit		(535)224	(315)224	226	226	226	594
Elderly housing	(7/94)1/96	Dwelling Unit		250	(500)250	250	250	250	900
Elementary School(2)	7/94	Students	382	475	400				
Intermediate School	7/94	Students		1200					
High School	7/94	Students	DELETED						
Park(2)	7/94	Acres	12						
Recreation Center (2)	7/94	Acres		3.97	2				
Church	7/94	Acres		4.39					
Commercial (2 shopping centers)	7/94	Square feet		160000					
<b>Estate of James Campbell</b>									
City of Kapolei									
Multi-family(multi of city)	10/95	Dwelling Unit			250	730	800	800	800
Makai Residential Multi-Family	10/95	Dwelling Unit			500	1500	2000	2000	2000
Local retail	10/95	Square foot	6000	20000	125000	230000	335000	440000	545000
Bank(walk in)	10/95	Square foot	7000	19000	19000	19000	19000	19000	19000
Medical Office	10/95	Square foot		97200	97200	150000	150000	150000	150000
Office	10/95	Square foot	261000	495000	998000	1489000	1929000	2315000	2530000
Power Center	(10/95)1/94	Square foot		(450000)280000	450000	450000	450000	450000	450000
Pre-school/Dry Care	10/95	Square foot	10000	10000	10000	10000	10000	10000	10000
Restaurant	10/95	Square foot	8000	20000	20000	20000	20000	20000	20000
Theaters	10/95	Screens	16	16	16	16	16	16	16

Table III-7  
(continued)

EWA REGION TRANSPORTATION MASTER PLAN DEVELOPER'S PROJECTED ABSORPTION SCHEDULE (PLEASE SHOW CUMULATIVE VALUES IN EACH COLUMN.)									
Developer/Project Name/Land Uses	Date as of	Parameter	Thru 1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2019	2020- Buildout
<b>Ewa Beach Shopping Center</b>									
Commercial	10/95	Square feet	107000	137000	137000	137000	137000	137000	137000
<b>Kapolei Business-Industrial</b>									
Industrial park	7/94	Employees		500	1100	1800	2500	3200	12900
James Campbell Industrial Park	7/94	Employees	3500	3500	3500	3500	3500	3500	3500
<b>Kapolei Shopping Center</b>									
Commercial	10/95	Square foot	133000	250000	250000	250000	250000	250000	250000
<b>Lanikai</b>									
Commercial	(10/95)1/96	Square foot		(130000)100000	(130000)200000	(130000)200000	(130000)200000	(130000)200000	(130000)200000
Single Family	10/95	Dwelling Unit							
Multi Family	10/95	Dwelling Unit							
<b>Makaha Hill</b>									
Single Family	7/94	Dwelling Unit			500	1000	1500	2100	2700
Multi Family	7/94	Dwelling Unit			500	1000	1400		
Golf Course(18 hole)	10/95	Acres				180	180	180	180
Open space/park	10/95	Acres			25	25	25	25	25
Commercial	7/94	Square Foot				500000	1000000	1000000	1000000
<b>Kula Residential Partners</b>									
			Phase	Phase	Phase				
			I	II - (1054)1146	III				
Royal Kula Phase I, II									
Single Family	(7/94)1/96	Dwelling Unit	146	II - (308)430	(478)1280				
Low density apartments	(7/94)1/96	Dwelling Unit	248	I - (308)996					
				II - (935)300	(240)720				
Park	7/94	Acres		+/- 1570					
Industrial	7/94	Employees		60	60				
Community center	7/94	Acres							
Park and Ride for child care center	7/94	Parking stalls		+/- 12					
Elementary School	7/94	Students		yes					
Golf Course(18 hole)	(7/94)1/96	Acres		(154)DELETED					

Table III-7  
(continued)

EWA REGION TRANSPORTATION MASTER PLAN DEVELOPER'S PROJECTED ABSORPTION SCHEDULE (PLEASE SHOW CUMULATIVE VALUES IN EACH COLUMN.)									
Developer/Project Name/Land Use	Date of	Parameter	Thru 1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2019	2020-Budget
<b>Village Park</b>									
Single Family	8/95	Dwelling Unit	1958 (combined total single & multi family)						
Multi-Family	8/95	Dwelling Unit							
Kaleiopuu Elementary School	7/94	Students							
<b>Galbraith/Schuler (Single Family)</b>	(9/95)12/95	Dwelling Unit	DELETED						
<b>Schools</b>									
<b>East Kapolei</b>									
Single Family	(9/95)12/95	Dwelling Unit		400	3350	(3750)6100	(1250)8000	(combined total single & multi)	
Multi-Family	12/95	Dwelling Unit						(Schuler estimates the mix to be 25% single family units, 75% multi-family units)	
<b>Saint Francis Hospital</b>									
Hospital (existing)	9/95	Square foot	116000						
Research/Family Practice	9/95	Square foot		90200					
Renal Dialysis Center (existing)	9/95	Square foot	6000						
Thrift Shop (existing)	9/95	Square foot	420						
Medical Office	9/95	Square foot	40000	85100					
Hospice	9/95	Square foot							
Power Plant/Laundry	9/95	Square foot			16000				
Skilled Nursing Facility 1	9/95	Square foot			54000				
Nursing/Staff Quarters	9/95	Square foot			70000				
Wellness/Conference Center	9/95	Square foot			10000				
Day Care Center	9/95	Square foot			6960				
Distribution Center	9/95	Square foot			20000				
Hospital Expansion	9/95	Square foot	DELETED						
Skilled Nursing Facility 2	9/95	Square foot	DELETED						
<b>Other Developments</b>									

Table III-7  
(continued)

EWA REGION TRANSPORTATION MASTER PLAN DEVELOPER'S PROJECTED ABSORPTION SCHEDULE (PLEASE SHOW CUMULATIVE VALUES IN EACH COLUMN.)									
Developer/Project Name/Land Use	Date of	Parameter	Thru 1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2019	2020-Budget
<b>East Beach</b>									
Single Family	8/95	Dwelling	3194 (combined total single & multi family)						
Multi Family	8/95	Dwelling							
Employment	8/95	Employee							
Park	8/95	Acres							
Elementary School	8/95	Student							
Elementary School	8/95	Student							
Elementary School	8/95	Student							
Middle School	8/95	Student							
High School	8/95	Student							
Golf Course	8/95	Acres							
<b>East Beach (excluding DHCD)</b>									
Single Family	8/95	Dwelling	898						
<b>Honouliuli (excluding DHCD)</b>									
Single Family	8/95	Dwelling	118						
<b>Naneaoli Gardens/Honouliuli</b>									
Single Family	8/95	Dwelling Unit	219						
<b>West Beach Estates</b>									
<b>Ko Olina Resort</b>									
Resort Hotel/Condo	8/95	Units	392	842	1900	3000	4000		4000
Multi Family	(8/95)1/96	Dwelling		(1455)	(4600)3000	(7800)4500	(8700)6000	7500	8700
Commercial	8/95	Square Foot		50000	275000	650000	800000		800000
Transit Station	8/95	Acres				2.8			2.8
Day Care/Fire Station	8/95	Acres				2			2
Marina	8/95	Silpa		350					350
Cultural Center	8/95	Acres	22						22
Golf Course (2 - 18)	8/95	Acres	169.3		325.3				325.3
Parks	8/95	Acres					43.3		43.3
Elementary School	8/95	Students				760			760

**LIMITING CONDITIONS AND ASSUMPTIONS**

The research, analysis, conclusions, and certification for valuation or market studies performed by The Hallstrom Group, Inc. are subject to and influenced by the following:

- The report expresses the opinion of the signers as of the date stated in the letter of transmittal, and in no way has been contingent upon the reporting of specified values or findings. It is based upon the then present condition of the national and local economy and the then purchasing power of the dollar.
- Legal descriptions used within the report are taken from official documents recorded with the State of Hawaii, Bureau of Conveyances, or have been furnished by the client, and are assumed to be correct. No survey is made for purposes of the report.
- Any sketches, maps, plot plans, and photographs included in the report are intended only to show spatial relationships and/or assist the reader in visualizing the property. They are not measured surveys or maps and we are not responsible for their accuracy or interpretive quality.
- It is assumed that the subject property is free and clear of any and all encumbrances other than those referred to herein, and no responsibility is assumed for matters of a legal nature. The report is not to be construed as rendering any opinion of title, which is assumed to be good and marketable. No title information or data regarding easements which might adversely affect the use, access, or development of the property, other than that referenced in the report, was found or provided. The property is analyzed as though under responsible ownership and competent management.
- Any architectural plans and/or specifications examined assume completion of the improvements in general conformance with those documents in a timely and workmanlike manner.

Table III-7  
(continued)

EWA REGION TRANSPORTATION MASTER PLAN DEVELOPER'S PROJECTED ABSORPTION SCHEDULE (PLEASE SHOW CUMULATIVE VALUES IN EACH COLUMN.)									
Developer/Project Name/Land Use	Date as of	Parameter	Thru 1994	1995-1999	2000-2004	2005-2009	2010-2014	2015-2019	2020-Balloon
<b>Barbers Point Harbor</b> Marine Industrial - D	8/95	Acres	188	248.5					
<b>Milky</b>									
<b>Barbers Point N.A.S.</b>									
Single Family	8/95	Dwelling	854 (combined total single family & townhouses)						
Townhouse	8/95	Dwelling							
Employment	8/95	Employee							
Elementary School	8/95	Student							
High School	8/95	Student							
<b>Irwin Point</b>									
Single Family	8/95	Dwelling	1130 (combined total single family & townhouse)						
Townhouse	8/95	Dwelling							
Employment	8/95	Employee							
Elementary School	8/95	Student							
<b>Pala</b>									
Townhouse	8/95	Dwelling	350						
<b>Wai'alea</b>									
Single Family	8/95	Dwelling	3						

- Preparation for, attendance, or testimony at any court or administrative hearing in connection with this report shall not be required unless prior arrangements have been made therefor.
- If the report contains an allocation of value between land and improvements, such allocation applies only under the existing program of utilization. The separate valuations for land and building must not be used in conjunction with any other purpose and are invalid if so used.
- If the report contains a valuation relating to a geographical portion or tract of real estate, the value reported for such geographical portion relates to such portion only and should not be construed as applying with equal validity to other portions of the larger parcel or tract; and the value reported for such geographical portion plus the value of all other geographical portions may or may not equal the value of the entire parcel or tract considered as an entity.
- If the report contains a valuation relating to an estate in land that is less than the whole fee simple estate, the value reported for such estate relates to a fractional interest only in the real estate involved, and the value of this fractional interest plus the value of all other fractional interest may or may not equal to the value of the entire fee simple estate considered as a whole.
- It is assumed that there are no hidden or inapparent conditions of the property, subsoil, or structures which would render it more or less valuable; we assume no responsibility for such conditions or for engineering which might be required to discover such factors.
- Nothing in the report should be deemed a certification or guaranty as to the structural and/or mechanical (electrical, heating, air-conditioning, and plumbing) soundness of the building(s) and associated mechanical systems, unless otherwise noted.
- Information, estimates, and opinions provided by third parties and contained in this report were obtained from sources considered reliable and believed to be true and correct.

- However, no responsibility is assumed for possible misinformation.
- Possession of the report, or a copy thereof, does not carry with it the right of publication, and the report may not be used by any person or organization except the client without the previous written consent of the appraiser, and then only in its entirety. If the client releases or disseminates the reports to others without the consent of the appraiser, the client hereby agrees to hold the appraiser harmless, and to indemnify the appraiser from any liability, damages, or losses which the analysts might suffer, for any reason whatsoever, by reason of dissemination of the report by the client. Further, if legal action is brought against the analyst by a party other than the client concerning the report or the opinions stated therein, the client agrees, in addition to indemnifying the analysts for any damages or losses, to defend said analysts in said action at client's expense. However, nothing herein shall prohibit the client or analysts from disclosing said report or opinions contained therein as may be required by applicable law.
- Disclosure of the contents of this report is governed by the By-Laws and Regulations of the Appraisal Institute. Neither all nor any part of the contents of this report (especially any conclusions as to value, the identity of the appraisers or the firm which they are connected, or any reference to the Appraisal Institute or to the MAI designation) shall be disseminated to the public through advertising media, public relations media, news media, sales media, or any public means of communication without the prior consent and approval of the appraisers.
- Unless otherwise stated in this report, the existence of hazardous material, which may or may not be present on the property, was not observed by the appraiser. The appraiser has no knowledge of the existence of such materials on or in the property. The appraiser, however, is not qualified to detect such substances. The presence of substances such as asbestos, urea-formaldehyde foam insulation, or other potentially hazardous materials may affect the value of the property. The value estimate is predicated on the assumption that there is no such material on or in the property that would cause a loss in value. No responsibility is assumed for any such conditions, or for any expertise or engineering knowledge required to discover

them. The client is urged to retain an expert in this field, if desired.

- The Americans with Disabilities Act (ADA) became effective January 26, 1992. We have not made a specific compliance survey and analysis of this property to determine whether or not it is in conformity with the various detailed requirements of the ADA. It is possible that a compliance survey together with a detailed analysis of the requirements of the ADA could reveal that the property is not in compliance with one or more of the requirements of the act. If so, this fact could have a negative effect upon the value of the property. We did not consider possible noncompliance with the requirements of ADA in estimating the value of the property.

**CERTIFICATION**

The undersigned do hereby certify that, to the best of our knowledge and belief, the statements of fact contained in this report are true and correct. It is further certified that the reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions, and are our personal, unbiased professional analyses, opinions, and conclusions. We further certify that we have no present or prospective interest in the property that is the subject of this report, and have no personal interest or bias with respect to the parties involved. Our compensation is not contingent on a predetermined value or direction in value that favors the client, the amount of the value estimate, the attainment of a stipulated result, or the occurrence of a subsequent event. The appraisal analyses, opinions, and conclusions were developed, and this report has been prepared, in conformity with the requirements of the Code of Professional Ethics and Standards of Professional Appraisal Practice of the Appraisal Institute and the Uniform Standards of Professional Appraisal Practice. The use of this report is subject to the requirements of the Appraisal Institute relating to review by duly authorized representatives. The undersigned certify that they have made personal inspections of the property that is the subject of this report. No other persons provided significant professional assistance other than the undersigned.

The Appraisal Institute conducts programs of continuing education for their designated members. The undersigned members have completed the requirements of the continuing education program of the Appraisal Institute.

# **VARONA VILLAGE PHASE II**

## **APPENDIX C**

### **Economic Impact Assessment**



Research  
Consulting  
Financial Consulting  
Training  
Database Marketing  
Socio-Economic Studies

Mr. Vincent R. Shigekuni  
PBR Hawaii, Inc.  
Pacific Tower Suite 650  
1001 Bishop St.  
Honolulu, HI 96813

October 30, 1996

Dear Mr. Shigekuni,

Please find attached the calculations of economic and fiscal impacts of the Varona Village Phase II development prepared for your use in the Final Environmental Assessment.

We discuss residential development of the Makai Parcel as "Alternative A," while development of the parcel as a community facility is "Alternative B." "Scenario A" is the entire development with the Makai Parcel devoted to Alternative A, and "Scenario B" is the entire development with community facility use of the Makai Parcel.

Assumptions for the calculation are as provided by the Department of Housing and Community Development. SMS Research has developed a few assumptions in these exhibits, which are explained in the notes. Assumptions about sales (in Exhibit 3) and the valuation of multifamily units (used in Exhibit 10) were not entirely provided by client. Assumptions used here are based on comparable developments.

The likely impacts can be summarized as follows:

SMS affiliations:  
Aliza Buder Associates  
Customer Insight Company  
Dowling Marketing Inc.  
International Survey Research  
Seminole Market  
Research Bureau, Inc.

SMS / 1042 Fort Street Mall, Suite 200 / Honolulu, Hawaii 96813  
Telephone (808) 537-3356 / FAX (808) 537-2686 / Computer 73444.1373 / Internet info@smskawaii.com

**Construction:** As shown in Exhibit 2, construction will involve estimated spending of some \$62 million to \$70 million (1995 dollars). (All dollar figures in this letter and the attached exhibits are 1995 constant dollars.) Over the entire construction period, about 500 to 550 person-years of direct employment will be created. In a three year construction period, that means that about 160 to 180 full-time jobs will be supported each year, on average. (The community facility alternative involves somewhat less spending and fewer jobs.) Of those jobs, the large majority will be on-site.

Total construction-related employment, including jobs supported by construction firms' spending and construction workers' spending is in the range of 1,600 to 1,700 jobs (over the entire construction period).

**Operations Jobs:** Little new employment will be generated on-site, except in Scenario B. Employment at the community facility is estimated, based on Oahu YMCAs, as beginning at about 20 full-time jobs and growing over time to about 30 full-time jobs. (Those figures include many part-time jobs added together.) Exhibit 4 shows direct jobs as ranging from 16, for Scenario A, to 37, for Scenario B, after buildout. Total jobs, including indirect and induced jobs associated with the project come to 25 and 55 jobs for the two scenarios. These are long-term jobs, unlike the construction jobs discussed above.

**Incomes:** Direct construction workers will earn some \$7 million to \$10 million in the year 2000, the peak development year. Total project-related workers' incomes will rise to a total of \$18 million to \$25 million in that year, but stabilize after construction at about \$1 million. (Exhibit 6 shows workforce income calculations.)

**Population and Housing:** The residential population of the Phase II area will grow to about 1,350 to 1,650 persons. As these are expected to be island residents, not newcomers to Oahu, the actual population impact on the City and County is nil. However, by locating residents in new homes, the project will address the twin problems of limited housing supply and high housing prices that have affected Oahu residents.

With a small permanent workforce, the project will not generate significant amounts of new housing demand. Exhibit 7 shows the housing demand associated with project jobs, and Exhibit 8 in turn shows the difference between housing production and the total demand for housing on the part of project-related operations workers. Under Scenario A, some 519 units would be built, while project related workforce housing demand would amount to only some 13 or 14 units, leaving a surplus of more than 500

units. Under Scenario B, with fewer units and more operations jobs, the surplus would still be about 375 housing units.

**Fiscal Impacts:** The new revenues associated with project development are calculated in Exhibits 9 and 10. Costs to the City and County as a developer have not been calculated -- these are to be provided by client. Impacts of new development at the site on the cost of providing other government services (e.g., road work) are expected to be minimal or nil, and are not shown here.

Exhibit 9 estimates increases in Hawaii State revenues as a result of construction of the project, showing a gain in revenues over the construction period amounting to \$6.2 to \$7.1 million (1995 dollars). Inasmuch as this calculation does not include any gain in revenues associated with new operations on-site, it is conservative.

Exhibit 10 estimates the increase in property tax revenues associated with project development. It starts with the assumption that current revenues from the site are tiny. (Sites owned by the City and County, and easements for utilities should yield no property tax income. A total tax yield of \$100 has been estimated as covering lands leased to other parties.)

Taxes on residential development will amount to some \$300,000 (under Scenario B) to \$350,000 annually at buildout. After the buyback period ends, the annual tax yield could grow to \$350,000 to \$400,000 (1995 dollars). By the year 2010, the cumulative increase in property tax revenues associated with the project would amount to \$3.1 million to \$3.6 million.

Please call if you have any questions. Thanks!

Sincerely,



John Kirkpatrick  
Vice President

**Exhibit 1: CONSTRUCTION MILESTONES**

	Begin	End	1999	2000	2001	2002
Infrastructure	before project	1999				
Projects						
Varona Expansion Area	2000	2000				
Area E	1998	2000				
Malak Area --						
Residential Alternative	2000	2000				
Community Facility Alternative	2000	2000				
<b>Total Construction Period</b>	<b>1998</b>	<b>2000</b>				

NOTE: Milestones developed by Corcoran Research Group based on preliminary market assessment by the Halperin Group and information from the City Department of Housing and Community Development.

Exhibit 2: CONSTRUCTION SPENDING AND EMPLOYMENT

	1997	1998	1999	2000	2001	2002	CUMULATIVE
<b>CONSTRUCTION SPENDING - IN MILLION \$ (1)</b>							
Infrastructure	\$0.3	\$1.8	\$9.5	\$0.0	\$0.0	\$0.0	\$17.6
Varona Village Expansion Area	\$0.0	\$0.0	\$0.0	\$14.0	\$0.0	\$0.0	\$14.0
Area E	\$0.0	\$4.9	\$17.9	\$6.7	\$0.0	\$0.0	\$29.5
Makai Area							
Alternative A - Residential Use	\$0.0	\$0.0	\$0.0	\$9.8	\$0.0	\$0.0	\$9.8
Alternative B - Community Facility	\$0.0	\$0.0	\$0.0	\$1.1	\$0.0	\$0.0	\$1.1
Annual Totals	\$0.3	\$6.8	\$27.4	\$30.5	\$0.0	\$0.0	\$70.9
Scenario A	\$0.3	\$6.8	\$27.4	\$31.6	\$0.0	\$0.0	\$62.2
Scenario B							
<b>CONSTRUCTION EMPLOYMENT - IN PERSON-YEARS</b>							
Direct Jobs (2)							
Scenario A	50	54	219	244	0	0	542
Scenario B	50	54	219	174	0	0	498
Indirect and Induced Jobs (3)							
Scenario A	111	119	480	535	0	0	1,189
Scenario B	111	119	480	343	0	0	1,053
Total Jobs							
Scenario A	161	173	699	779	0	0	1,731
Scenario B	161	173	699	517	0	0	1,551

NOTES: (1) Alternatives are alternative uses for Makai Area; "Scenarios" are project totals including one alternative or the other. (2) Construction costs based on estimates of average construction cost per square foot and unit size. (3) Direct jobs estimated from construction spending, with an estimated 8.0 jobs per million dollars (1995 \$). Estimated adopted from 1995 average construction workforce and value of construction completed (Bank of Hawaii, 1996). (4) Estimated on basis of unpublished DBEDT Input-Output Model. Employment multiplier of 2.27 is a weighted average of multipliers for single-family (2.25), multi-family (2.17), and commercial (1.76) construction.

Exhibit 3: RESIDENTIAL SALES, OCCUPANCY, AND POPULATION

	1998	1999	2000	2001	2002	2003
<b>BUILDOUT</b>						
Area E	42	153	57	0	0	0
Varona Village Expansion	0	0	157	0	0	0
Makai Area: Alternative A	0	0	110	0	0	0
Annual	42	153	324	0	0	0
Alternative A	42	153	214	0	0	0
Alternative B	0	0	110	0	0	0
Cumulative	42	195	519	519	519	519
Alternative A	42	195	409	409	409	409
Alternative B	0	0	110	110	110	110
<b>SALES</b>						
Units Sold during Year (1)						
Area E (1)	21	96	99	33	3	0
Varona Village Expansion (2)	0	0	126	31	0	0
Makai Area: Alternative A (1)	0	0	55	50	5	0
Inventory, End of Year	21	79	36	4	0	0
Area E	0	0	31	0	0	0
Varona Village Expansion	0	0	0	0	0	0
Makai Area: Alternative A	0	0	55	6	1	0
Cumulative Units Sold	21	116	216	248	252	252
Area E	21	116	216	248	252	252
Varona Village Expansion	0	0	126	157	157	157
Makai Area: Alternative A	0	0	55	105	109	110
<b>OCCUPANCY</b>						
Units Occupied during Year (3)						
Area E	16	92	165	229	238	239
Varona Village Expansion	0	0	94	143	149	149
Makai Area: Alternative A	0	0	41	89	103	104
Annual	16	92	300	461	490	492
Alternative A	16	92	273	351	364	364
Alternative B	0	0	27	110	126	128
Cumulative	16	108	398	859	1,349	1,841
Alternative A	16	108	371	722	1,086	1,450
Alternative B	0	0	27	137	263	391
<b>POPULATION</b>						
Area E (4)	47	273	551	644	710	713
Varona Village Expansion (5)	0	0	369	591	617	617
Makai Area: Alternative A (4)	0	0	123	266	307	311
Total, Scenario A	47	273	1,034	1,541	1,634	1,641
Total, Scenario B	47	273	941	1,274	1,327	1,330

NOTES: 1. Estimated an assumption that 50% of units delivered in each year are sold in that year, and 50% of unsold inventory is sold in the year. 2. Estimated an assumption that 60% of units delivered in each year are sold in that year, and 40% of unsold inventory is sold in the year. 3. Estimated an assumption that 95% of units sold through the end of the previous year will be occupied, plus with 75% of the units sold in the current year. 4. Estimated from 1990 Census for Oahu (average persons per household 2.02) and Planning Dept. projections for 2010 households (Oahu Regional Transportation Plan, 1995). The Dept. projection for 2010 households is the year 2000 plus a straight-line projection from 1990 to 2010. 5. Year 2000 population based on 1990 population of 1,000,000 plus a straight-line projection from 1990 to 2000. At the same rate as the City and County average. Household size used for year 2000: 4.13 persons per household.

Exhibit 4: DIRECT OPERATIONS EMPLOYMENT

	1999	2000	2001	2002	2003
<b>DIRECT JOBS</b>					
<b>Scenario A</b>					
Real Estate (Sales)	1	4	6	0	0
Residential Areas	1	3	12	15	16
<b>Scenario B</b>					
Real Estate (Sales)	1	4	3	0	0
Residential Areas	1	3	10	12	12
Community Facility	0	0	0	20	22
<b>TOTALS</b>	<b>2</b>	<b>7</b>	<b>18</b>	<b>16</b>	<b>16</b>
<b>Scenario A</b>					
<b>Scenario B</b>					
<b>DIRECT JOBS BY INDUSTRY</b>					
<b>Scenario A</b>					
Amusement Services	0	1	2	3	4
Other Agricultural	0	1	4	5	5
Other Services	0	2	6	10	10
Real Estate	1	4	6	0	0
<b>TOTAL</b>	<b>2</b>	<b>7</b>	<b>18</b>	<b>16</b>	<b>16</b>
<b>Scenario B</b>					
Amusement Services	0	0	0	20	22
Other Agricultural	0	1	3	4	4
Other Services	0	2	7	8	8
Real Estate	1	4	3	0	0
<b>TOTAL</b>	<b>2</b>	<b>7</b>	<b>14</b>	<b>32</b>	<b>34</b>

NOTE: Direct operations estimated on the following assumptions:  
 Real Estate Sales: 5 per 100 homes in un sold inventory, end of year  
 Property Management and Maintenance: 3 per 100 homes sold  
 Community Facility: 20 jobs at start up, growing to about 30 after five years.

Exhibit 5: TOTAL OPERATIONS-RELATED EMPLOYMENT

	1999	2000	2001	2002	2003
<b>DIRECT JOBS BY INDUSTRY</b>					
<b>Scenario A</b>					
Scenario A	2	7	18	16	16
Scenario B	2	7	14	32	34
<b>INDIRECT AND INDUCED JOBS ASSOCIATED WITH --</b>					
<b>Scenario A</b>					
Amusement Services	0	0	1	2	2
Other Agricultural	0	1	2	2	2
Other Services	0	1	3	4	4
Real Estate	1	3	5	0	0
<b>TOTAL</b>	<b>1</b>	<b>6</b>	<b>11</b>	<b>9</b>	<b>9</b>
<b>Scenario B</b>					
Amusement Services	0	0	0	11	12
Other Agricultural	0	1	2	2	2
Other Services	0	1	3	3	4
Real Estate	1	3	3	0	0
<b>TOTAL</b>	<b>1</b>	<b>5</b>	<b>7</b>	<b>15</b>	<b>18</b>
<b>ALL JOBS (DIRECT, INDIRECT AND INDUCED) ASSOCIATED WITH --</b>					
<b>Scenario A</b>					
Scenario A	3	13	29	24	25
Scenario B	3	12	21	48	55

NOTE: Direct operations jobs from Exhibit 4, indirect and induced jobs supported by operations jobs from unpublished State Input-Output model Type II employment multiplier for these industries.

Exhibit 6: WORKFORCE INCOME

	TOTAL WORKFORCE INCOME (\$ Millions)			
	1998	1999	2000	2001
<b>SCENARIO A</b>				
Direct Jobs				
Construction (1)	\$2.3	\$9.2	\$10.3	\$0.0
Operations	\$0.0	\$0.2	\$0.5	\$0.5
Indirect and Induced Jobs				
Construction (1)	\$3.2	\$12.8	\$14.3	\$0.0
Operations	\$0.0	\$0.1	\$0.3	\$0.2
<b>TOTAL SCENARIO A</b>	\$5.5	\$22.4	\$25.4	\$0.7
<b>SCENARIO B</b>				
Direct Jobs				
Construction (1)	\$2.3	\$9.2	\$7.4	\$0.0
Operations	\$0.0	\$0.2	\$0.4	\$0.4
Indirect and Induced Jobs				
Construction (1)	\$3.2	\$12.8	\$10.2	\$0.0
Operations	\$0.0	\$0.2	\$0.4	\$0.9
<b>TOTAL SCENARIO B</b>	\$5.5	\$22.6	\$18.4	\$1.3

NOTES: Incomes estimates from reports of statewide average income by industry, with jobs allocated by industry as shown in earlier exhibits. Average wages for second quarter, 1995 multiplied by four to estimate 1995 average wages. Indirect and induced employment wages estimated from statewide average annual wage, all covered employment.

SOURCE: Hawaii Department of Labor and Industrial Relations, Research and Statistics Office Internet posting of historical wages.

Exhibit 7: POPULATION AND HOUSING DEMAND ASSOCIATED WITH PROJECT-RELATED JOBS

SCENARIO A --	1999					2000					2001					2002					2003									
<b>OPERATIONS JOBS (1)</b>	2	7	18	18	18	1	5	11	9	9	1	5	11	9	9	1	5	11	9	9	1	5	11	9	9	1	5	11	9	9
Total Direct Jobs	1	5	11	9	9	1	5	11	9	9	1	5	11	9	9	1	5	11	9	9	1	5	11	9	9	1	5	11	9	9
Indirect and Induced Jobs	1	2	7	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>EWA SHARE OF JOBS (2)</b>	1	7	17	16	16	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1
Direct Jobs	1	7	17	16	16	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1
Indirect and Induced Jobs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>POPULATION SUPPORTED BY WORKFORCE (INCLUDING WORKERS) (3)</b>	6	26	60	50	51	3	14	36	34	34	3	14	36	34	34	3	14	36	34	34	3	14	36	34	34	3	14	36	34	34
Statewide	6	26	60	50	51	3	14	36	34	34	3	14	36	34	34	3	14	36	34	34	3	14	36	34	34	3	14	36	34	34
Ewa	3	14	36	34	34	3	14	36	34	34	3	14	36	34	34	3	14	36	34	34	3	14	36	34	34	3	14	36	34	34
<b>WORKFORCE HOUSEHOLDS (4)</b>	2	9	20	17	17	1	5	12	11	11	1	5	12	11	11	1	5	12	11	11	1	5	12	11	11	1	5	12	11	11
Statewide	2	9	20	17	17	1	5	12	11	11	1	5	12	11	11	1	5	12	11	11	1	5	12	11	11	1	5	12	11	11
Ewa	1	5	12	11	11	1	5	12	11	11	1	5	12	11	11	1	5	12	11	11	1	5	12	11	11	1	5	12	11	11
<b>ESTIMATED EVENTUAL DEMAND FOR NEW HOUSING</b>	0	1	3	2	3	0	1	2	2	2	0	1	2	2	2	0	1	2	2	2	0	1	2	2	2	0	1	2	2	2
Low Range (5)	0	1	3	2	3	0	1	2	2	2	0	1	2	2	2	0	1	2	2	2	0	1	2	2	2	0	1	2	2	2
Statewide	0	1	3	2	3	0	1	2	2	2	0	1	2	2	2	0	1	2	2	2	0	1	2	2	2	0	1	2	2	2
Ewa	0	1	2	2	2	0	1	2	2	2	0	1	2	2	2	0	1	2	2	2	0	1	2	2	2	0	1	2	2	2
High Range (6)	1	3	6	5	5	1	3	6	5	5	1	3	6	5	5	1	3	6	5	5	1	3	6	5	5	1	3	6	5	5
Statewide	1	3	6	5	5	1	3	6	5	5	1	3	6	5	5	1	3	6	5	5	1	3	6	5	5	1	3	6	5	5
Ewa	0	1	4	3	3	0	1	4	3	3	0	1	4	3	3	0	1	4	3	3	0	1	4	3	3	0	1	4	3	3

Continued on next page

Exhibit 7, Continued

SCENARIO B -	1988	1999	2000	2001	2002	2003
<b>OPERATIONS JOBS (1)</b>						
Total Direct Jobs	2	7	14	32	34	37
Total Indirect and Induced Jobs	1	5	7	15	16	18
<b>EWA SHARE OF JOBS (2)</b>						
Direct Jobs	1	7	13	32	34	37
Indirect and Induced Jobs	0	0	0	1	1	1
<b>POPULATION SUPPORTED WORKFORCE (INCLUDING WORKERS)</b>						
Statewide	6	25	43	99	104	114
Ewa	3	14	28	69	73	80
<b>WORKFORCE HOUSEHOLDS</b>						
Statewide	2	8	14	33	35	38
Ewa	1	5	9	23	24	26
<b>ESTIMATED EVENTUAL FOR NEW HOUSING</b>						
Low Range (5)	0	1	2	5	6	6
Statewide	0	1	1	3	4	4
Ewa	1	2	4	10	10	11
High Range (6)	0	1	3	7	7	8
Statewide						
Ewa						

NOTES:

- (1) From Exhibit 4.
- (2) Estimated on assumption that 80% of real estate sales jobs are on site, and all other direct operations jobs are on site. Development Plan area share of indirect and induced jobs is estimated as 6.73% in 2000, based on City projections of residential population in Oahu Regional Transportation Plan.
- (3) Assumes 2.07 persons per operations job, based on 1990 County average of 1.46 workers per household and average household size of 3.02 persons per household.
- (4) Based on 1990 County average of 3.02 persons per household.
- (5) Assuming that 15% of worker households will eventually require new housing.
- (6) Assuming that 30% of worker households will eventually require new housing.

Exhibit 8: DIFFERENCE BETWEEN PROJECT HOUSING PRODUCTION AND PROJECT-RELATED WORKFORCE HOUSING DEMAND IN EWA

SCENARIO A -	1988	1999	2000	2001	2002	2003
<b>UNITS BUILT</b>	42	195	519	519	519	519
<b>TOTAL POTENTIAL DEMAND FROM PROJECT-RELATED WORKFORCE HOUSEHOLDS (1)</b>						
Low Estimate	1	6	14	13	13	13
High Estimate	1	6	16	14	14	14
<b>DIFFERENCE</b>						
Low Estimate	41	189	505	506	506	506
High Estimate	41	189	503	505	505	505
<b>SCENARIO B -</b>						
<b>UNITS BUILT</b>	42	195	409	409	409	409
<b>TOTAL POTENTIAL DEMAND FROM PROJECT-RELATED WORKFORCE HOUSEHOLDS (1)</b>						
Low Estimate	1	5	11	26	28	30
High Estimate	1	6	12	30	32	34
<b>DIFFERENCE</b>						
Low Estimate	41	190	398	383	381	379
High Estimate	41	189	397	379	377	375

NOTES: From Exhibits 3 and 7.

- (1) From Exhibit 7. Ewa workforce households plus Ewa eventual demand for new housing.



Exhibit 10, Continued

	1991 (1)	1992	2000	2001	2002 Budget +19 Yr.
<b>C. ADJUSTMENT FOR OWNER OCCUPANT EXEMPTION (4)</b>					
VALUE SUBJECT TO EXEMPTION (\$1,000s)					
Improved Residential	\$0	\$1,680	\$6,120	\$4,560	\$0
Apartment (Scenario A)	\$0	\$0	\$0	\$4,400	\$0
<b>CUMULATIVE TAXABLE LAND VALUE (AFTER EXEMPTION)</b>					
Improved Residential	\$0	\$2,370	\$18,255	\$42,565	\$51,125
Apartment (Scenario A)	\$0	\$0	\$0	\$183	\$4,583
<b>D. TAXES (\$1,000s)</b>					
<b>ACREAGE TO BE DEVELOPED (2)</b>					
Unimproved Res	\$0	\$0	\$0	\$0	\$0
Agricultural	\$0	\$0	\$0	\$0	\$0
<b>DEVELOPED LAND VALUE</b>					
Improved Residential	\$0	\$11	\$37	\$133	\$160
Apartment (Scenario A)	\$0	\$0	\$0	\$1	\$16
<b>IMPROVED VALUE</b>					
Improved Residential	\$0	\$0	\$75	\$145	\$182
Apartment (Scenario A)	\$0	\$0	\$0	\$25	\$32
<b>TOTAL TAXES</b>					
Scenario A	\$0	\$11	\$132	\$304	\$380
Scenario B	\$0	\$11	\$132	\$278	\$341
<b>E. INCREASE IN TAX REVENUES</b>					
<b>TAX REVENUES BEFORE DEVELOPMENT (5)</b>					
	\$0				
<b>DIFFERENCE IN TAX REVENUES</b>					
<b>SCENARIO A</b>					
Annual	(50)	\$11	\$132	\$304	\$346
Cumulative	(50)	\$11	\$143	\$447	\$783
<b>SCENARIO B</b>					
Annual	(50)	\$11	\$132	\$278	\$305
Cumulative	(50)	\$11	\$143	\$431	\$725

**NOTES:**  
 (1) All figures in thousands of 1995 dollars, except Areas (6) and (7).  
 Because the City and County already own the land to be developed, it is not subject to property taxes.  
 (2) No future agricultural value estimated, an assumption that undeveloped acreage would all be classified as Unimproved Residential by 1998.  
 (3) Taxable value of low-income and 99-year units assumed to be constant by brackets for ten years, after which it would rise to market value.  
 (4) Standard Assessor's exemption (\$40,000) assumed for all units.  
 (5) Honolulu City and County 1996-1997 final property tax rates; City and County tax records for property and other areas comparable to developed tract.

**SOURCES:**

# **VARONA VILLAGE PHASE II**

## **APPENDIX D**

### **Traffic Study**

**TRAFFIC IMPACT  
ASSESSMENT  
STUDY**

**TRAFFIC IMPACT ASSESSMENT STUDY**

**VARONA VILLAGE, PHASE II**

Ewa, Oahu, Hawaii

**VARONA VILLAGE  
PHASE II**

Ewa, Oahu, Hawaii

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**June 1996**

**June 1996**

PBOD Ref.: 16235A01



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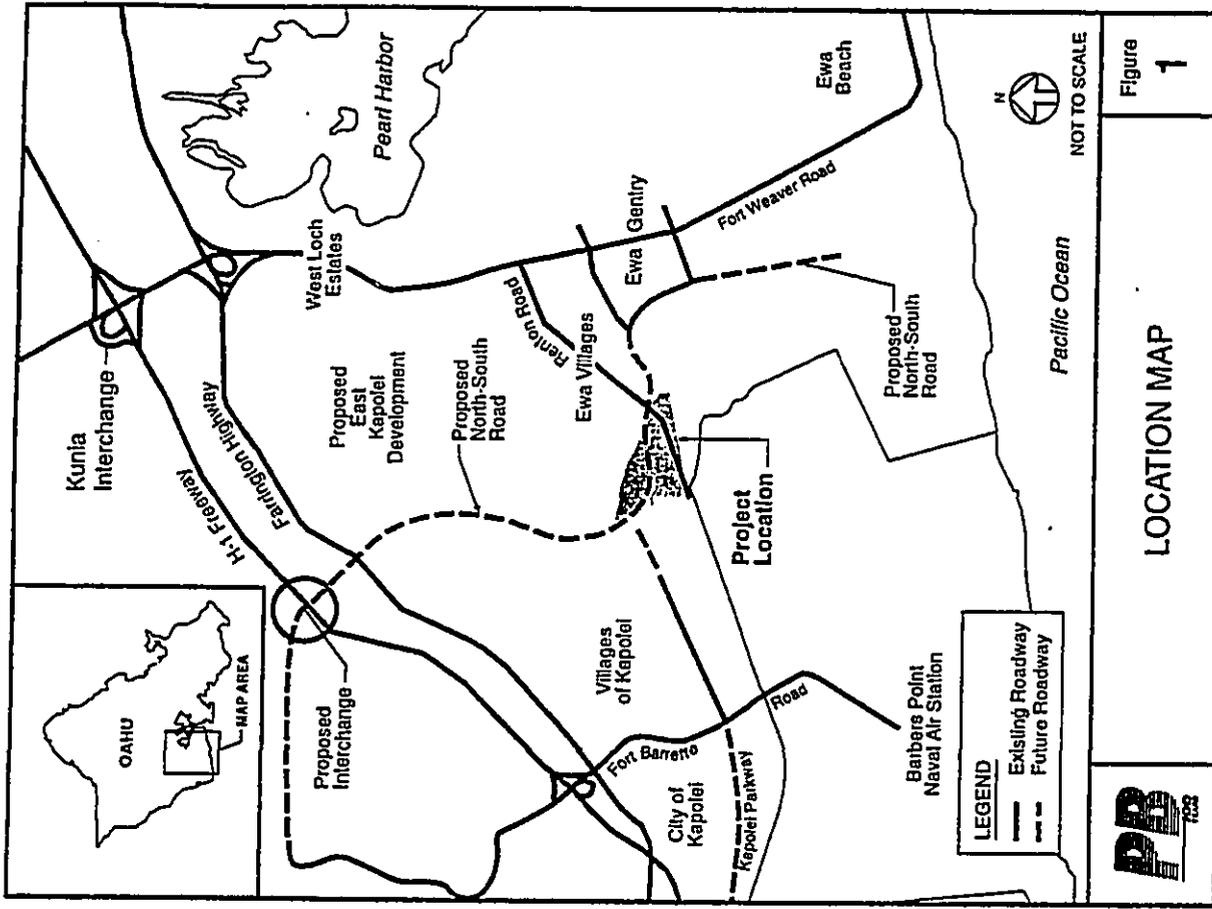
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**I. INTRODUCTION**

As part of the Ewa Villages project, the City and County of Honolulu Department of Housing and Community Development proposes to develop the Varona Village Phase II project, located in Ewa, Oahu as shown in Figure 1. The Varona Village Phase II project is an expansion of the existing Varona Village. The project consists of three separate parcels referred to as Area E (approximately 25 acres), Varona Village Expansion Area (approximately 27 acres), and Makai Area (approximately 9 acres) located north, west and south of the existing Varona Village as shown in Figure 2. Varona Village, along with Renton Village and Tenney Village, comprise the three plantation villages that make up the overall Ewa Villages.



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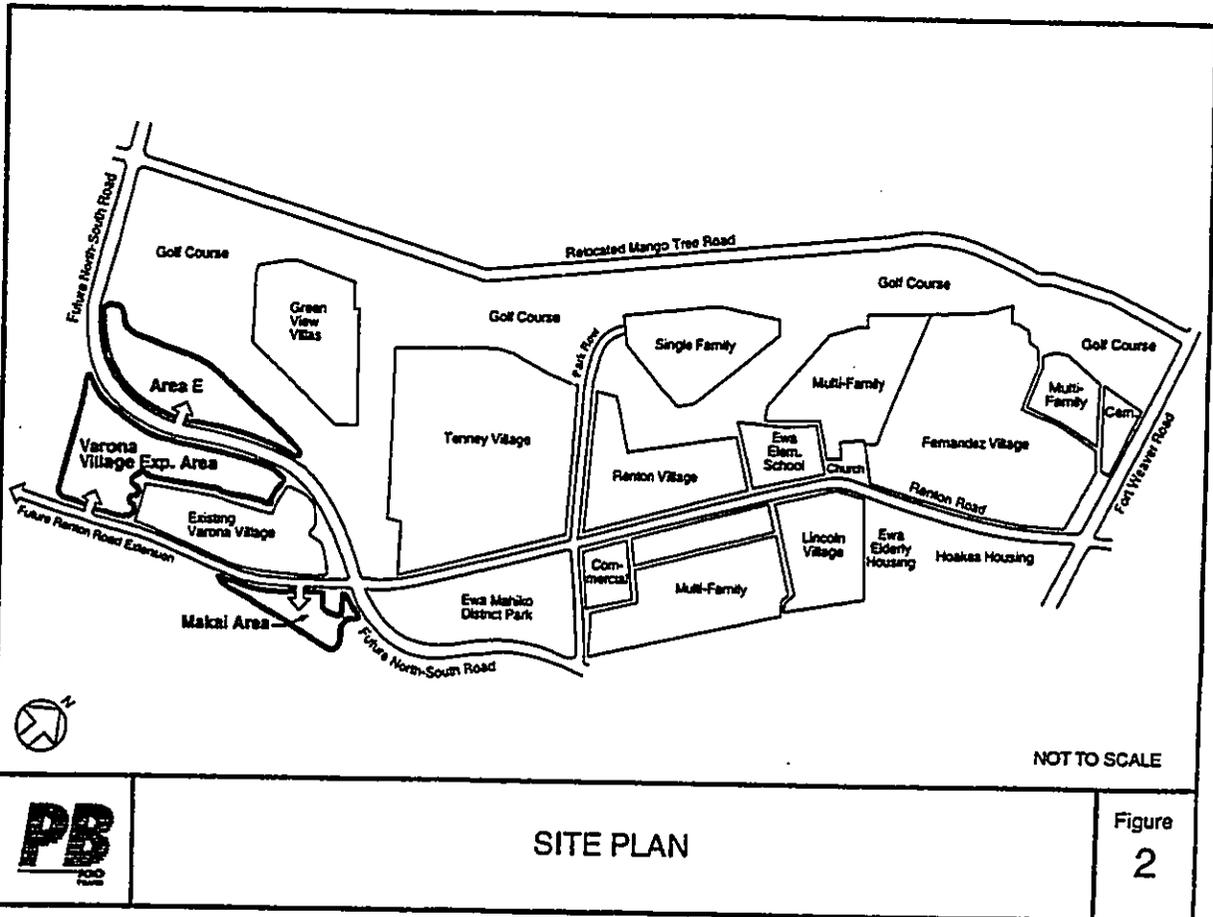
**LOCATION MAP**

Figure  
**1**

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Varona Village, Phase II  
June 1996



SITE PLAN

Figure  
2

II. EXISTING CONDITIONS

Existing Roadway System

Renton Road

Access to Varona Village is provided by Renton Road which connects to Fort Weaver Road as a four-legged signalized intersection. Renton Road has been improved as part of the Ewa Villages project and is a four-lane divided roadway with curb, gutter and sidewalks in both directions, from Fort Weaver Road to Pahika Street. From Pahika Street to the bridge crossing Kaloi Gulch, Renton Road continues as a two-lane divided roadway with curb, gutter and sidewalks in both directions. From the bridge over Kaloi Gulch to its termination at the existing Varona Village, Renton Road is an undivided two-lane roadway that is poorly paved with unpaved shoulders. The posted speed limit on Renton Road is 25 miles per hour.

Fort Weaver Road

Fort Weaver Road is a major arterial which provides regional access to the Ewa area. Fort Weaver Road connects to Farrington Highway at a grade-separated interchange. North of Farrington Highway, Fort Weaver Road becomes Kuniia Road which connects to Interstate H-1 at the Kuniia interchange. Fort Weaver Road runs generally in a north south direction from Farrington Highway to North Road in Ewa Beach town where it turns east and continues parallel to the beach until its terminus at Ewa Beach park. Fort Weaver Road is a four-lane divided roadway from Farrington Highway to the intersection with Hanakahi Street in Ewa Beach town. From Hanakahi Street to just east of Kiihaa Street, Fort Weaver Road continues as a four-lane undivided road. East of Kiihaa Street, Fort Weaver is a two-lane undivided road. The posted speed limit on Fort Weaver Road in the vicinity of Renton Road is 45 miles per hour.

#### Park Row

Park Row is a collector road which provides an access onto Renlon Road for the Greenview Villas subdivision and Tenney and Renlon Villages. Park Row connects to Renlon Road as a four-legged, unsignalized intersection. The Park Row approaches are STOP-sign controlled. The southern Park Row leg is currently used only by construction traffic and traffic from an existing maintenance building.

#### Existing Traffic Volumes

Manual traffic counts were conducted on Tuesday and Wednesday, May 14 and 15, 1996 during the commuter peak periods of 5:30 AM to 7:30 AM and 4:15 PM to 6:30 PM. A 24-hour count using a pneumatic tube counter was also conducted on Renlon Road at the Kalol Guich bridge from 4:00 PM Tuesday May 14, 1996 to 4:00 PM Wednesday May 15, 1996. The count data is included in Appendix A. The counts indicate that the morning peak hour occurs between 6:30 and 7:30 AM and the afternoon peak hour occurs between 5:15 and 6:15 PM. Observations of substantial construction traffic were also made during the counts. The existing peak hour turning movements are shown in Figure 3.

#### Intersection Analysis

The intersection of Renlon Road and Park Row was chosen for analysis since it is anticipated to become a significant intersection near the Varona Phase II development.

#### Methodology

The intersections studied within this report were evaluated using the methodologies for unsignalized and signalized intersections outlined in the 1994 Highway Capacity Manual<sup>1</sup> (HCM). Operating conditions at an intersection are expressed as a qualitative index known as Level of Service (LOS) with letter designations ranging from A through F, with LOS A representing free-flow operating conditions and LOS F representing over-capacity conditions. Levels of Service for unsignalized intersections are evaluated for specific movements at the intersection

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(all movements of the minor street approaches and the left turns of the major street approaches), while the Level of Service for signalized intersections are evaluated for overall intersection operations. Level of Service criteria are described in Appendix B. The analysis worksheets are included as Appendix C.

#### Renlon Road and Park Row Intersection

The analysis results indicate that all movements operate very well, with little delays (LOS A) during the peak hours.

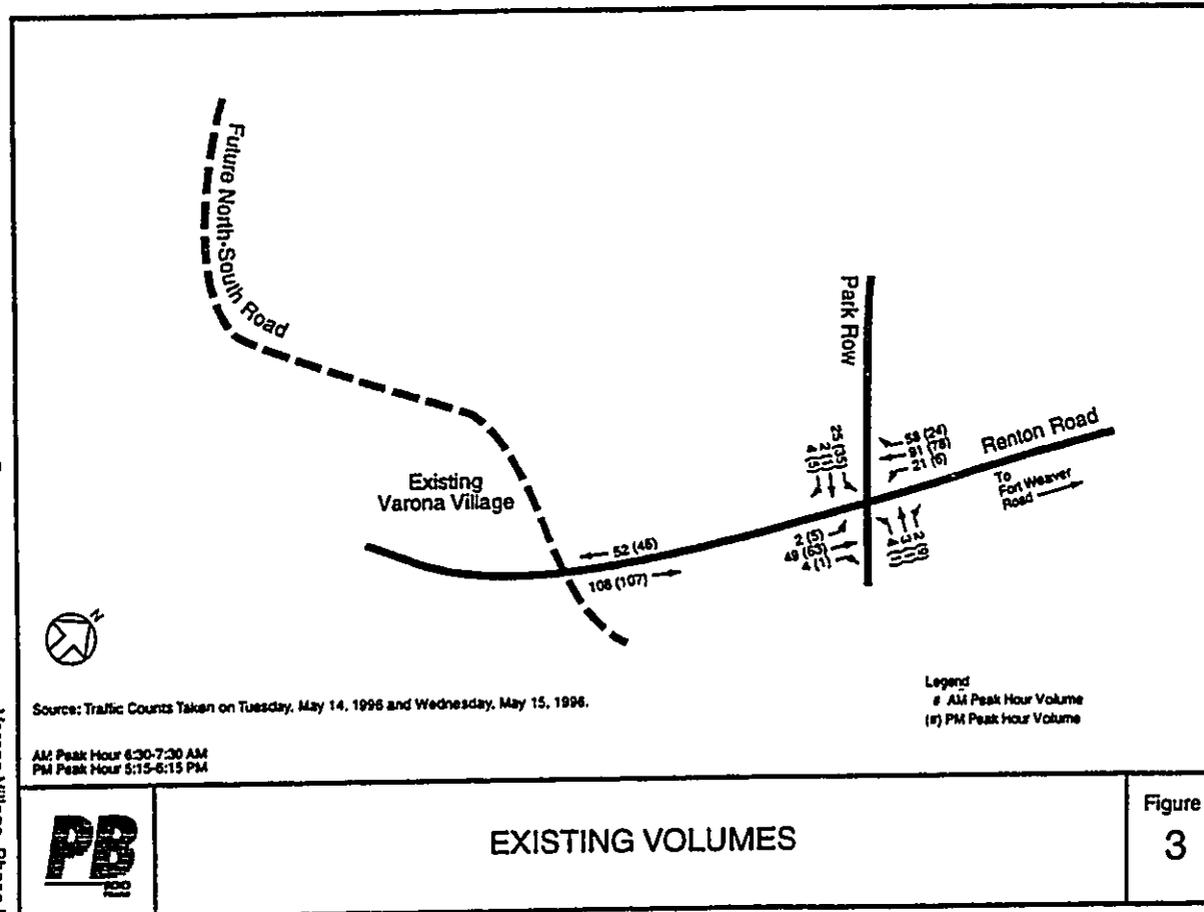
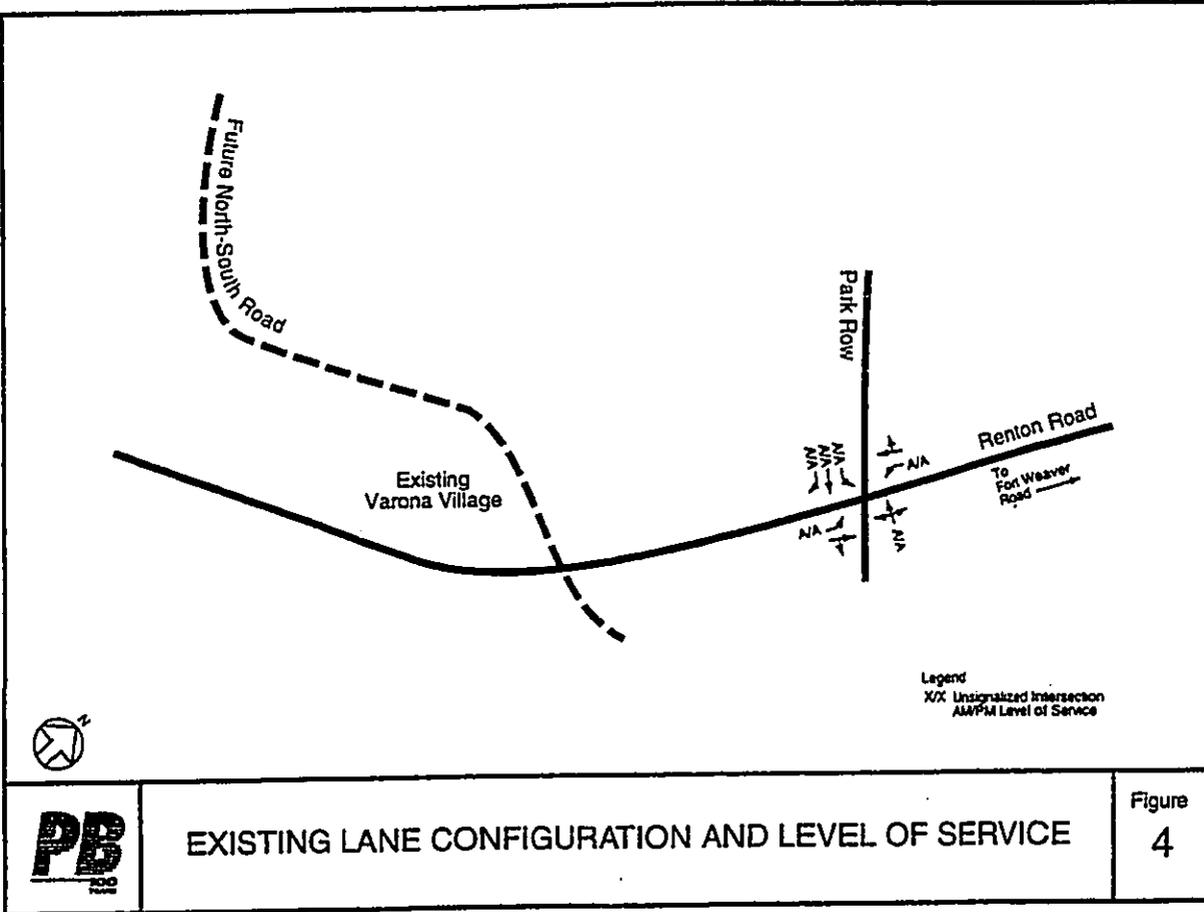
#### Summary of Results

The existing intersection of Renlon Road and Park Row currently operates very well (LOS A) even with the presence of construction traffic which will be eliminated when the development is completed. Existing lane configuration and level of service is shown in Figure 4.

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### III. BASE YEAR 2005 WITHOUT THE PROJECT

Base year 2005 represents future year conditions without the project traffic. This scenario provides a base condition which will be compared to the future year 2005 with project traffic scenario described in the following section. This comparison is used to determine the relative traffic impacts of the proposed development. The year 2005 was selected because it represents a future horizon year that will encompass a completed and occupied project.

#### Future Roadway System

The base year condition assumes the completion of a new roadway in the Ewa area, the North-South Road, starting from an interchange connection onto the H-1 freeway, approximately midway between the Kunia and Makakilo interchanges, extending south to the proposed Ewa Marina development near Ewa Beach, by year 2005. Along the way, the North South Road meanders through the Varona Village Phase II, Ewa Villages, and Ewa Genity developments. This assumption is based on the schedule for the North-South Road Corridor Major Investment Study (MIS) which is currently being conducted by the City and County of Honolulu Department of Transportation Services.

#### Traffic Volume Forecasts

Base year conditions account for growth in traffic due to new developments in the area by year 2005. The development of the traffic volume forecasts for base year conditions consisted of using preliminary forecasts from the North-South Road Corridor Study, and estimating trips from developments along Park Row.

#### Preliminary North-South Road Traffic Volume Forecasts

Base year conditions were based on preliminary travel demand model forecasts for the North-South Road Corridor Study. The forecasts were primarily used to estimate traffic volumes on North-South Road in the vicinity of the project.

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The traffic forecasts were based on the latest land use information provided for developments in the Ewa area.

The horizon year for the North-South Road study model is year 2020, and these forecasts were, therefore, multiplied by a factor of 80% to estimate year 2005 traffic volumes. It is estimated that approximately 80% of the land use development in the project area, assumed in the year 2020 forecasts will be completed by year 2005 based on developers' absorption schedules.

#### Ewa Village Traffic on Park Row

Traffic volumes were also estimated for the Ewa Village parcels located along Park Row that would be completed by year 2005. These projects included the Green View Villas subdivision, Ewa Villages golf course, and portions of Tenney and Renton Villages.

The project year 2005 traffic volumes are expected to be conservatively high for the following reasons: an 80% buildout of development in the area is probably an optimistic schedule, the addition of traffic from other Ewa Village parcels to the North-South Road forecasts results in a "double counting" of traffic volumes since the North-South Road forecasts should already include these trips.

#### Intersection Analysis

##### North-South Road and Renton Road Intersection

The analysis results indicate that the projected traffic volumes at the intersection will meet the peak hour traffic signal warrant (Warrant 11) outlined in the Manual on Uniform Traffic Control Devices (MUTCD)<sup>2</sup> by year 2005. As a signalized intersection, the overall intersection will operate acceptably (LOS C and D) during the morning and afternoon peak hours.

##### Renton Road and Park Row Intersection

The analysis results indicate that the projected traffic volumes at the intersection will also meet the peak hour traffic signal warrant (Warrant 11). As a

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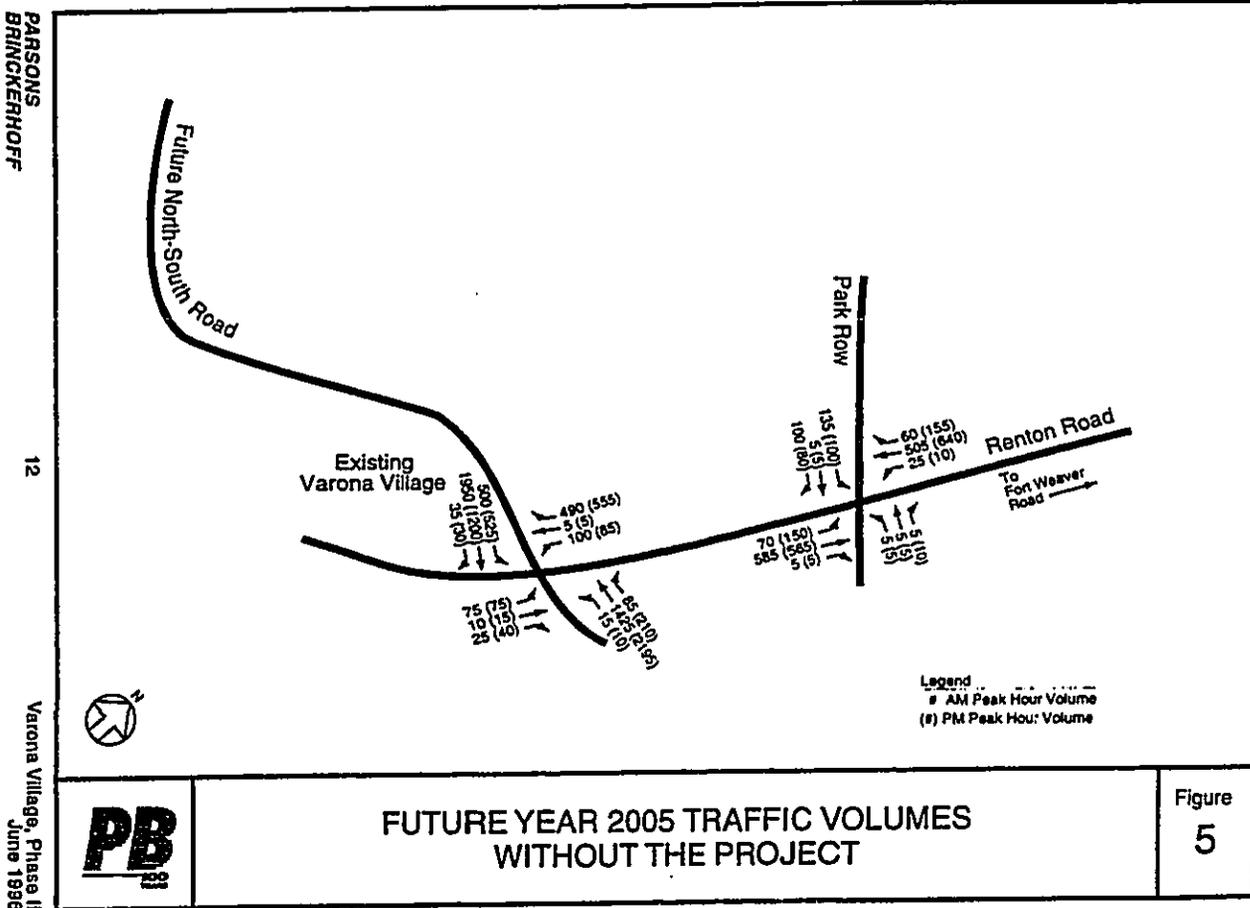
10

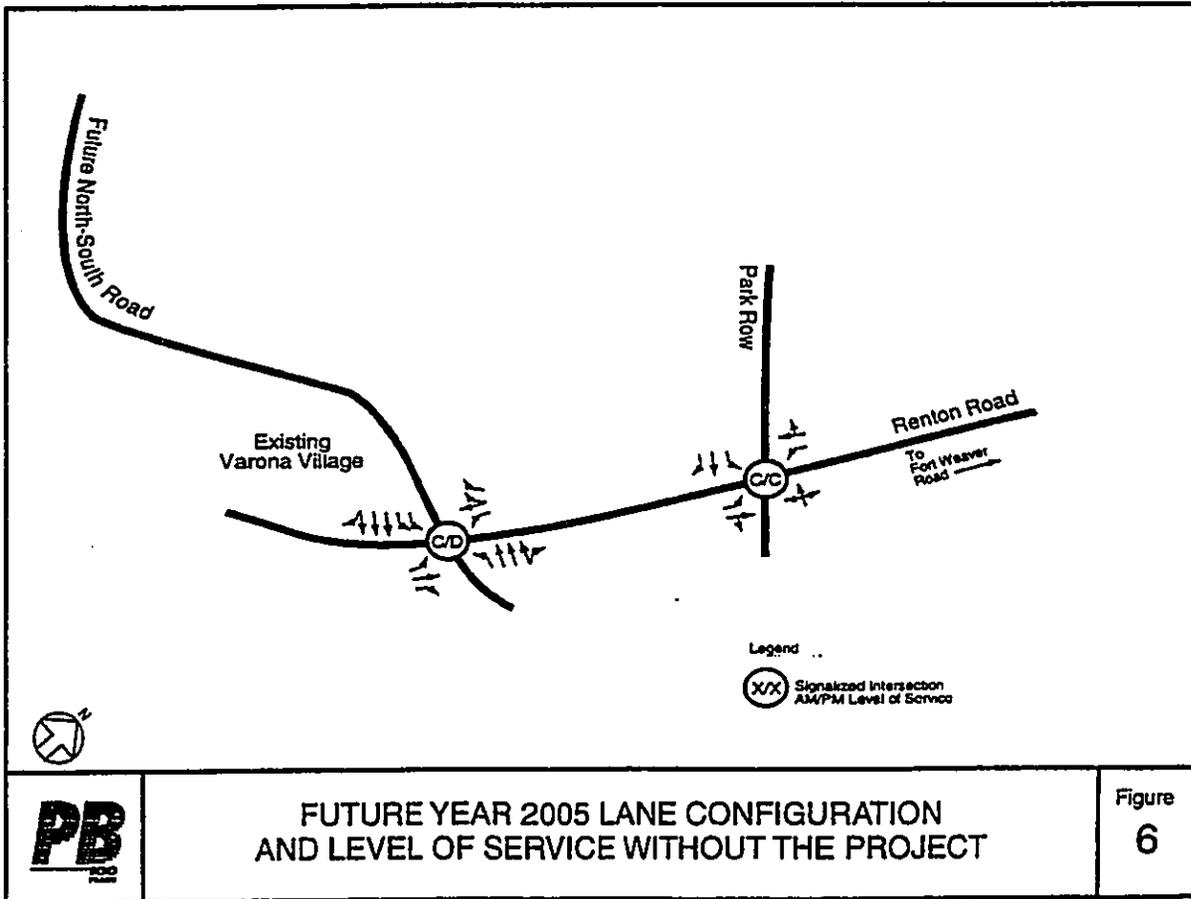
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signalized intersection, it is expected to operate well (LOS C) during the morning and afternoon peak hours.

**Summary of Results**

The analysis results reveal that the intersections of North-South Road with Renton Road and Renton Road with Park Row will operate acceptably as signalized intersections in year 2005 without the project. The future year 2005 traffic volumes without the project and the corresponding lane configuration and levels of service are shown in Figures 5 and 6.





#### IV. FUTURE YEAR 2005 WITH PROJECT TRAFFIC

Future year 2005 conditions with project traffic is estimated by adding trips generated by the proposed project onto the base year 2005 traffic forecasts. This scenario is compared with the base year 2005 scenario described in the previous section to determine the relative impact of the development.

##### Project Traffic

The Varona Village Phase II development consists of three areas of development: Area E, Varona Village Expansion Area, and Makal Area. Area E is approximately 25 acres in size and is expected to contain 252 dwelling units. Varona Village Expansion Area is approximately 27 acres in size and is expected to contain 157 dwelling units. And Makal Area (approximately 9 acres) is expected to contain 110 dwelling units.

Project traffic is developed by the three step method of trip generation, trip distribution and traffic assignment.

##### Trip Generation

Trip generation estimates the number of vehicular trips that a project generates. To estimate trips generated by the proposed development, trip generation rates published by the Institute of Transportation Engineers (ITE) in Trip Generation, Fifth Edition, were used. The trip generation is summarized in Table 1.

FUTURE YEAR 2005 LANE CONFIGURATION  
AND LEVEL OF SERVICE WITHOUT THE PROJECT

Figure  
6

**Table 1. Trip Generation**

LAND USE	QUANTITY	UNIT	AM PEAK HOUR			PM PEAK HOUR				
			RATE	TRIPS IN	TRIPS OUT	RATE	TRIPS IN	TRIPS OUT		
			(VPH)	(VPH)	(VPH)	(VPH)	(VPH)	(VPH)		
Area E										
multi-family	210	units	0.44	92	16	76	0.55	116	77	39
single family	42	units	0.74	31	6	23	1.01	42	27	15
Varona Village Expansion Area										
single family	157	units	0.74	116	30	86	1.01	159	103	56
Makai Area										
multi-family	110	units	0.44	48	8	40	0.55	61	40	21
<b>TOTAL</b>	<b>519</b>	<b>units</b>		<b>287</b>	<b>62</b>	<b>225</b>		<b>378</b>	<b>247</b>	<b>131</b>

Note: VPH = vehicles per hour  
 RATE = vehicular trips per hour per unit

**Trip Distribution**

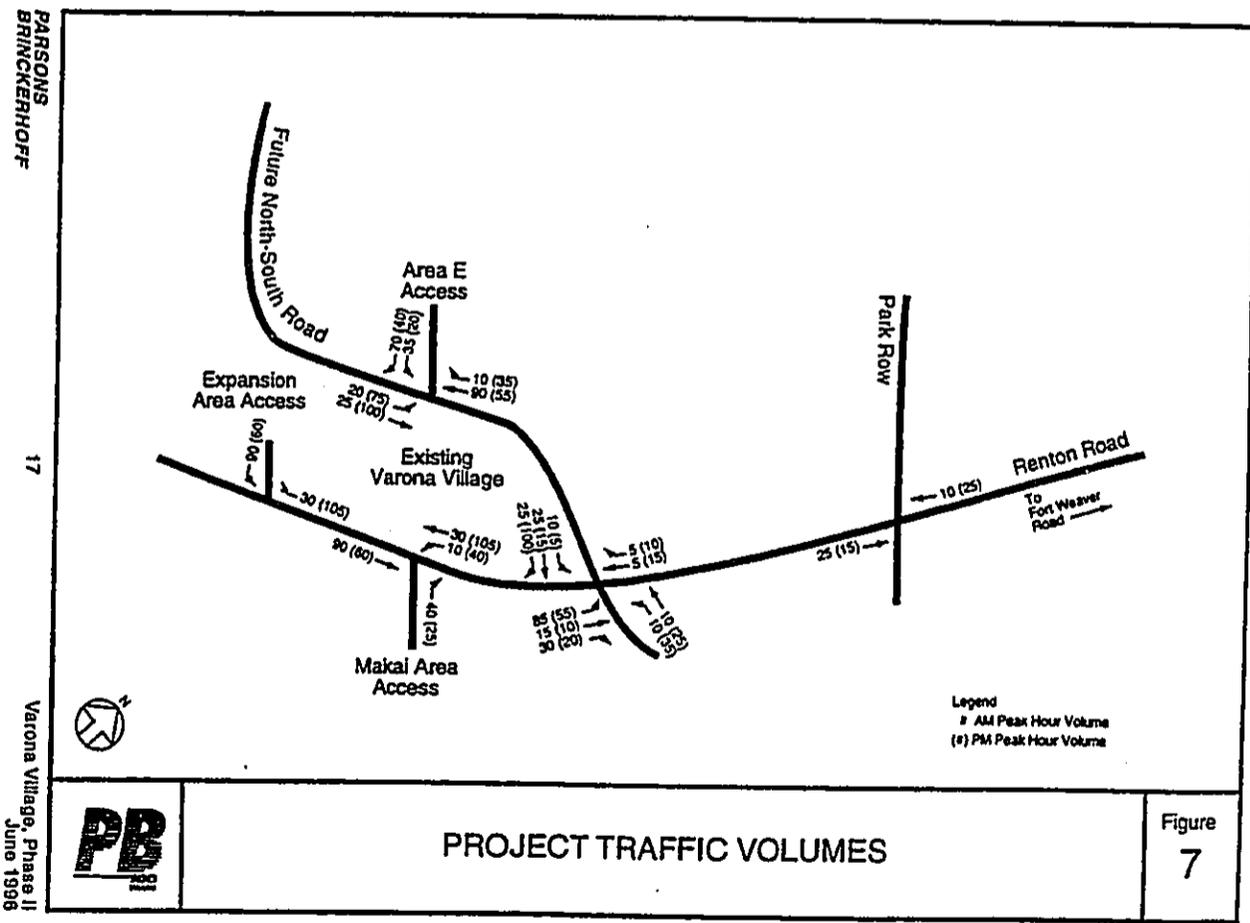
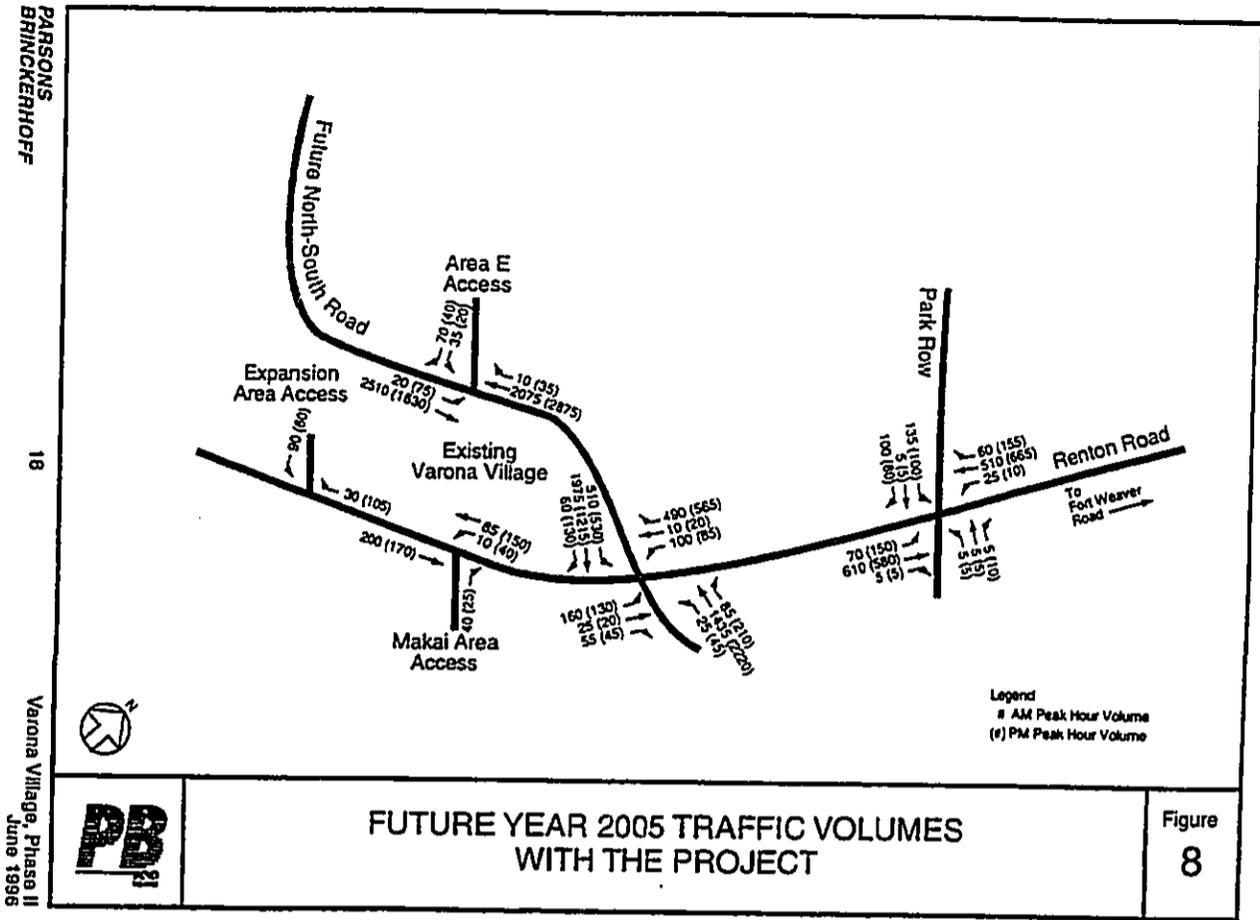
Trip distribution estimates where trips generated by the project originate from and are destined to. Trip distribution of the project traffic is based on traffic counts taken at the intersection of Fort Weaver Road and Kolowaka Drive in year 1992 which yielded a distribution of 75% to/from the north (H-1 freeway and Farrington Highway) and 25% to/from the south (Ewa Beach, Iroquois Point). This count was used because it was the only access for a residential community (Ewa by Gentry) and would therefore be representative of the distribution of this project's traffic.

**Traffic Assignment**

Traffic assignment is the process that estimates which particular roadways project generated traffic are expected to use. Traffic assignment is based on the most probable route to a destination or from an origin.

The project generated traffic was primarily assigned to the North-South Road due to its proximity to the project. A small percentage of the project traffic

was assigned to Fort Weaver Road via Renton Road to account for school related trips and a portion of trips to/from Central Oahu. Figure 7 shows the project generated traffic assignment. The project generated traffic was added to the base year 2005 traffic volumes to determine the future year 2005 with project traffic volumes. These volumes are shown in Figure 8.



### **Intersection Analysis**

#### **North-South Road and Renton Road Intersection**

The analysis results indicate that the intersection will operate acceptably, at the same level of service as the without project case, (LOS C and D) during the morning and afternoon peak hours.

#### **Renton Road and Paik Row Intersection**

The analysis results indicate that the intersection will operate well, at the same level of service as the without project case, (LOS C) during the morning and afternoon peak hours.

#### **North-South Road and Area E Access Intersection**

The analysis results indicate that the projected traffic volumes at the intersection will meet the peak hour traffic signal warrant (Warrant 11) outlined in the Manual on Uniform Traffic Control Devices (MUTCD) by year 2005. As a signalized intersection, the overall intersection will operate well, (LOS B) during the morning and afternoon peak hours.

#### **Renton Road and Varona Village Expansion Area Access Intersection**

The results of the analysis indicate that the intersection will operate very well, with little or no delays, (LOS A) for all approaches as an unsignalized intersection during both peak hours.

#### **Renton Road and Makal Area Access Intersection**

The results of the analysis indicate that the intersection will operate very well, with little or no delays, (LOS A) for all approaches as an unsignalized intersection during both peak hours.

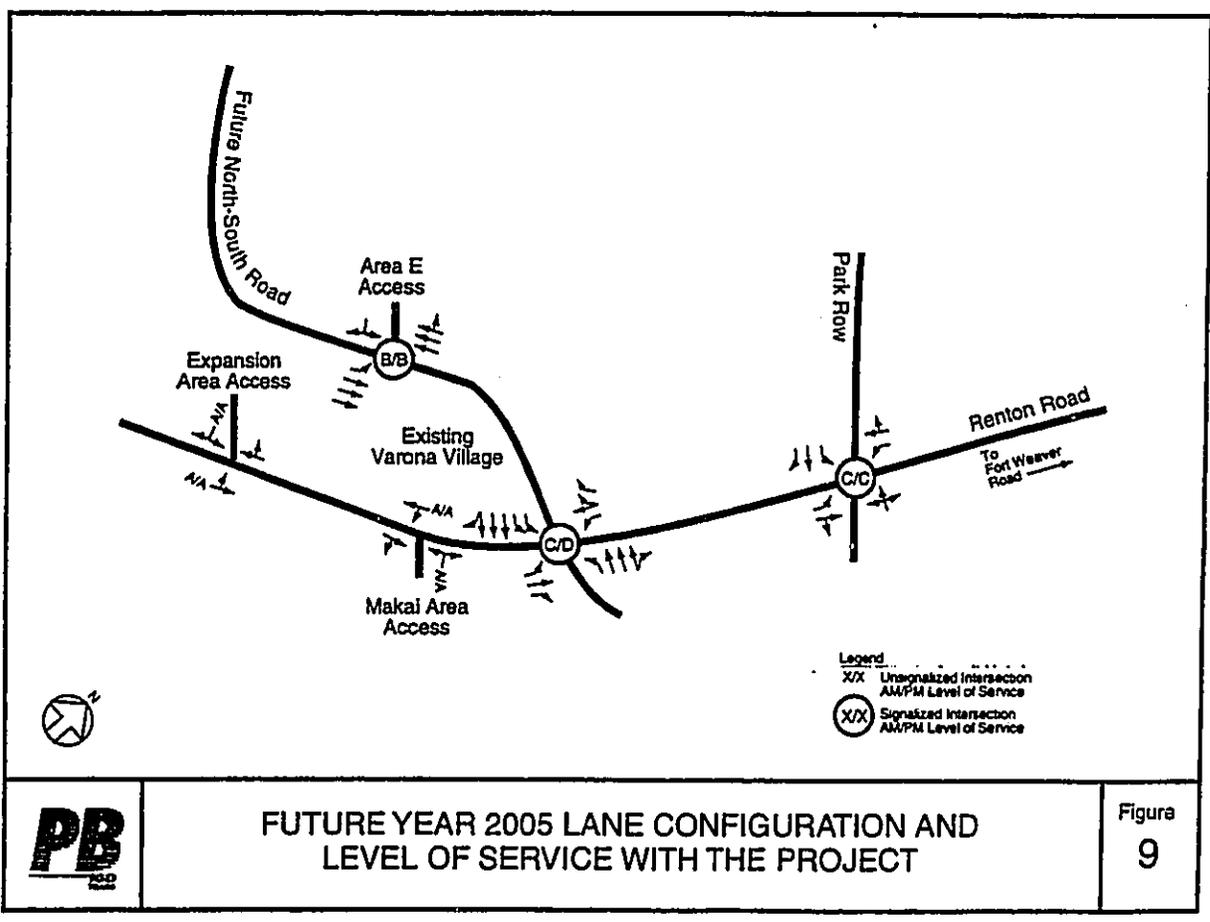
#### **Summary of Results**

The analysis results reveal that the intersections of the North-South Road with Renton Road and Renton Road with Paik Row will operate at the same level of service with the project as without the project in year 2005. The intersections of the

project accesses onto the North-South Road and Renton Road are also expected to operate very well (LOS A and B). The levels of service for future conditions with the project along with the lane configurations are shown in Figure 9. A comparison of levels of service for existing, base year, and future year with project conditions are summarized in Table 2.

**Table 2. Level-of-Service Summary**

Intersection	Existing		Future Year 2005 Without Project		Future Year 2005 With Project	
	AM	PM	AM	PM	AM	PM
Renlon Rd. and Paik Row	A	A	n/a	n/a	n/a	n/a
Renlon Rd. EB L	A	A	n/a	n/a	n/a	n/a
Renlon Rd. WB L	A	A	n/a	n/a	n/a	n/a
Park Row NB LTR	A	A	n/a	n/a	n/a	n/a
Park Row SB L	A	A	n/a	n/a	n/a	n/a
Park Row SB T	A	A	n/a	n/a	n/a	n/a
Park Row SB R	A	A	n/a	n/a	n/a	n/a
overall intersection (signalized)	n/a	n/a	C	C	C	C
North South Rd. and Renlon Rd.	n/a	n/a	C	D	C	D
overall intersection (signalized)	n/a	n/a	C	D	C	D
North South Rd. and Area E Access	n/a	n/a	n/a	n/a	n/a	B
overall intersection (signalized)	n/a	n/a	n/a	n/a	n/a	B
Renlon Rd. and Varona Vill. Exp. Area Access	n/a	n/a	n/a	n/a	A	A
Renlon Rd. EB L/T	n/a	n/a	n/a	n/a	A	A
Acc. Rd. SB L/R	n/a	n/a	n/a	n/a	A	A
Renlon Rd. and Makai Area Access	n/a	n/a	n/a	n/a	A	A
Renlon Rd. WB L/T	n/a	n/a	n/a	n/a	A	A
Acc. Rd. NB L/R	n/a	n/a	n/a	n/a	A	A
NB - northbound	L - left turn					
SB - southbound	T - through					
WB - westbound	R - right turn					
EB - eastbound	n/a - not applicable					



## V. SUMMARY AND RECOMMENDATIONS

### Summary

The City and County of Honolulu Department of Housing and Community Development proposes to develop the Varona Village Phase II project. The Varona Village Phase II project is a part of their currently developing Ewa Villages project. It will consist of three separate parcels referred to as Area E, Varona Village Expansion Area, and Makai Area located north, west and south of the existing Varona Village.

This study assumed a constructed and fully operational North-South Road and interchange with H-1 freeway. A major investment study (MIS) is currently being conducted for the North-South Road. Preliminary traffic volume forecasts for year 2020 developed for the North-South Road MIS were used to develop a base year 2005 forecast for this study. Year 2005 was selected as a horizon year since it encompasses the completion of the Varona Village Phase II development and is consistent with horizon years of planning studies in the Ewa area.

### Recommendations

#### Renton Road Intersections

The intersections of the North-South Road with Renton Road and Renton Road with Park Flow are projected to meet traffic signal warrants even without the Varona Village project. These intersections should be monitored and signalized only when warrants are met.

North-South Road will be a major north/south arterial and its intersection with Renton Road is anticipated to be a major intersection. Based on the traffic projections, provisions for a six-lane divided roadway, with channelization of intersection turning movements should be planned for the North-South Road. Provisions for separate left and right turn lanes should be planned for the Renton Road eastbound approach. The westbound approach is recommended to be

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configured with a separate left-turn lane, a shared through/right-turn lane, and an exclusive right-turn lane. The double right-turn lanes are needed to handle the large projected westbound to northbound right-turn movement at this intersection.

Based on the current traffic forecasts, it appears that Renton Road, east of the future North-South Road will need to be modified to provide the proper number of receiving lanes on eastbound Renton Road. The proposed double left-turn lanes from the southbound North-South Road would require two receiving lanes, while the existing Renton Road has only one receiving lane. Because the traffic projections used in this study are being revised to account for major changes in the proposed land use such as the relocation of the University of Hawaii West Oahu Campus site, it is recommended that a single southbound to eastbound left-turn lane be implemented for now. The intersection should be monitored, and if necessary, modifications to the eastbound Renton Road identified as part of the North-South Road MIS.

#### Varona Village Expansion and Makai Areas

The Varona Village Expansion Area and Makai Area accesses onto Renton Road will operate very well as single lane, STOP-sign controlled approaches. If Renton Road is terminated at the Varona Village Phase II development, the existing 56-foot right of way is adequate to accommodate the traffic along Renton Road. If Renton Road is planned to be extended through the City of Kapolei, it is recommended that the 82-foot right of way used for Renton Road adjacent to Tenney and Renton Villages be continued, adjacent to this project.

#### Area E Intersection

It is also projected that the access to Area E/North South Road intersection will warrant signalization in the future. The intersection should be monitored and signalized when warranted. In the interim, prior to signalization, the following are recommended: provide a median left-turn lane within the North-South Road at the Area E access intersection, and install conduits and pullboxes in anticipation of the future traffic signal.

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**Conclusion**

Traffic due to the Varona Village Phase II project will have a small impact to traffic operations at the adjacent intersections. The vehicular traffic generated by the project is expected to comprise less than 3% of the forecasted traffic along Renton Road east of the North South Road, and less than 5% of the forecasted traffic along the North South Road north of Renton Road. The anticipated levels of service with the project will be the same as the levels of service without the project. The recommendations identified above will provide for the safe and efficient traffic operations for Varona Village Phase II.

**REFERENCES**

<sup>1</sup> Transportation Research Board, National Research Council, Special Report Highway Capacity Manual, Washington D.C., 1994.

<sup>2</sup> Federal Highway Administration, Manual on Uniform Traffic Control Devices for Streets and Highways, Washington D.C., 1988.

<sup>3</sup> Institute of Transportation Engineers, 5th Edition, 1991.







HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4a 06-27-1996  
 Parsons Brinckerhoff Quade & Douglas  
 Streets: (E-W) Renton Rd  
 (N-S) North South Rd  
 Analyst: J. Imai  
 File Name: NSRENPM2.HC9  
 Area Type: Other  
 Comment: Future Year 2005 PH Peak With Project  
 5-30-96

	Eastbound		Westbound		Northbound		Southbound	
	L	R	L	R	L	R	L	R
No. Lanes	1	1	1	1	1	3	2	3
Volumes	130	20	45	85	20	565	45	2220
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vols	0	0	0	200	0	0	0	0
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	*							
Thru	*							
Right	*							
Peds	*							
WB Left		*						
Thru		*						
Right		*						
Peds		*						
NB Right			*					
WB Right			*					
Green	5.0P	2.0P	14.0P		10.0P	5.0P	49.0P	
Yellow/AR	5.0	0.0	5.0		5.0	0.0	5.0	
Cycle Length	105 secs	Phase combination order: #1 #2 #3 #5 #6 #7						

Intersection Performance Summary

Lane Group	Cap	Adj Sat	Flow	v/c	Ratio	Delay	LOS	Approach
EB L	152	1770	0.903	0.086	68.1	F	52.8	E
T	319	1863	0.066	0.171	27.7	D		
R	498	1583	0.094	0.314	19.3	C		
WB L	118	1770	0.754	0.067	52.1	E	48.2	E
TR	245	1611	0.851	0.152	49.2	E		
R	241	1583	0.813	0.152	45.4	E		
NB L	202	1770	0.232	0.114	32.3	D	48.0	E
TR	2678	5513	1.051	0.486	48.2	E		
SB L	573	3539	1.004	0.162	63.2	F	26.0	D
TR	2935	5504	0.531	0.533	12.3	B		
Intersection Delay = 39.9 sec/veh Intersection LOS = D								
Lost Time/Cycle, L = 12.0 sec Critical v/c(x) = 0.994								

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4a 05-31-1996  
 Parsons Brinckerhoff Quade & Douglas  
 Streets: (E-W) Road to Area E  
 (N-S) North South Rd  
 Analyst: J. Imai  
 File Name: ASGASW.MC9  
 Area Type: Other  
 Comment: AM Peak Future Year 2005 WITH PROJECT  
 5-31-96

	Eastbound		Westbound		Northbound		Southbound	
	L	R	L	R	L	R	L	R
No. Lanes	1	1	1	1	3	3	1	3
Volumes	1	35	78	2015	10	20	20	20
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vols	0	0	0	0	0	0	0	0
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left								
Thru								
Right								
Peds								
WB Left		*						
Thru		*						
Right		*						
Peds		*						
NB Right			*					
WB Right			*					
Green	30.0P				5.0P	33.0P		
Yellow/AR	5.0				5.0	5.0		
Cycle Length	90 secs	Phase combination order: #1 #2 #3 #4 #5 #6 #7						

Intersection Performance Summary

Lane Group	Cap	Adj Sat	Flow	v/c	Ratio	Delay	LOS	Approach
WB L	433	1770	0.866	0.210	19.3	C	20.3	C
R	187	1583	0.191	0.210	20.5	C		
SB TR	3337	5184	0.683	0.632	6.5	B	6.5	B
SB L	323	1770	0.181	0.698	6.7	B	7.5	B
T	1818	1588	0.355	0.698	7.5	B		
Intersection Delay = 6.3 sec/veh Intersection LOS = B								
Lost Time/Cycle, L = 6.0 sec Critical v/c(x) = 0.689								





Worksheet for TWC Intersection

```

Step 1: RT from Minor Street      NS      EB
-----
Conflicting Flows: (vph)          16
Potential Capacity: (pcph)       1319
Movement Capacity: (pcph)        1319
Prob. of Queue-free State:       1.00
-----
Step 2: LT from Major Street     WS      EB
-----
Conflicting Flows: (vph)          31
Potential Capacity: (pcph)       1659
Movement Capacity: (pcph)        1659
Prob. of Queue-free State:       1.00
TW Saturation Flow Rate: (pcph)  1768
RT Saturation Flow Rate: (pcph)  1768
Major LT Shared Lane Prob. of
Queue-free State:                 1.00
-----
Step 4: LT from Minor Street     WS      EB
-----
Conflicting Flows: (vph)          10
Potential Capacity: (pcph)       1010
Major LT, Minor TW Impedance Factor: 1.00
Adjusted Impedance Factor:       1.00
Capacity Adjustment Factor:       1.00
Prob. of Impeding Movement:      1.00
Movement Capacity: (pcph)        1010
  
```

Intersection Performance Summary

```

Movement v/c/sat MovCap SatCap Avg.Total Delay LOS Delay By App
-----
NS L 105 1011 1011 2.2 A 1.9
NS R 1 1319 1319 2.2 A 1.9
NS L 1 1659 1659 2.2 A 0.7
  
```

Intersection Delay = 2.6

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

File Name ..... WASHDC.MCS  
 Etcetera: (M-2) Road to Veterans Hill (E-W) Easton Road  
 Major Street Direction..... SW  
 Length of Time Analyzed... 60 (min)  
 Analyst..... J. Paul  
 Date of Analysis..... 5/18/76  
 Other Information..... PM Peak Future Year 2015 WITH PROJECT

Two-Way Stop-Controlled Intersection

	Eastbound				Westbound				Northbound				Southbound			
	L	T	R	A	L	T	R	A	L	T	R	A	L	T	R	A
No. Lanes	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Stop/7510																
Volume	1	1	1	1	1	105										
PH	.95	.95	.95	.95	.95	.95										.95
Grade	0	0	0	0	0	0										0
MC's (1)	0	0	0	0	0	0										0
SURV's (1)	0	0	0	0	0	0										0
CV's (1)	0	0	0	0	0	0										0
PC's	1.1	1.1	1.1	1.1	1.1	1.1										1.1

Adjustment Factors

Vehicle Movement	Critical Gap (s)	Follow-up Time (s)
Left Turn Major Road	5.00	2.10
Right Turn Major Road	5.50	2.60
Through Traffic Minor Road	6.00	3.10
Left Turn Minor Road	6.50	3.60

Worksheet for TWC Intersection

Step 1: RT from Minor Street	50	85
Conflicting Flows: (vph)		51
Potential Capacity: (pcph)		1100
Movement Capacity: (pcph)		1100
Prob. of Queue-Free State:		1.00
Step 2: LT from Major Street	40	85
Conflicting Flows: (vph)		105
Potential Capacity: (pcph)		1526
Movement Capacity: (pcph)		1526
Prob. of Queue-Free State:		1.00
TM Saturation Flow Rate: (pcphpl)		1700
RT Saturation Flow Rate: (pcphpl)		
Major RT Shared Lane Prob. of Queue-Free State:		1.00
Step 4: LT from Minor Street	30	85
Conflicting Flows: (vph)		51
Potential Capacity: (pcph)		1100
Major RT, Minor TM		
Precedence Factors:		1.00
Adjusted Impedance Factors		1.00
Capacity Adjustment Factor due to Impeding Movements		1.00
Movement Capacity: (pcph)		982



Worksheet for TSC Intersection

Step 1: RT from Minor Street 30 28  
 Conflicting Flows (vph) 100  
 Potential Capacity (pcph) 1096  
 Movement Capacity (pcph) 1096  
 Prob. of Queue-Free State: 0.95

Step 3: LT from Major Street 22 28  
 Conflicting Flows (vph) 200  
 Potential Capacity (pcph) 1375  
 Movement Capacity (pcph) 1375  
 Prob. of Queue-Free State: 0.99  
 RT Saturation Flow Rate: (pcph) 1700  
 Major LT Shared Lane Prob. of Queue-Free State: 0.99

Step 4: LT from Minor Street 30 28  
 Conflicting Flows (vph) 100  
 Potential Capacity (pcph) 116  
 Major LT, Minor RT Impedance Factor: 0.99  
 Adjusted Impedance Factor: 0.99  
 Capacity Adjustment Factor due to Impeding Movement: 0.99  
 Movement Capacity (pcph) 109

Intersection Performance Summary

Movement	FlowRate (vph)	MaxCap (vph)	SharedCap (vph)	Avg. Delay (s)	LCR	Delay by App.
RT L	1	707	0	0	0	3.5
RT R	66	1096	1003	2.5	A	3.5
RT L	12	1375	2.6	A	0.1	

Intersection Delay = 0.7

File Name: MCDATP.MCI  
 Streets: (R-3) Road to Nohel Area (E-W) Rendon Road  
 Major Street Direction: EW  
 Length of Time Analyzed: 60 (min)  
 Analyst: J. Ing  
 Date of Analysis: 5/13/86  
 Other Information: PM Peak Future Year 2005 (WITH PROBLEMS)

Two-way Stop-controlled Intersection

	Southbound		Westbound		Northbound		Eastbound	
	L	T	L	T	L	T	L	T
Sp. Lanes	0	1	0	1	0	0	0	0
Stop/field	0	0	0	0	0	0	0	0
Volume	170	11	10	150	1	1	1	1
PMF	.95	.95	.95	.95	.95	.95	.95	.95
Grade	0	0	0	0	0	0	0	0
MC's (H)	0	0	0	0	0	0	0	0
SI/MI's (H)	0	0	0	0	0	0	0	0
CV's (H)	0	0	0	0	0	0	0	0
PCV's	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1

Adjustment Factors

Vehicle Movement	Critical Gap (s)	Cellgroup Time (s)
Left Turn Major Road	5.00	3.10
Right Turn Major Road	5.50	3.10
Through Traffic Minor Road	6.00	3.10
Left Turn Minor Road	6.50	3.10

Worksheet for TSC Intersection

Step 1: RT from Minor Street	79	28
Conflicting Flows: (vph)	170	
Potential Capacity: (pcph)	1336	
Movement Capacity: (pcph)	1336	
Prob. of Queue-free State:	0.97	
Step 2: LT from Major Street	78	28
Conflicting Flows: (vph)	171	
Potential Capacity: (pcph)	1321	
Movement Capacity: (pcph)	1321	
Prob. of Queue-free State:	0.97	
TM Saturation Flow Rate: (pcph/s)	1700	
RT Saturation Flow Rate: (pcph/s)		
Major LT Shared Lane Prob. of Queue-free State:	0.96	
Step 3: LT from Minor Street	90	29
Conflicting Flows: (vph)	310	
Potential Capacity: (pcph)	655	
Major LT, Minor TM		
Impedance Factor:	0.96	
Adjusted Impedance Factor:	0.96	
Capacity Adjustment Factor due to Impeding Movement	0.96	
Movement Capacity: (pcph)	621	

12 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100





most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.

**LEVEL OF SERVICE B:** This level describes operation with delays in the range of 5.1 to 15.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than at Level of Service A, causing higher delays.

**LEVEL OF SERVICE C:** This level describes operations with delays in the range of 15.1 to 25.0 seconds per vehicle. These higher delays may result from fair progression and/or cycle lengths. Individual cycle failures (queued vehicles do not clear in one cycle) may begin to appear as the number of vehicles stopping is significant; many vehicles, however, still pass through the intersection without stopping.

**LEVEL OF SERVICE D:** This level describes operations with delays in the range of 25.1 to 40.0 seconds per vehicle. At Level of Service D, the influence of congestion becomes more noticeable. Longer delays may result from a combination of unfavorable congestion, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

**LEVEL OF SERVICE E:** This level describes operation with delays in the range of 40.1 to 60.0 seconds per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.

**LEVEL OF SERVICE F:** This level describes operation with delay in excess of 60.0 seconds per vehicle. A symptom is a long vehicle queue on the approach with LOS F operations. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at v/c ratios below 1.00 with many individual cycle failures. Poor progression and long cycle length may also be major contributing causes to such delay levels.

## APPENDIX C

### ANALYSIS WORKSHEETS

File Name ..... RENPKAL.HCO  
 Streets: (N-S) Park Row (E-W) Renton Road  
 Major Street Direction... EW  
 Length of Time Analyzed... 60 (min)  
 Analyst..... J. Imai  
 Date of Analysis..... 5/15/96  
 Other Information..... AM Peak Existing

Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	0	1	0	0	1	1
Stop/Yield			N			N			1	0	1	1
Volumes	2	49	4	21	91	58	4	3	2	25	2	4
PHF	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Grade	0	0	0	0	0	0	0	0	0	0	0	0
MC's (%)	0	0	0	0	0	0	0	0	0	0	0	0
SU/RV's (%)	0	0	0	0	0	0	0	0	0	0	0	0
CV's (%)	0	0	0	0	0	0	0	0	0	0	0	0
PCE's	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn-Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	51	120
Potential Capacity: (pcph)	1305	1204
Movement Capacity: (pcph)	1305	1204
Prob. of Queue-free State:	1.00	1.00
Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	53	149
Potential Capacity: (pcph)	1617	1456
Movement Capacity: (pcph)	1617	1456
Prob. of Queue-free State:	0.99	1.00
Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	223	196
Potential Capacity: (pcph)	833	861
Capacity Adjustment Factor due to Impeding Movements	0.98	0.98
Movement Capacity: (pcph)	820	847
Prob. of Queue-free State:	1.00	1.00
Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	197	196
Potential Capacity: (pcph)	814	815
Major LT, Minor TH		
Impedance Factor:	0.98	0.98
Adjusted Impedance Factor	0.99	0.98
Capacity Adjustment Factor due to Impeding Movements	0.98	0.98
Movement Capacity: (pcph)	800	801

Intersection Performance Summary

Movement	FlowRate v(ppch)	MoveCap Cm(ppch)	SharedCap Csh(ppch)	Avg.Total Delay	LOS	Delay By App
NB L	4	800	>	>	>	A
NB T	3	820	>	4.1	>	A
NB R	2	1305	>	>	>	A
SB L	29	801		4.7	A	4.4
SB T	2	847		4.3	A	
SB R	4	1204		3.0	A	
EB L	2	1456		2.5	A	0.1
WB L	24	1617		2.3	A	0.3

Intersection Delay = 0.9

File Name ..... RENPKPI.HCO  
 Streets: (N-S) Park Row (E-W) Renton Road  
 Major Street Direction... EW  
 Length of Time Analyzed... 60 (min)  
 Analyst..... J. Imai  
 Date of Analysis..... 5/15/96  
 Other Information..... PM Peak Existing

Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	1	1	0	0	0	1	1	0	1
Stop/Yield	1	1	0	1	1	0	0	0	1	1	0	1
Volumes	3	63	1	6	78	24	1	1	1	9	35	1
PHF	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Grade	0	0	0	0	0	0	0	0	0	0	0	0
MC's (%)	0	0	0	0	0	0	0	0	0	0	0	0
SU/RV's (%)	0	0	0	0	0	0	0	0	0	0	0	0
CV's (%)	0	0	0	0	0	0	0	0	0	0	0	0
PCE's	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tcf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWS Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	64	90
Potential Capacity: (pcph)	1285	1247
Movement Capacity: (pcph)	1285	1247
Prob. of Queue-free State:	0.99	1.00
Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	64	102
Potential Capacity: (pcph)	1598	1533
Movement Capacity: (pcph)	1598	1533
Prob. of Queue-free State:	1.00	1.00
Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	174	163
Potential Capacity: (pcph)	884	896
Capacity Adjustment Factor due to Impeding Movements	0.99	0.99
Movement Capacity: (pcph)	878	890
Prob. of Queue-free State:	1.00	1.00
Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	166	168
Potential Capacity: (pcph)	849	846
Major LT, Minor TH Impedance Factor:	0.99	0.99
Adjusted Impedance Factor:	0.99	0.99
Capacity Adjustment Factor due to Impeding Movements	0.99	0.99
Movement Capacity: (pcph)	840	835

Intersection Performance Summary

Movement	FlowRate v (pcph)	MoveCap Cm (pcph)	SharedCap Csh (pcph)	Avg.Total Delay	LOS	Delay By App
NB L	1	840	>	>	>	A
NB T	1	878	>	3.1	>	A
NB R	10	1285	>	>	>	3.1
SB L	41	835		4.5	A	4.3
SB T	1	890		4.0	A	
SB R	6	1247		2.9	A	
EB L	3	1533		2.4	A	0.1
WB L	7	1598		2.3	A	0.1

Intersection Delay = 1.0

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4a 06-27-1996  
 Parsons Brinckerhoff Quade & Douglas  
 Streets: (E-W) Renton Rd (N-S) North South Rd  
 Analyst: J. Imai File Name: NSREN2A.HC9  
 Area Type: Other 5-30-96  
 Comment: Future Year 2005 AM Peak Without Project

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	1	3	3	2	3	3
Volumes	75	10	25	100	5	490	15	1425	85	500	1950	35
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vols	0	0	0	0	0	0	0	0	0	0	0	0
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Phase Combination 1 2 3 4 5 6 7 8  
 EB Left \* \* \* \* \*  
 Thru \* \* \* \* \*  
 Right \* \* \* \* \*  
 Peds \* \* \* \* \*  
 WB Left \* \* \* \* \*  
 Thru \* \* \* \* \*  
 Right \* \* \* \* \*  
 Peds \* \* \* \* \*  
 NB Right \* \* \* \* \*  
 SB Right \* \* \* \* \*  
 Green 5.0P 5.0P 15.0P 5.0P 10.0P 30.0P  
 Yellow/AR 5.0 0.0 5.0 5.0P 10.0P 30.0P  
 Cycle Length: 90 secs Phase combination order: #1 #2 #3 #5 #6 #7

Intersection Performance Summary

Lane Group:	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach:
EB L	138	0.574	0.078	34.6	D	29.5 D
EB T	352	0.031	0.189	22.6	C	
EB R	475	0.055	0.300	17.0	C	
WB L	236	0.445	0.133	28.2	D	23.6 C
WB TR	389	0.403	0.244	22.0	C	
NB L	387	0.395	0.244	22.0	C	
NB TR	138	0.116	0.078	29.4	D	24.7 C
SB TR	1969	0.888	0.356	24.6	C	
SB L	668	0.811	0.189	31.8	D	21.8 C
SB TR	2600	0.884	0.467	19.5	C	

Intersection Delay = 23.1 sec/veh Intersection LOS = C  
 Lost Time/Cycle, L = 12.0 sec Critical v/c(x) = 0.706

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4a 06-27-1996  
 Parsons Brinckerhoff Quade & Douglas  
 Streets: (E-W) Renton Rd (N-S) North South Rd  
 Analyst: J. Imai File Name: NSREN2P2.HC9  
 Area Type: Other 5-30-96  
 Comment: Future Year 2005 PM Peak Without Project

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	1	3	3	2	3	3
Volumes	75	15	40	85	5	555	10	2195	210	525	1200	30
Lane Width	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
RTOR Vols	0	0	0	0	0	0	0	0	0	0	0	0
Lost Time	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

Phase Combination 1 2 3 4 5 6 7 8  
 EB Left \* \* \* \* \*  
 Thru \* \* \* \* \*  
 Right \* \* \* \* \*  
 Peds \* \* \* \* \*  
 WB Left \* \* \* \* \*  
 Thru \* \* \* \* \*  
 Right \* \* \* \* \*  
 Peds \* \* \* \* \*  
 NB Right \* \* \* \* \*  
 SB Right \* \* \* \* \*  
 Green 5.0P 2.0P 14.0P 10.0P 5.0P 49.0P  
 Yellow/AR 5.0 0.0 5.0 5.0P 10.0P 49.0P  
 Cycle Length: 105 secs Phase combination order: #1 #2 #3 #5 #6 #7

Intersection Performance Summary

Lane Group:	Adj Sat Flow	v/c Ratio	g/c Ratio	Delay	LOS	Approach:
EB L	152	0.521	0.086	37.5	D	30.7 D
EB T	319	0.050	0.171	27.6	D	
EB R	498	0.084	0.314	19.3	C	
WB L	118	0.754	0.067	52.1	E	44.6 E
WB TR	243	0.775	0.152	42.3	E	
NB L	241	0.788	0.152	43.3	E	
NB TR	202	0.054	0.114	31.5	D	44.5 E
SB TR	2678	1.040	0.486	44.6	F	
SB L	573	0.995	0.162	61.1	F	25.9 D
SB TR	2971	0.480	0.533	11.8	B	

Intersection Delay = 37.3 sec/veh Intersection LOS = D  
 Lost Time/Cycle, L = 12.0 sec Critical v/c(x) = 0.938

# **VARONA VILLAGE PHASE II**

## **APPENDIX E**

### **Engineering Report**

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PRELIMINARY ENGINEERING REPORT  
FOR  
VARONA VILLAGE, PHASE II

Prepared for:  
Department of Housing and Community Development  
City and County of Honolulu

Prepared by:  
Engineering Concepts, Inc.  
250 Ward Avenue, Suite 206  
Honolulu, Hawaii 96814

August 1996

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**PRELIMINARY ENGINEERING REPORT  
FOR  
VARONA VILLAGE, PHASE II**

**INTRODUCTION**

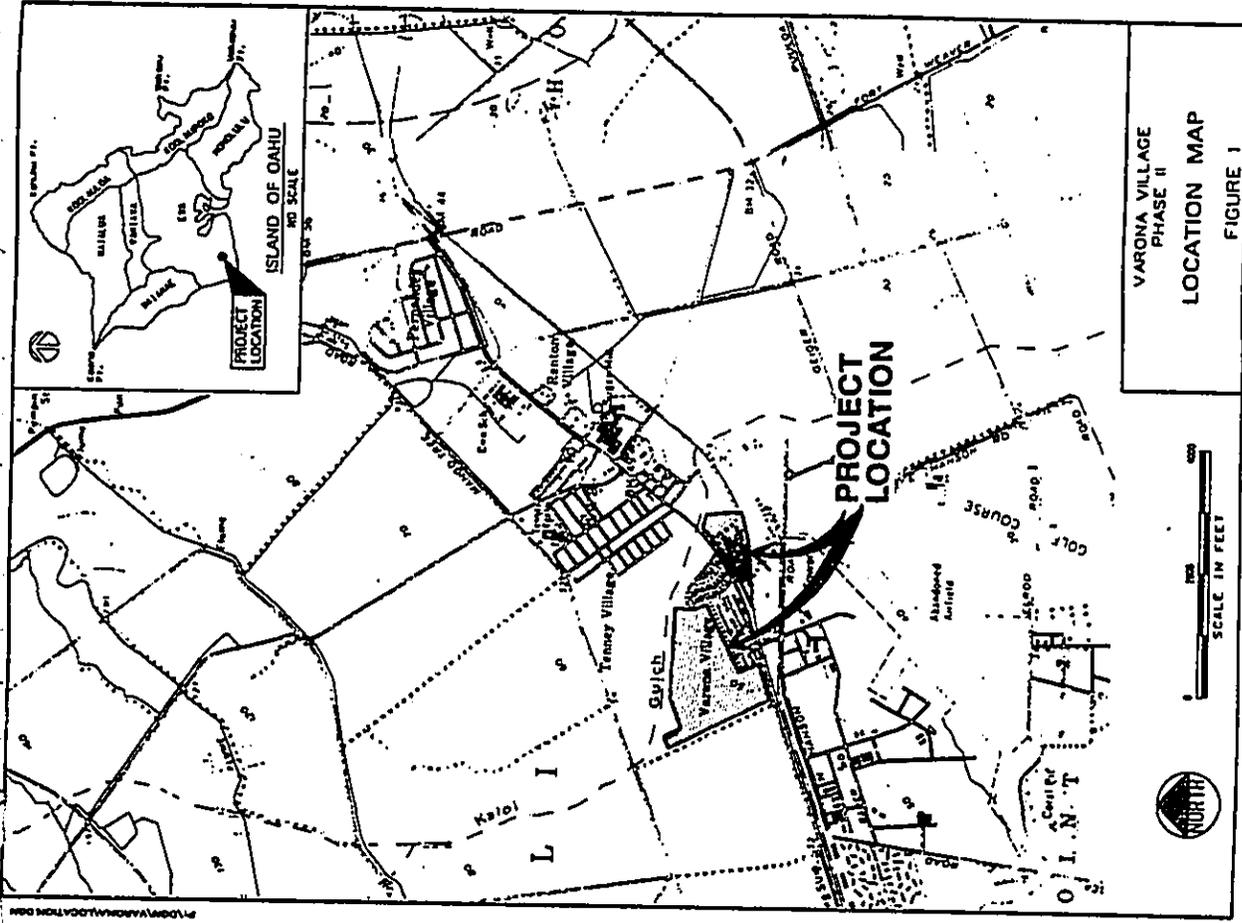
The Varona Village, Phase II Master Plan area is comprised of three development areas, encompassing approximately 61 acres (see Figures 1 and 2):

	<u>Acres</u>
Area E	25
Varona Village Expansion Area	27
Makai Area	<u>9</u>
Total	61

Area E, situated between the Ewa Villages Golf Course to the north and the proposed North-South Road to the south, is intended for residential development. Approximately 124 single family or 252 multi-family residential units could be developed at this site, or a combination of the two types of residences. In addition, an access road to serve the golf course driving range and maintenance facility may also be constructed within this development area.

The Varona Village Expansion Area is located immediately north and west of the existing Varona Village community. The development area is also bounded by the proposed North-South Road to the north, a 75-ft wide Hawaiian Electric Company 138 kV power line easement to the west, and the OR&L railroad right-of-way to the south. Approximately 170 single family residential units are planned for this development area. The Expansion Area is intended to be an extension of the existing Varona Village, designed to incorporate many of the features of old plantation style neighborhoods.

The Makai Area is situated southeast of the existing Varona Village community, beyond Renton Road. The OR&L railroad right-of-way is located to the south, and Kaiol Gulch is located to the northeast. The Makai Area is planned for community





region varies from the high 60's (degrees Fahrenheit) to the low 90's. Rainfall is light, with median annual rainfall of about 20 inches.

#### TOPOGRAPHIC FEATURES

Topographic features are illustrated on Figure 3 and described below.

Area E was previously graded during construction of the Ewa Villages Golf Course. The site slopes slightly, with an elevation of about 60 ft at the golf course maintenance facility (western boundary) to approximately 54 ft at the eastern tip.

The Varona Village Expansion Area also slopes slightly in a west to east direction. Elevations range from about 54 ft at the western corner fronting the proposed North-South Road to about 45 ft at the eastern boundary with the existing Varona Village.

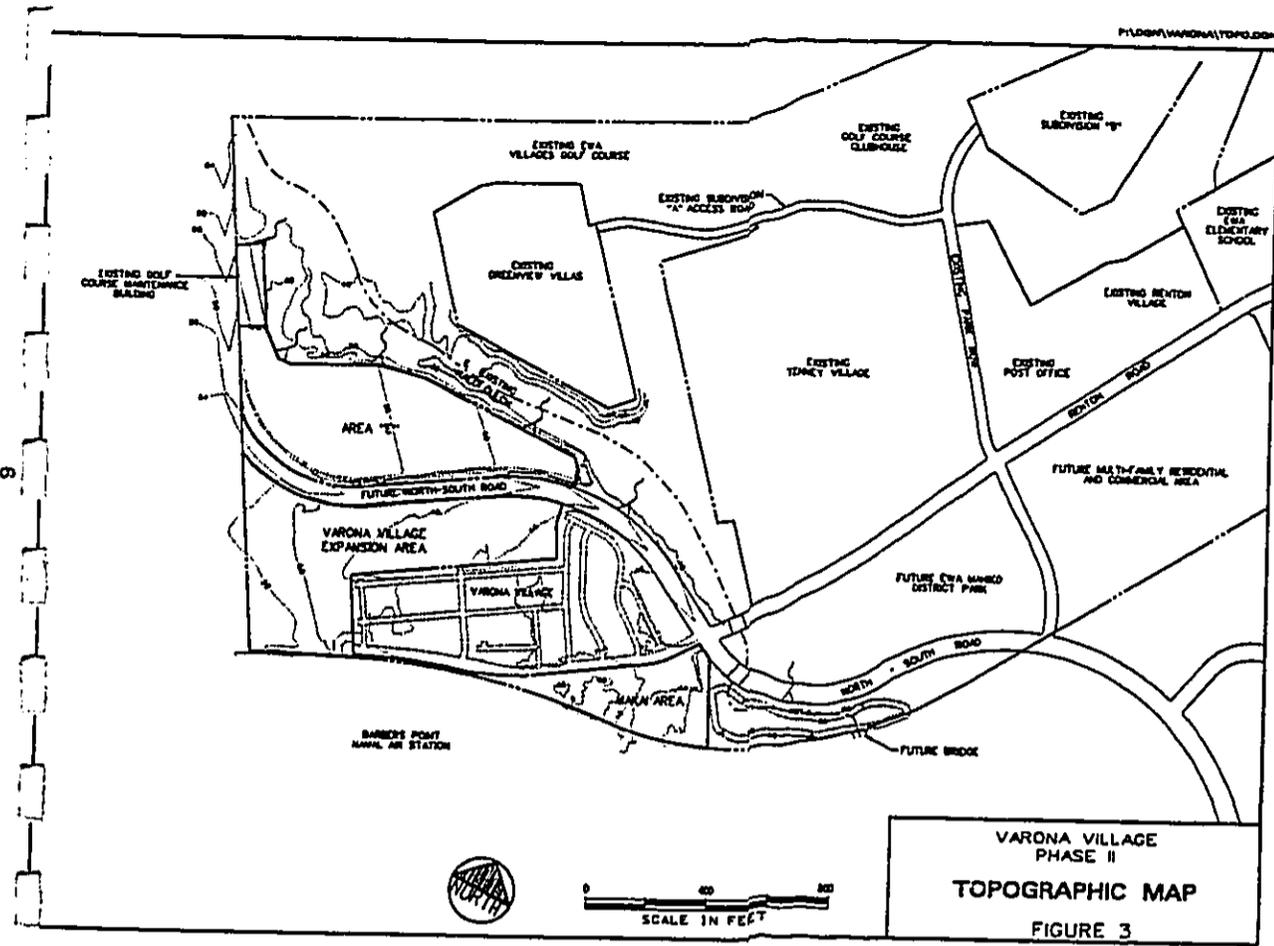
Topographic elevations within the Makai Area extend from 48 ft at the western corner to about 41 ft at the eastern end, fronting Kaloi ditch.

#### SOILS

Soil types within the project site are identified in the U.S. Department of Agriculture, Soil Conservation Service, *Soil Survey*. These soil types include:

- Honouliuli clay, 0-2 percent slopes (HxA)
- Mamala stony silty clay loam, 0-12 percent slopes (MnC)

Both of the Honouliuli and Mamala soil series include well-drained soils which developed in alluvium along the coastal plains of Oahu and have been used for sugarcane, truck crops, orchards and pasture. The HxA soil type is characterized as having moderately slow permeability, slow runoff potential and slight erosion hazard. MnC is characterized as having moderate permeability, very slow to medium runoff potential, and slight to moderate erosion hazard.



## DRAINAGE

### EXISTING CONDITIONS

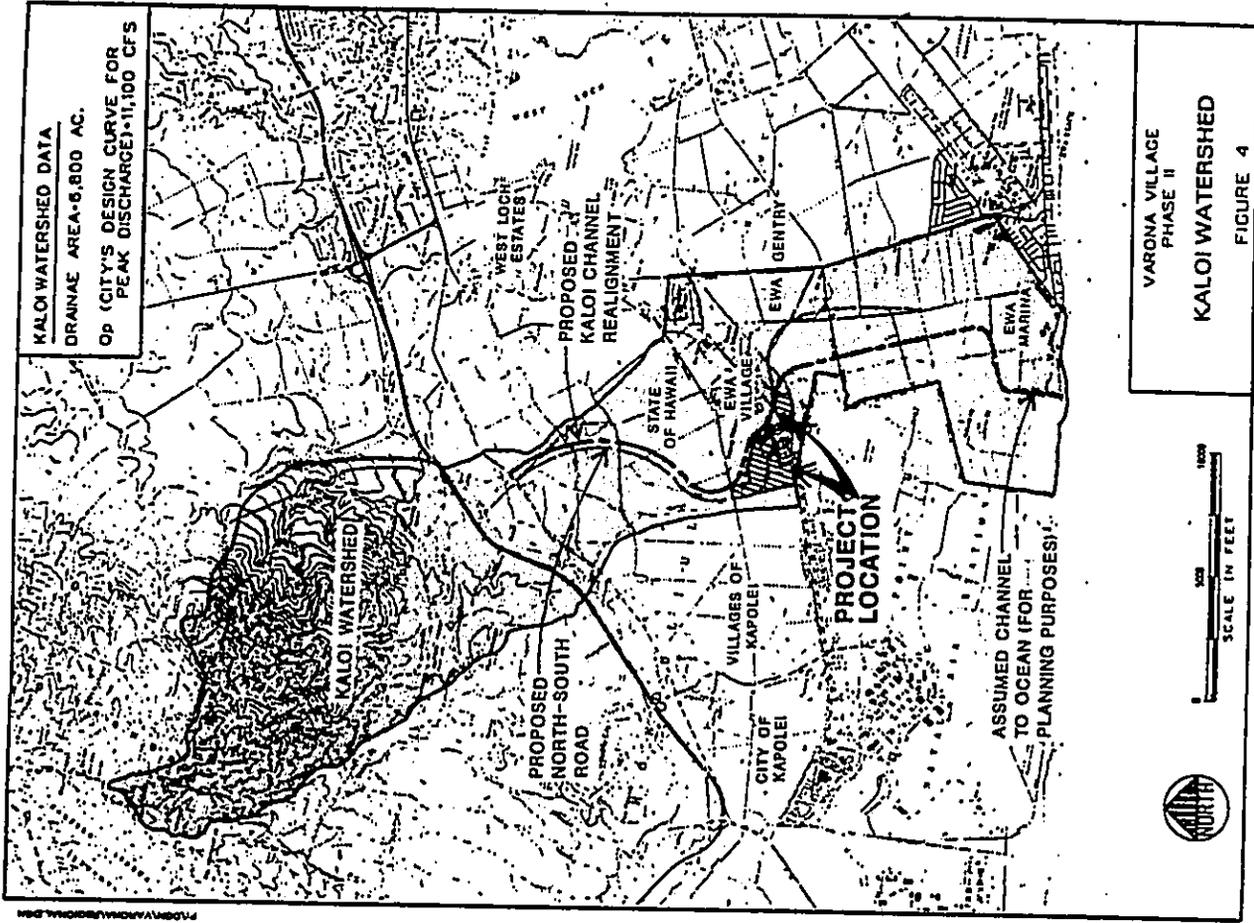
The project sites fall within the Kaloï watershed, a drainage basin encompassing approximately 11 square miles. The watershed extends from the crest of the Waianaa mountain range to the ocean (Figure 4). All of Ewa Villages, except the eastern most portion adjacent to Fort Weaver Road, falls within Kaloï watershed.

There are no existing drainage improvements within the project sites. However, drainage improvements have been, or will be installed in the adjacent developments that will also benefit this project (Figure 5). The Ewa Village golf course serves as the major drainage component of the Villages, intercepting runoff from lands mauka of the Villages. Onsite runoff from portions of the Villages is also routed by underground drainage systems to the golf course for disposal. The portion of the golf course immediately adjacent to Area E is designated as Kaloï Channel, conveying onsite runoff and runoff from the mauka areas through the Villages. Kaloï Channel continues below Ewa Villages in the form of the Ewa by Gentry golf course.

Construction plans are currently being processed for the "Ewa Villages Revitalization, Phase 9 - Varona Village Infrastructure Improvements" project. This project will install an underground drainage system that is sized to serve both the existing Varona Village and the proposed Varona Village Expansion Area. Elements of the Varona Village drainage system include catchbasins, manholes, and drainpipes within the Varona Village roadways, and a box culvert along Renton Road.

An existing detention basin, Basin No. 13, is found adjacent to the Makai Area, below Renton Road. This detention basin is a temporary feature, necessary until downstream restrictions are removed. Downstream restrictions include the culvert crossing of the railroad tracks, and the lack of adequate conveyance capacity through Ewa Marina. Haseko, developers of Ewa Marina, has objected to the discharge of runoff on to their property at a rate exceeding existing conditions. Until the culvert crossing the railroad tracks is fully improved, and until such time that Ewa Marina accepts additional runoff above existing conditions rates, full improvement of Kaloï Channel through the Villages cannot be completed. Ultimately, Basin No. 13 will be converted to the lower portion of Kaloï Channel.

7



8

**Flood Hazard**

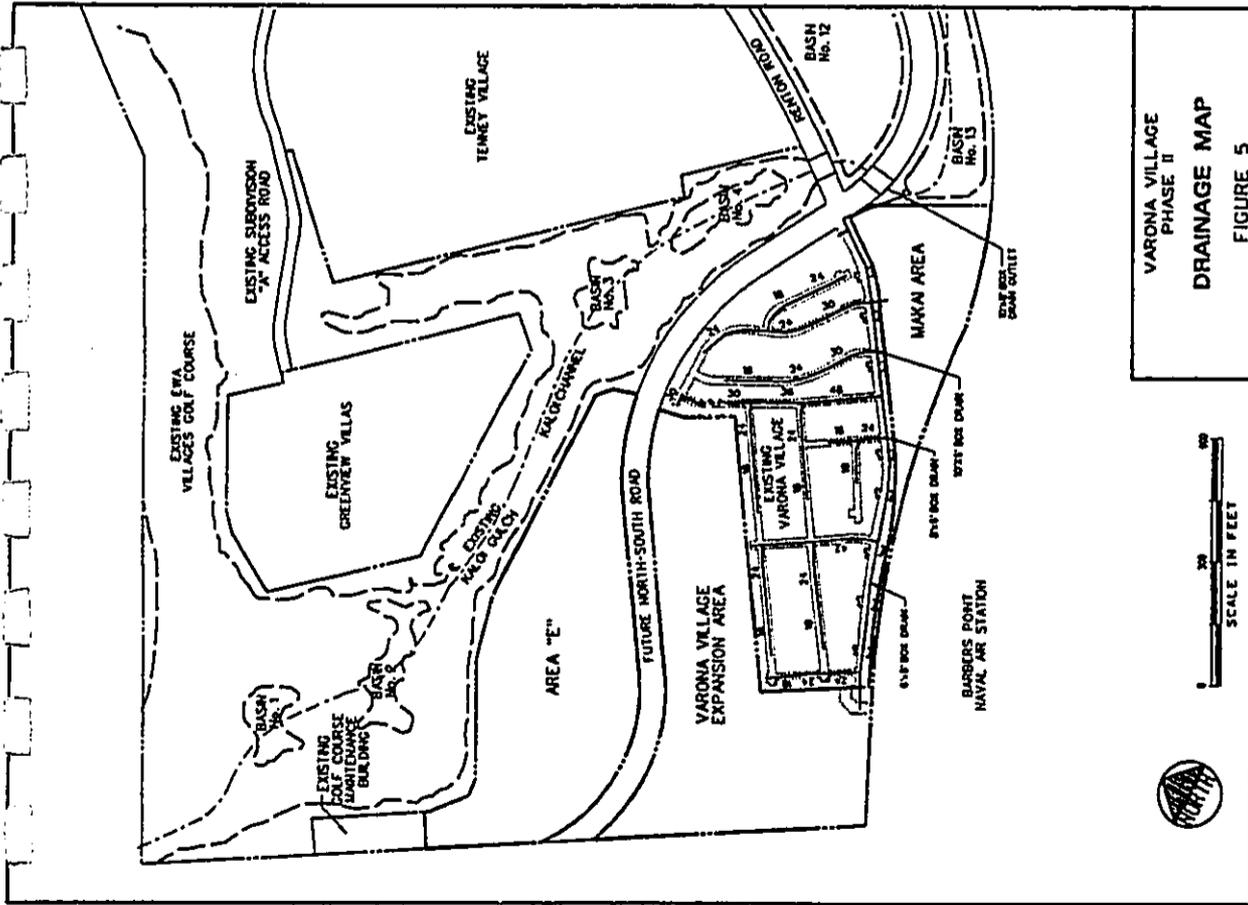
Prior to the recent golf course improvements, a significant portion of Ewa Villages was subject to inundation during moderate to heavy rainstorms. Most of the Varona Village Expansion Area and Makai Area, and all of Area E were identified as being within a flood plain by the Flood Insurance Rate Maps (FIRM) prepared by the Federal Emergency Management Administration (FEMA). Subsequent to construction of the golf course, the FIRM has been revised resulting in only the golf course and a very small portion of the Makai Area remaining in the flood plain. The portion of the Makai Area that still remains in the flood plain is immediately adjacent to temporary Basin No. 13. The remaining areas of the Villages have been removed from the flood plain, relieving the existing neighborhood of flooding and allowing development of the remaining vacant sites.

**Runoff**

Runoff for the three sites, as well as runoff from an offsite area west of the Varona Village Expansion area were calculated for existing conditions for both the 10-year and 50-year storms and are listed in the table below. Calculations were based on a rainfall duration of one hour, and rainfall intensities of 1.75 inch/hour for the 10-year storm and 2.25 inch/hour for the 50-year storm.

PARCEL	ACRES	10-YR RUNOFF	50-YR RUNOFF
Area E	25	26.3 cfs	33.9 cfs
Expansion Area	27	25.9 cfs	33.3 cfs
Makai Area	9	8.8 cfs	11.3 cfs
Offsite Runoff	52	39.4 cfs	50.6 cfs

Area E, having already been mass graded, generally sheet flows in a northeasterly direction into the western portion of the golf course. Existing runoff from the Varona Village Expansion Area and the offsite areas flows overland in an easterly direction around and through the existing Varona Village. The proposed drainage



system to be constructed under the "Ewa Villages Revitalization, Phase 9 - Varona Village Infrastructure Improvements" project is designed to collect runoff from the undeveloped expansion area and convey it to Detention Basin No. 13. Runoff from the Makai area also flows generally in an easterly direction towards Basin No. 13, collecting in small sumps and depressions along the way.

**MODIFICATIONS AFTER DEVELOPMENT**

The proposed Varona Village, Phase II project will alter the character of the project's 61 acres. The vegetative cover (weeds, scrub brush and sugarcane) currently established on the site will be replaced with pavement, buildings, and landscaped yards typical of residential developments.

As a result of the proposed improvements, the rate of peak runoff for the 10-year and 50-year storms will increase. Estimated peak runoff for the developed condition is given in the table below.

<u>PARCEL</u>	<u>ACRES</u>	<u>10-YR RUNOFF</u>	<u>50-YR RUNOFF</u>
Area E	25	77.9 cfs	99.2 cfs
Expansion Area	27	72.1 cfs	103.5 cfs
Makai Area	9	24.8 cfs	31.9 cfs
Offsite Runoff	52	101.9 cfs	131.0 cfs

Peak runoff rates generated onsite are expected to increase by 2.5 to 3 times for the 10- and 50-year storms after development of the project sites. This is due to the loss of open space, creation of impervious surfaces, and the effects of a more efficient drainage system.

Drainage patterns in the onsite areas proposed for development may be altered slightly from the existing conditions due to the alignment of the proposed roads and culverts. Also, runoff from the Expansion Area will need to be distributed to match the collection points to be constructed with the Varona Village Infrastructure Improvements project.

**IMPACTS AND MITIGATION**

In general, consideration has been given to future development of Varona Village, Phase II in planning of downstream drainage facilities. Impacts on developments downstream of the project sites should be nonexistent. The project sites have been included in a drainage master plan prepared for the entire Ewa Villages. The master plan has been reviewed and accepted by the City and County of Honolulu Department of Public Works.

The onsite drainage improvements required to handle runoff from the development will consist of catchbasins, manholes, drain pipes, and culverts within the roadway system. The drainage systems will be designed in accordance with the City and County Storm Drainage Standards and will follow the criteria identified in the approved drainage master plan.

The onsite underground drainage system for a large portion of Area E will discharge directly into the golf course. A smaller drainage area will connect to the drainage system within the North-South Road.

Drainage systems designed for the Varona Village Expansion Area will connect to the proposed drainage system for the existing Varona Village. The main drainage component in Varona Village is a box culvert in Renton Road that conveys collected runoff to Kalo Channel discharging in the vicinity of the North-South Road.

The Makai Area drainage system discharges into Basin No. 13 in the interim while downstream restrictions still exist. When the downstream restrictions are removed and Kalo Channel fully constructed, the Makai Area drainage system will discharge directly into the channel.

**GRADING AND SOIL EROSION GRADING**

Grading within the three project sites will be required to provide pads for houses that facilitate drainage to the roadways. It appears that most of Area E has been mass graded as part of the golf course construction, however, additional grading for the roadways and house pads will be required. The Varona Village Expansion Area remains in a natural state, requiring mass and fine grading to accommodate roadways

and house pads. This is also true for the Makai Area, a very small portion of which remains in the flood plain adjacent to temporary Basin No. 13. It is anticipated that additional grading will be required to build up the low lying areas to allow for removal of this area from the floodplain. All grading operations will be in conformance with the applicable ordinances of the City and County of Honolulu.

#### SITE CHARACTERISTICS

Each of the three project sites were identified as individual areas for the purposes of calculating soil erosion potential. The sites represent distinct drainage areas separated by roadways or other developments.

All three of the areas are currently vacant but are planned for residential and/or community facilities development. Runoff from Area E and the Makai Area flow overland directly to the Ewa Villages golf course and/or Kaloi Channel. Runoff from the Varona Village Expansion Area will be collected by the proposed Varona Village drainage system for ultimate conveyance to Kaloi Channel.

#### CALCULATION OF SOIL EROSION POTENTIAL

The U.S. Department of Agriculture, Soil Conservation Service uses the Universal Soil Loss Equation (USLE) to estimate long term average annual soil erosion losses from sheet and rill erosion. It is used to estimate erosion on forest land, farm fields, construction/development sites, and other areas. Soil losses can be estimated for present conditions or for a future condition. The soil loss equation is--

where:

- A = RKLSCP
- A = soil loss (tons/acre/year)
- R = rainfall factor
- K = soil erodibility factor
- L = slope length factor
- S = slope gradient factor
- C = cover and management factor
- P = erosion control practice factor

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The rainfall factor (R) is based on the U.S. Soil Conservation Service (SCS) Erosion and Sediment Control Guide for Hawaii. A soil erodibility factor (K) was selected for each area after evaluating the U.S. Department of Agriculture Soil Survey and City and County of Honolulu Soil Erosion Standards and Guidelines. The K values for the site are based on the weighted average of all K values for soil types in each area. The cover and management factor (C) is also based on a weighted average for C values within each area and was recalculated accordingly to reflect conditions after development of each site. Both R and K factors will remain the same for the site before and after the proposed project is constructed.

The slope length factor (L) and slope gradient factor (S) are combined into an LS factor for calculations. Each subarea has different factors to reflect the differences in topography. The LS factor decreased after development, because site grading and construction of an underground drainage system is expected to reduce slope and length of overland flow.

#### Existing Soil Erosion Potential

The existing soil erosion potential for the three areas were estimated using the USLE and are as follows:

Area	R	K	LS	C	P	A	Tons/Year
Area E	200	0.28	0.20	0.15	1	1.7	43.0
Exp. Area	200	0.22	0.20	0.15	1	1.3	34.3
Makai Area	200	0.28	0.20	0.15	1	1.7	15.1

The total estimated soil loss under existing conditions for the three sites is 92.4 tons/year.

#### Soil Erosion Potential After Development

Estimated soil loss under developed conditions for the three areas is expected to decrease from existing conditions. Soil erosion potential under developed conditions are estimated as follows:

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Area	R	K	LS	Q	P	A	Tons/Year
Area E	200	0.28	0.14	0.01	1	0.1	2.0
Exp. Area	200	0.22	0.13	0.01	1	0.1	1.6
Makai Area	200	0.28	0.13	0.01	1	0.1	1.0

The total estimated soil loss under developed conditions for the three sites is 4.6 tons/year.

**IMPACTS AND MITIGATION**  
**Long Term Impacts**

Based on the USLE, soil erosion potential at the project sites should decrease substantially after development of the proposed residential improvements. This decrease in soil erosion is attributed to the reduction of erodible surfaces (increase in buildings and pavement); reduction of length and slope of overland flow due to site grading and construction of an underground storm drainage system; and increase in landscaped area (reduction of bare ground).

**Short Term Impacts and Mitigation**

The construction of the proposed project will involve land disturbing activities that result in soil erosion. These land disturbing activities include removal of existing vegetation (clearing and grubbing) and leveling, removing and replacing soil.

Mitigation measures can be implemented to reduce short-term soil erosion. For example, limiting grading to not more than fifteen contiguous acres at a time and seeding half of the area can reduce short-term erosion potential by almost 50 percent.

Additional erosion control measures would lessen construction impacts even further. These are--

1. Minimize time of construction.
2. Retain existing ground cover until the latest date before construction.
3. Early construction of drainage control features.

4. Use of temporary sprinklers in nonactive construction areas when ground cover is removed.
5. Station water truck on site during construction period to provide for immediate sprinkling, as needed, in active construction zones (weekends and holidays included).
6. Use temporary berms and cut-off ditches, where needed, for control of erosion.
7. Thorough watering of graded areas after construction activity has ceased for the day and on weekends.
8. Sod or plant all cut and fill slopes immediately after grading work has been completed.

Grading and erosion control plans for the project sites will be prepared in compliance with Chapter 23, Revised Ordinances of Honolulu.

**WATER**

**EXISTING CONDITIONS**

The Board of Water Supply (BWS) provides potable water to the Ewa Villages area from the 228' service system. Pressure to sustain the system is planned to be maintained by the Honouliuli and Kunia 228' tanks. Source for this system is from the BWS wells in Waipahu and Honouliuli.

Maximum day demand storage for the Villages is planned to be obtained from reservoirs in Honouliuli. A 5.0 million gallon (mg) storage reservoir and a 1.0 mg head tank at the 440' elevation currently serve the system. Additional storage and transmissions facilities for this system have been planned and will be implemented as demand requires.

There are no existing water system facilities within the project sites, however, an existing 12-inch waterline is located in the proposed North-South Road corridor that runs between Area E and the Varona Village Expansion Area. In addition, construction plans for the "Ewa Villages Revitalization, Phase 9 - Varona Village Infrastructure Improvements" project include water system improvements to the existing Varona

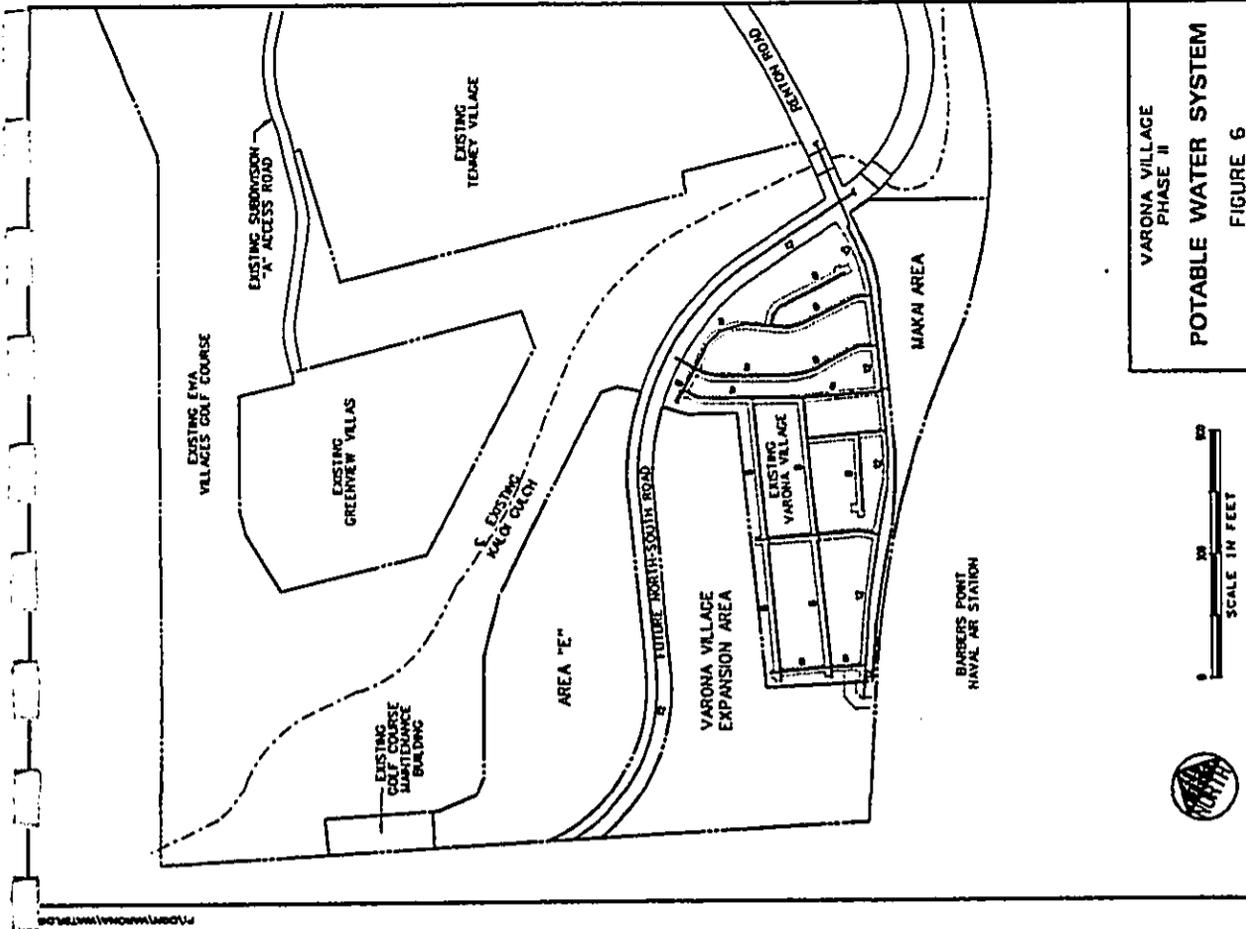
Village, including points of connection for the Varona Village Expansion Area and Makai Area (see Figure 6).

**PROJECTED WATER DEMANDS**

Additional water demands will be generated from the three development areas within the proposed Varona Village, Phase II development. The estimated water demands are based on the Water System Standards of the Board of Water Supply. A range of estimated demands for the proposed development areas are listed below. The lower values presented for Area E and the Makai Area are based on development of single family homes while the higher values are based on multi-family units. If a combination of single family and multi-family homes are developed, the estimated water demands will fall between the upper and lower values. Only single family homes are proposed for the Varona Village Expansion Area. The project area was included in the *Ewa Villages Water Master Plan* prepared by R. M. Towill Corp. in January 1996. The master plan, which has been approved by the Board of Water Supply and is currently in the process of being updated, identified unit demands for single family developments in the Ewa Villages at 500 gals/unit and 400 gals/unit for multi-family developments. Based on these unit demands, the ranges of Average Daily Demands for the three sites are:

	AVERAGE DAILY DEMAND (MGD)	
	(Single Family)	(Multi-Family)
Area E	0.062	0.101
Varona Village Expansion Area	0.085	0.085
Makai Area	<u>0.026</u>	<u>0.044</u>
Total	0.173	0.230

Based on the above average daily demands, a maximum daily demand ranging from 0.260 mgd to 0.345 mgd is expected. Corresponding peak hour demands will range from 0.520 mgd to 0.690 mgd.



#### MODIFICATIONS AFTER DEVELOPMENT

Development of Area E will require additional water lines to be constructed. Connection to the existing 12-inch waterline in the North-South will provide Area E with its water service. Twelve-inch and 8-inch lines will be installed within the roadways to serve the subdivision.

The Varona Village Expansion Area and the Makai Area will be served by water systems connecting to the stubouts from the existing Varona Village. The stubouts are planned to be installed as part of the "Ewa Villages Revitalization, Phase 9 - Varona Village Infrastructure Improvements" project. Eight-inch waterlines in the Expansion and Makai Areas will also be installed in roadways serving the projects. However, 12-inch lines may be required in the Makai Area if multi-family units are developed.

All water system improvements will be designed in accordance with the Water System Standards and Approved Materials List and Standard Details for Water System Construction of the Board of Water Supply.

#### IMPACTS AND MITIGATION

Development of the Varona Village, Phase II project will result in additional demands being placed on the existing water system. However, consideration has been given to future development of the project in the planning of adjacent water system facilities. The project has been included in the *Ewa Villages Water Master Plan* by R.M. Towill Corp., allowing the required demands to be incorporated in the overall planning of major infrastructure components. As indicated in the master plan, offsite water facilities required by the entire Ewa Villages project are being planned and coordinated by the Department of Housing and Community Development.

#### WASTEWATER

##### EXISTING CONDITIONS

Wastewater generated from the Ewa Villages is conveyed by gravity sewer through the Ewa by Genry development to Geiger Road and the Honouliuli Wastewater Treatment Plant (WWTP).

The Honouliuli WWTP is located approximately one-half mile southeast of the proposed Makai Area development. The WWTP presently operates as a primary treatment facility with design capacity of 38 MGD. Construction will soon commence to upgrade a portion of the plant (approximately 13 MGD) to achieve secondary treatment. The present wastewater flows to the WWTP are in excess of 25 MGD, but well below the 38 MGD design capacity.

Primary treated effluent from the WWTP is disposed via the Barbers Point Ocean Outfall which has 112 MGD capacity.

#### PROJECTED WASTEWATER FLOWS

Wastewater will be generated from the three development areas within the proposed Varona Village, Phase II development. The estimated average wastewater design flow is based on the City and County Department of Wastewater Management (DWWM) Design Standards. A range of estimated contributions from the proposed development areas are listed below. The lower values presented for Area E and the Makai Area are based on development of single family homes while the higher values are based on multi-family units. If a combination of single family and multi-family homes are developed, the estimated wastewater flow will fall between the upper and lower values. Only single family homes are proposed for the Varona Village Expansion Area.

	<u>AVERAGE DESIGN FLOW RATE (GPD)</u>	
	<u>(Single Family)</u>	<u>(Multi-Family)</u>
Area E	42,160	61,488
Varona Village Expansion Area	57,800	57,800
Makai Area	<u>17,680</u>	<u>26,180</u>
Total	117,640	145,468

For planning purposes, the total average wastewater design flow rate for Varona Village, Phase II is 0.118 to 0.146 MGD. Wastewater generated at the project site is expected to be of typical domestic composition.

#### MODIFICATIONS AFTER DEVELOPMENT

Varona Village, Phase II was addressed in the *Ewa Villeges Sewerage Master Plan*, prepared by R. M. Towill Corp. in November 1995. The sewerage master plan identified the following offsite improvements in the vicinity of Varona Village, Phase II development areas:

- Construction of an 8-inch gravity sewer along the proposed North-South Road, extending from the golf course maintenance building to Renton Road. This sewer would serve Area E.
- Construction of 8-, 10- and 12-inch gravity sewers along Renton Road fronting the existing Varona Village and extending to the intersection with the proposed North-South Road. This sewer would serve the Makai Area and the Varona Village Expansion Area.
- Construction of 8-inch gravity sewers within the existing Varona Village extending from the Varona Village Expansion Area to Renton Road to convey wastewater from the expansion area to the proposed Renton Road sewer.

In addition, the following sewers would be constructed to serve other phases of the Ewa Village development, including Varona Village, Phase II:

- Construction of 12-, 18- and 21-inch gravity sewers along Renton Road extending from the North/South Road intersection, fronting Tenney Village, to Park Row Extension.
- Construction of a 24-inch gravity sewer along Park Row Extension from Renton Road to North-South Road.
- Construction of a 36-inch gravity sewer along North-South Road from Park Row Extension to an existing sewer manhole in Ewa by Gentry.

The proposed wastewater collection system adjacent to the project area is illustrated on Figure 7.

#### IMPACTS AND MITIGATION

The proposed wastewater system improvements will be designed and constructed in accordance with DWWWM Design Standards.

The *Ewa Villeges Sewerage Master Plan* references the *Ewa by Gentry-West, Utilities Master Plan* which indicates excess capacity in the receiving sewer. Therefore, negative impacts to the existing collection system are not anticipated.

Due to the excess capacity at the Honouliuli WWTP and Barber Point Ocean Outfall, it is anticipated that wastewater generated by Varona Village, Phase II can be accommodated by the existing City and County treatment and disposal facilities.

#### SOLID WASTE

Currently, the three sites are undeveloped and do not generate solid wastes.

#### PROJECTED SOLID WASTE GENERATION AND CHARACTERISTICS

The proposed project will result in generation of solid wastes during construction and after development. Construction wastes will primarily consist of vegetation, rocks and debris resulting from clearing and grubbing the site at the onset of construction. Most of these wastes will be combustible.

The typical range of per capita solid waste generation from a municipal source (residential and commercial) is 2.0 to 5.0 pounds per capita per day (lb/capita/day). Municipal solid waste generation from the proposed development is estimated to be 3 to 5 tons/day based on an average per capita generation rate of 4.0 lb/capita/day. The lower generation rate would be associated with development of only single family residential units, while the higher rate would be associated with development of higher density multi-family residential units in Area E and the Makai Area. The solid waste composition is expected to be typical for a municipal source.

**MODIFICATIONS AFTER DEVELOPMENT**

It is anticipated that refuse generated by the single family residential developments will be collected by the City and County Department of Public Works Division of Refuse Collection and Disposal. Refuse generated from multi-family residential developments and the community facilities which may be developed in the Makai Area would be serviced by private refuse collection companies.

It is estimated that municipal refuse collection from the site will necessitate 2 to 4 truck trips per collection day. This estimate is based on a manually loaded, 20 cubic yard compactor truck capable of achieving a typical compaction density of 500 pounds per cubic yard and twice a week collection service. The lower number of trips is associated with development of only single-family residential units, while development of multi-family units at Area E and the Makai Area would result in the higher number of trips.

**IMPACTS AND MITIGATION**

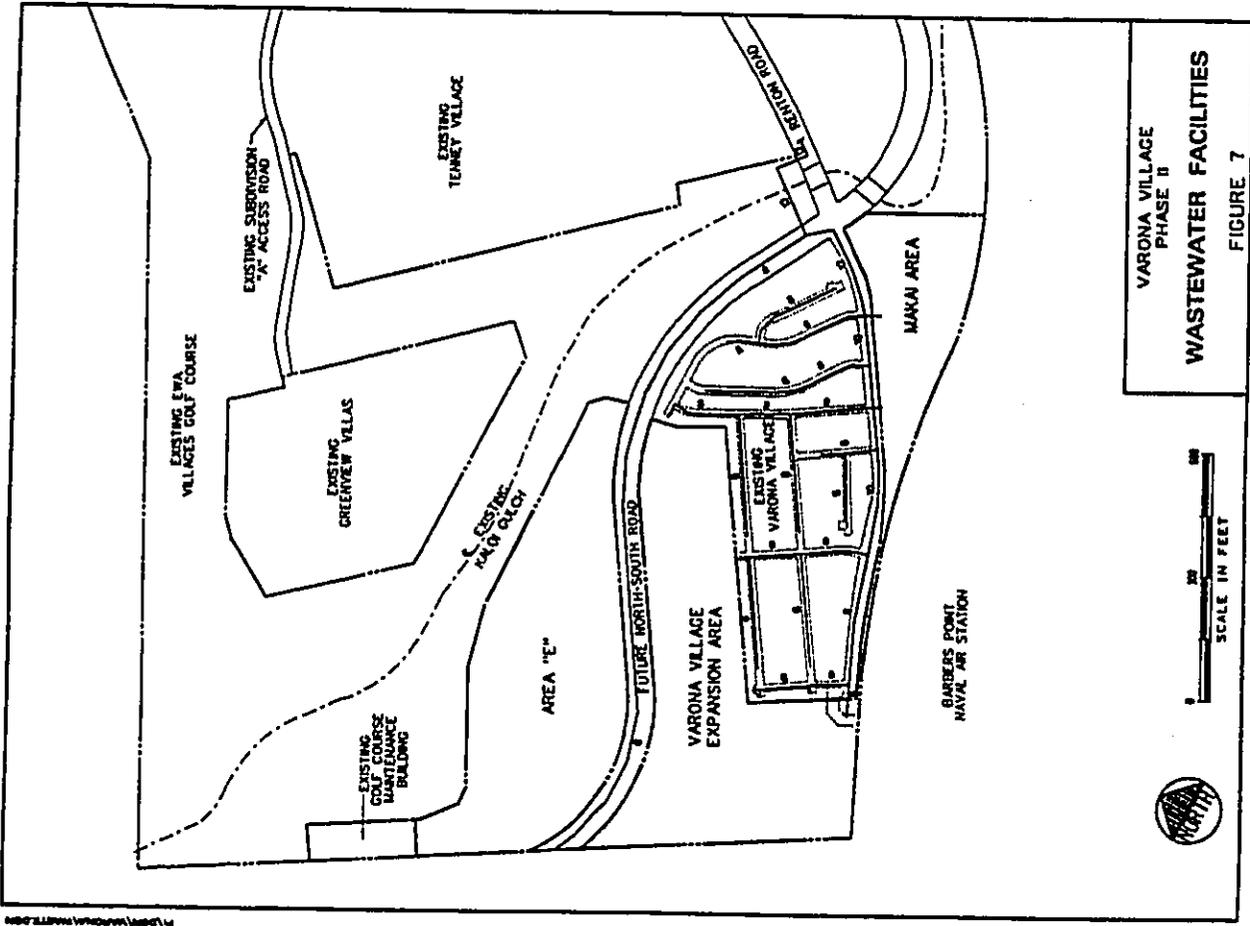
The proposed development will be a new generator of solid waste. Generation of construction wastes will be a short term impact. The contractor will be required to remove all debris from the project site to mitigate the environmental impact.

Refuse generated from the proposed Varona Village, Phase II development is not expected to have a significant impact on the leeward Oahu solid waste disposal facilities. The City and County currently operates the H-POWER waste energy recovery facility and a landfill site at Waimanalo Gulch in leeward Oahu.

**POWER AND COMMUNICATION SYSTEMS**

Power generation and transmission systems for the Ewa Plain are provided by Hawaiian Electric Company (HECO). The Kahe and Waietu power plants service the area surrounding the project site.

Communications facilities for the area surrounding the project site is provided by GTE Hawaiian Telephone Company (HTCo).



EXISTING CONDITIONS

There is no existing electrical, telephone or CATV service within the project site. However, the surrounding subdivisions and golf course are served by HECO and HTC.

MODIFICATIONS AFTER DEVELOPMENT

Area E will derive electric, telephone and CATV service from an underground duct system to be constructed in North/South Road. Utility improvements within this development area will be underground. The City and County anticipates constructing those portions of the North/South Road required to provide access and to extend utilities from the end of the improved portion of Renton Road to the subdivision. HECO has determined that the existing 12.47 kV distribution system has sufficient capacity to provide underground service to the development area. One auto-transfer switching vault will be required. In addition, HTC has indicated that the existing duct system appears adequately sized to serve the development area; however, a cross-connect site will be required.

It has been proposed that electric and telephone service for residential units in the Varona Village Expansion Area be derived from the underground duct system in Renton Road, to be constructed as part of the Ewa Villages Phase 9 - Varona Village Improvements project (HECO request P214752). HECO has determined that the proposed 12.47 kV overhead system will have sufficient capacity to provide service to the lots, and that an auto-transfer switching vault will not be required. In addition, HTC has determined that the existing duct system has sufficient capacity to provide service to the lots. A 201E exemption to permit overhead electric and communication utilities within the subdivision will be obtained by the City and County. However, should the Expansion Area be served underground rather than overhead, the required switch gear for Area E has the capability to service both subdivisions.

It is anticipated that the Makal Area will also be provided with electrical and communication facilities by HECO and HTC, with service connections from Renton Road.

IMPACTS AND MITIGATION

The proposed Varona Village, Phase II development will place additional demands on the utility systems. Discussions with HECO and HTC are ongoing to determine the necessary infrastructure improvements required to service the project. These electrical and communication system improvements will be constructed and maintained in accordance with current utility standards.

CONSTRUCTION COST ESTIMATE

Construction cost estimates for grading and infrastructure found below are based on the three project sites being developed as single family subdivisions. The estimate identifies site preparation and earthwork, and roadway and utilities construction. Site preparation and earthwork includes clearing and grubbing, grading, and temporary dust and erosion control measures. Roadway and utilities construction include costs for roadways and drainage, sewer, water and electrical systems.

Estimated Construction Costs

<u>Area E</u>	
Site Preparation and Earthwork	\$ 860,000
Roadways and Utilities Construction	\$ 5,440,000
Total	\$ 6,300,000
<u>Varona Village Expansion Area</u>	
Site Preparation and Earthwork	\$ 1,330,000
Roadways and Utilities Construction	\$ 7,470,000
Total	\$ 8,800,000
<u>Makal Area</u>	
Site Preparation and Earthwork	\$ 510,000
Roadways and Utilities Construction	\$ 1,990,000
Total	\$ 2,500,000

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**VARONA VILLAGE PHASE II**

**APPENDIX F**

**Biological Survey**

VARONA VILLAGE  
BIOLOGICAL SURVEY

INTRODUCTION

The project site, totalling approximately 100 acres, involves the lands adjacent to Varona Village, Eva District, Oahu. The site is a large triangular tract formed by Kato'i Gulch, the OR & L railroad tracks and the old cane haul road west of Varona. It includes the old, abandoned house lots between Renton Road and the OR & L tracks but excludes the occupied residences which constitute the present Varona Village.

The vegetation in the region was described by Riperton and Hosaka (1942) as one of xerophytic lowland shrubs with a coastal fringe of kiawe trees (*Prosopis pallida*). Because of the arid conditions which characterize this zone, the vegetational cover is generally sparse. The main shrubs include kiu (*Acacia farnesiana*), 'ilima (*Sida fallax*) and koo-hoole (*Leucaena leucocephala*) which is found mostly in gullies and on alluvial flats. Herbaceous species consist mainly of grasses such as bristly foxtail (*Setaria verticillata*), swollen fingergrass (*Chloris barbata*) and feather fingergrass (*C. ciliaris*).

A biological survey of the land immediately east of the project site, including the village of Eva, was conducted in 1990 (Funk, 1990). Four vegetation types were found: Village and House Sites, Federal Fields, Sugar Cane Fields and Fallow Fields. The vegetation in the Village and House Sites consisted of "weedy" species, cultivated plants and plants which have escaped from cultivation, and the Sugar Cane Fields was dominated by planted sugar cane (*Saccharum officinarum*). The Federal Fields and Fallow Fields were characterized by large communities of alien (non-native) plant species, many of which are commonly referred to as "weeds". Many of the plants in this project site are lowland weedy species including those mentioned by Riperton and Hosaka (1942). In addition, Para grass (*Brachiaria mutica*), sandbur (*Cenchrus echinatus*), spiny amaranth (*Amaranthus spinosus*), coat buttons (*Tribulus procumbens*), Mexican fire plant (*Euphorbia statiborhoa*) and 'uhaloa (*Valtheria indica*) were found to be common or locally abundant.

METHODS

A walk-through survey with at least 80% coverage was conducted on 21 March 1996 to determine the faunal and floral composition of the project site. Transects were established in all vegetation types and all plant species observed were recorded. Special emphasis was given to locating and documenting native plant communities and rare and endangered species.

PREPARED FOR: PSR Hawaii  
BY: Kenneth M. Nagata  
DATE: 2 May 1996

In conjunction with the vegetation survey a cursory survey of mammals and birds was also conducted. This consisted merely of observations made along the vegetation transects. No listening posts were established, no traps were set and nests were not investigated. The results obtained are therefore qualitative rather than quantitative.

RESULTS

FLORA

The vegetation in the project site was found to be similar to those described for the region (Riperton and Houka, 1942) and for the lands immediately to the east (Funk, 1990). It consists almost exclusively of weedy roadside species, cultivated plants and those which have persisted long after cultivation. Four vegetation types were recognized.

Abandoned Lots (A)

The presently inhabited residences of Varona Village are located mainly of Renton Road. The house lots makai of Renton Road and extending the OR & L tracks have been long abandoned. Old dilapidated structures, foundation slabs and rubbish heaps are common in this area. These lots have been overgrown with buffelgrass (*Cenchrus ciliaris*), Chinese violet (*Asystasia gangetica*), Spanish needle (*Bidens pilosa*) and false mallow (*Calvastrum coromandelianum*). Spiny amaranth and koe-kofo are also common. Landscape plants such as 'opium' (*Pithecolobium dulce*), monkeypod (*Samanea saman*), Bougainvillea and *Carena indica*, mango (*Mangifera indica*), papaya (*Carica papaya*), pumelo (*Citrus Xunzhi*) and star apple (*Chrysophyllum cainito*).

Waste Area (W)

The vegetation to the east between Varona and Kaloi Gulch has been grubbed, leaving mostly bare ground. For want of a more appropriate term this has been designated as Waste Area. Buffelgrass, Spanish needle, Guinea grass (*Panicum maximum*) and Castor bean (*Elicinus cornutus*) are resprouting in the grubbed area. Vegetation at the periphery consist mostly of Guinea grass, Castor bean and koe-kofo.

Ruderal Fields (R)

The Ruderal Fields is located mainly of Varona Village. It is a mosaic of different species, some of which are dominant over small areas. Rubbish heaps,

compost heaps, junk piles, dirt piles and abandoned vegetable plots contribute to the complexity of this community. A fenced construction yard and a tree nursery are located in the west end of the Ruderal Fields. These sites are included in the Cultivated Land community.

Most of the land mainly of Varona has been or is being used for vegetable gardening. Because of cultivation, much of the soil has been tilled and enriched, resulting in a great abundance of residual vegetables and weeds. In certain areas Guinea grass forms dense stands 3' tall but in most sites the vegetation consists of a combination of bristly foxtail, spiny amaranth, Spanish needle, false mallow, 'uhaloa, *Enallia forbergii*, cheese weed (*Melisa parviflora*), golden crown-beard (*Verbesina scabelloides*) and nut grass (*Cyperus rotundus*). Vegetables such as eggplant (*Solanum melongena*), okra (*Hibiscus manihot*), sweet potato (*Ipomoea batatas*) and cassava (*Xanthos zizantifolia*) can be found persisting in old garden plots which have been completely overgrown by weedy species. Feral species such as poison pear (*Simarouba charantia* var. *abbreviata*) and currant tomato (*Lycopersicon pimpinellifolium*) are also common in this community.

Cultivated Land (C)

Three areas of Cultivated Land were recognized. Kaloi of Renton Road is the Eva Hongwanji Mission and an adjacent construction yard. Both features are included in this vegetation type. Numerous landscape species including *Fouquieria*, *Juniperus*, arca palm (*Chrysalidocarpus lutescens*), fish geranium (*Pelargonium hortorum*) and marigold (*Tagetes* s), potted cacti and succulents and vegetables such as bush beans (*Phaseolus vulgaris*), tomato (*Lycopersicon esculentum*), green onion (*Allium fistulosum*) and eggplant are cultivated on the Hongwanji grounds. Common weedy species characterize the construction yard.

The tree nursery and construction yard in the Ruderal Fields constitute the second Cultivated Land site. Mounds of coral covered with plastic constitute the construction yard while crown trees (*Cocos nucifera*), green palms and other palms, and *Erythrina* sp. are planted in the nursery. Swollen fingergrass, radiate fingergrass (*Chloris radiata*), golden crown-beard and spiny amaranth 2 - 3' tall generally provide 90 - 100% cover but where the soil is shallow or poor the cover may be less than 50%.

The vegetable garden system mainly of Varona is the largest component of the Cultivated Land. In addition to most of the prominent species found in the Ruderal Fields, vegetables such as green onion, cassava, sweet potato, Chinese

cabbage (*Brassica chinensis*), dahlia (*Euphorbia nativus* var. *longipinnatus*) and *Cochlosoma oleraceum* are common. Plots are apparently being followed frequently while new land is cleared for cultivation. Consequently the boundary between the Cultivated Land and the Ruderal Fields is quite vague and merely represents the current general trends.

Native Plants and Rare and Endangered Species

A total of 167 plant species was recorded from the project site. Of these only one, 'ilima, is native. It is an indigenous species common to the lowlands and foothills on all the main islands of Hawaii. In addition, three other plants are considered "possibly indigenous"; hoary abutilon (*Abutilon incanum*), black nightshade (*Solanum americanum*) and 'ohaloa. All are found in small to moderate numbers in the project site. Clearly native plants represent a negligible component of the vegetation in the study area. There are no rare and endangered plants in the site nor are there any native plant communities.

FAUNA

Only seven birds were observed in the site. All but one were widespread species commonly associated with urban, ruderal and agricultural sites. The most widespread species were the barred dove (*Coccyzus arcticus*) and red-vented bulbul (*Pycnonotus cafer*) which were present in all plant communities except the Waste Area. By far the most abundant, however, was cattle egret (*Bubulcus ibis*). At least a dozen were observed in the Ruderal Fields. Two Pacific golden-plovers (*Pluvialis fulva*) were observed on the ground in the Ruderal Fields.

Except for pet dogs in Varona Village, no mammals were observed. It is highly probable, however, that feral cats, mongoose and one or more species of rats and field mice are present in the study area.

DISCUSSION

The vegetation in the Varona Village project site consists almost exclusively of alien (non-native) species. Some of the species are landscape plants, several are escapes from cultivation and some are vegetable crops but the majority are weeds, dryland species. Four plant communities were recognized. The largest and most diverse is the Ruderal Fields which is characterized by numerous abandoned garden plots, rubbish and compost heaps and dirt piles. The resulting vegetation is a mosaic of numerous subcommunities and a large number of species. The garden plots closest to Varona Village are actively being cultivated and represent the bulk of the Cultivated Land community. Abandoned lots, located

west of Renton Road consist of former house sites overgrown with Buffelgrass, Chinese violet, Spanish needle and false mallow. The smallest community, the Waste Area, is a bulldozed site with remnant vegetation along its periphery.

Only one common native species, the 'ilima, was present in the site. It was found in moderate to small numbers in the Abandoned Lots and in the Ruderal Fields and is an insignificant element in the vegetation of the project site.

Only seven birds and no mammals were observed in the site. Six of the birds are common urban and field species and one, the Pacific golden-plover, is a common migratory species.

CONCLUSION

There are no important biological resources in the project site. The proposed project will not adversely impact the integrity of the native flora nor will it adversely affect the habitat of any rare or otherwise significant animal species.

PLANT SPECIES CHECKLIST

Families are arranged alphabetically in two groups: Gymnosperms and Angiosperms. The Angiosperms are further divided into Monocotyledons and Dicotyledons. Genera and species are arranged alphabetically within each family. Taxonomy, common names and status follow those of Neal (1965), St. John (1973) or Wagner et. al. (1990). The abundance determinations are relative and are dependent on the judgement of the investigator.

EXPLANATION OF SYMBOLS

- Species Status:  
 E - Endemic to the Hawaiian Islands, i.e. occurring naturally nowhere else in the world.  
 I - Indigenous, i.e. native to the Hawaiian Islands but also occurring naturally elsewhere.  
 X - Exotic (alien), i.e. plants introduced after the Western discovery of the islands.  
 P - Polynesian introductions; plants introduced before the Western discovery of the islands.

Relative Abundance Ratings:

- A - ABUNDANT, generally the major or dominant species in a given area.  
 C - COMMON, generally distributed throughout a given area in large numbers.  
 O - OCCASIONAL, generally distributed through a major portion of a given area, but in small numbers.  
 U - UNCOMMON, observed uncommonly but more than 10 times in a given area.  
 R - RARE, observed 2 to 10 times in a given area.  
 X - Indicates presence only

Vegetation Types:

- A - Abandoned Lots  
 W - Waste Areas  
 R - Ruderal Fields  
 C - Cultivated Land

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ANIMAL SPECIES CHECKLIST

Families are arranged alphabetically and genera and species are arranged alphabetically within each family. Taxonomy follows that of Berger (1981). Quantitative techniques were not employed and thus only presence is recorded in each vegetation type.

EXPLANATION OF SYMBOLS

Species Status:

- H - Migratory species.
- X - Exotic (alien), i.e. animals introduced after the Western discovery of the islands.

Vegetation Types:

- A - Abandoned Lots
- W - Waste Areas
- R - Ruderal Fields
- C - Cultivated Land







**VARONA VILLAGE PHASE II**

**APPENDIX G**

**Noise Assessment**

D.L. ADAMS ASSOCIATES, LTD.



ACOUSTICAL CONSULTANTS

#96-18

ENVIRONMENTAL NOISE ASSESSMENT STUDY  
VARONA VILLAGE, PHASE II  
EWA, OAHU, HAWAII

July 17, 1996

Prepared For:

PBR Hawaii  
Pacific Tower, #650  
1001 Bishop Street  
Honolulu, Hawaii 96813

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### References

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2	Federal Highways Administration Recommended Equivalent Hourly Sound Levels Based on Land Use
3	Project Site and Vicinity Noise Level Measurements
4	Estimated Day-Night Average Sound Levels ( $L_{dn}$ ) Due to Traffic at Fifty Feet from the Proposed North-South Road Right-Of-Way.
5	Estimated Day-Night Average Sound Levels ( $L_{dn}$ ) Due to Traffic at Fifty Feet from the Renton Road Right-Of-Way
6	Building Noise Reduction Factors
7	Proposed North-South Road Barrier Attenuation

# CORRECTION

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

D.L. ADAMS ASSOCIATES, LTD.



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**Figures**

- 1 Project Site and Vicinity
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- 5 Proposed North-South Road
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- 14 Equipment Noise Levels

**1.0 SUMMARY**

- 1.1 The project site is currently exposed to ambient noise levels of approximately 47 to 57 dBA during daytime hours. Nighttime ambient noise levels at the project site are expected to be at least 10 dB lower than daytime ambient noise levels.
- 1.2 Residences located within 95 to 100 feet of the proposed North-South Road ROW will likely experience peak-hour traffic noise levels above the HUD recommended limit for "acceptable" sites of  $L_{dn}$  65 without noise mitigation. Feasible noise mitigation includes special building constructions to increase the exterior-to-interior noise reduction, or noise barriers such as walls or earthen berms along the roadway.
- 1.3 Residences associated with the project along Renton Road, should not be significantly impacted by traffic noise if located beyond 25 feet of the ROW.
- 1.4 The project site is located near HIA arrival flight tracks 17, 18, 19 & 20. These tracks are frequently used under tradewind conditions during daytime hours (7 am to 10 pm). When the 1987 aircraft noise contours from HIA are combined with those from BPNAS, the project site would lie entirely within the  $L_{dn}$  55 or greater zone with some portions within the  $L_{dn}$  60 or greater zone. However, BPNAS is scheduled to close by July, 1999, in which case the project site would be outside of the existing and projected future (2007)  $L_{dn}$  55 noise contour from HIA.
- 1.5 Noisy equipment from the Honouliuli WWTP could impact residences during nighttime hours, particularly within the Makai Area, if located too close to the treatment plant.
- 1.6 Noise mitigation may be needed to control noise from exterior mechanical equipment associated with the Makai Area community facilities.
- 1.7 The dominant noise source during project construction is anticipated to be earth moving equipment. Construction noise may significantly impact nearby existing residential areas, but will be confined to daytime only and should be relatively short-term.

**2.0 PROJECT DESCRIPTION**

The proposed development is comprised of three parcels designated as Area E, Varona Village Expansion Area, and Makai Area totaling approximately 61 acres located within the Ewa Plains on leeward Oahu as shown in Figure 1. Area E, bounded by

the proposed North-South Road and the Ewa Villages Golf Course, is approximately 25 acres. The Varona Village Expansion Area, bounded by the proposed North-South Road to the north, the 75-foot wide Hawaiian Electric Company power line easement to the west and the OR & L railroad right-of-way (ROW) and the existing Varona Village to the south and east, consists of approximately 27 acres. The Makai Area, bounded on the north by Renion Road, the OR & L railroad ROW to the south, and by the proposed North-South Road to the east, is the smallest parcel consisting of approximately 9 acres.

Multi-family and/or single family housing is planned Area E. The Varona Village Expansion will only be developed for single-family use. Development of the Makai Area may include community facilities and/or residential units. Currently, the project site is undeveloped.

### 3.0 NOISE STANDARDS AND GUIDELINES

Standards and guidelines promulgated by the various local, state and federal agencies use different noise descriptors to express noise levels. To better understand the various noise descriptors used, a brief description of some common acoustical terminology is presented in Appendix A.

### 3.1 State Department of Health

The Hawaii Department of Health (DOH) regulations [Reference 1] specify allowable noise levels in terms of the A-weighted sound levels that may not be exceeded at or beyond the property line for more than 10% of any 20-minute period. The specified noise limits vary depending on the zoning and time of day as shown in Figure 2. The DOH also specifies the following with respect to adjacent zoning and order of precedence.

"Where the allowable noise level between two adjacent zoning districts differ, the lower allowable noise level shall be used. For example, the allowable noise level for the residential district shall be used at the property line between residential and business districts.

The limits specified in the allowable noise levels table shall apply subject to the order of precedence with which uses were initiated after the effective date of this rule; provided that a new order of precedence is established when any use is discontinued. The initiation of use shall be measured by the date of rezoning.

For example, if agricultural or industrial operations are conducted next to a lot used as residence, the agricultural or industrial limits would apply if the building permit for the residence was obtained after agricultural or industrial operations had been initiated after the effective date of this rule. Residential limits would apply if the building permit for the residence was obtained before agricultural or industrial operations had been initiated."

### 3.2 City and County of Honolulu Land Use Ordinance

The City and County of Honolulu Land Use Ordinance (LUO) [Reference 2] noise regulations differ from the DOH noise regulations in that the maximum permissible octave band sound pressure levels are specified instead of A-weighted sound pressure levels. Also, there is no specified period of time associated with the exceedance of these levels. The LUO noise regulations, which are presented in Figure 3, are theoretically enforced by the Building Department; however, the Building Department does not have noise measurement capabilities, noise complaints are usually handled by the DOH.

### 3.3 State Department of Transportation, Airports Division

The Airports Division, Hawaii Department of Transportation (DOT) local land use compatibility guidelines [Reference 3] are expressed in terms of yearly day-night average sound levels,  $L_{dn}$ , due to aircraft operations. A residential land use, which is specified as single-family homes, apartments, hotels, and resorts, is compatible with an aircraft generated  $L_{dn}$  less than or equal to 60 dBA and are presented in Table 1.

The DOT guidelines also specify 60 dBA as the maximum allowable  $L_{dn}$  level for school, day care centers, and church uses without any mitigation measures. Commercial uses such as retail shops, restaurants, shopping centers, etc. are compatible with  $L_{dn}$  levels up to 65 dBA without any mitigating measures. With noise mitigating measures implemented, such commercial uses are allowed in areas exposed to an  $L_{dn}$  as high as 75 dBA.

### 3.4 U.S. Federal Highway Administration

The Federal Highway Administration (FHWA) has established a set of design goals for traffic noise exposure [Reference 4]. The FHWA defines four land use categories and assigns corresponding maximum hourly equivalent sound levels,  $L_{eq}$ , which are listed in Table 2. For example, Category B, defined as picnic and recreation areas, parks,

residences, motels, schools, churches, libraries, and hospitals, has a corresponding maximum exterior  $L_{eq}$  of 67 dBA and a maximum interior  $L_{eq}$  of 52 dBA. These limits are viewed as design goals, and all projects which are developed to meet these limits are deemed in conformance with the FHWA noise standards.

### 3.5 U.S. Department of Housing and Urban Development

The U.S. Department of Housing and Urban Development (HUD) has established Site Acceptability Standards for interior and exterior noise for housing [Reference 5]. These standards are based on day-night average sound levels,  $L_{dn}$ , and identify the need for noise abatement, either at the site property line or in the building construction. HUD Site Acceptability Criteria rank sites as Acceptable, Normally Unacceptable, or Unacceptable. "Acceptable" sites are those where noise levels do not exceed an  $L_{dn}$  of 65 dBA. Housing on acceptable sites do not require additional noise attenuation other than that provided in customary building techniques. "Normally Unacceptable" sites are those where the  $L_{dn}$  is above 65 dBA, but does not exceed 75 dBA. Housing on normally unacceptable sites requires some means of noise abatement, either at the property line or in the building construction, to assure the interior noise levels are acceptable. "Unacceptable" sites are those where the  $L_{dn}$  is 75 dBA or higher. The term "unacceptable" does not necessarily mean that housing cannot be built on these sites, but rather that more sophisticated sound attenuation would likely be needed.

### 3.6 U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (EPA) has identified a range of yearly day-night average sound levels,  $L_{dn}$ , sufficient to protect public health and welfare from the effects of environmental noise [Reference 6]. The EPA has established a goal to reduce exterior environmental noise to an  $L_{dn}$  not exceeding 65 dBA and a future goal to reduce exterior environmental noise to an  $L_{dn}$  not exceeding 55 dBA. Additionally, the EPA states that to protect against hearing damage, one's 24-hour equivalent sound level exposure,  $L_{eq(24)}$ , at the ear should not exceed 70 dBA. The EPA emphasizes that these goals are not intended as regulations as they have no authority to regulate noise levels, but rather these goals are intended to be viewed as levels below which the general population will not be at risk from any of the identified effects of noise.

### 4.0 EXISTING ACOUSTICAL ENVIRONMENT

On Friday afternoon, June 7, 1996, noise levels were sampled at three locations within, and in the vicinity of the project site. Noise level measurements were taken using a Larson-Davis Model 700 Sound Level Meter. During the measurements, the sky was

partly cloudy with temperatures in the mid-80's and tradewinds blowing at 5 to 15 mph. The measurement locations are shown on Figure 4 and the results are presented in Table 3.

Continuous 10-minute measurements of the noise environment were conducted at Locations 1 and 2. The ambient noise levels at Locations 1 and 2, taken as the 90-Percentile Exceedance Sound Level, ranged from 43.5 to 48.5 dBA which is typical for rural areas. At Location 3, the 10-minute-total measurement was not continuous, but rather the measurement was paused when it became apparent that noise from nearby aircraft would significantly contribute to the results. The ambient noise level measured at Location 3 was 47.3 dBA.

On average, one commercial or military aircraft would pass just south of the project site on a landing approach to Honolulu International Airport about every 3 to 5 minutes. No aircraft operations associated with Barbers Point Naval Air Station were observed for the duration of the visit. As can be seen from Table 3, the dominant noise sources at the time of the measurements were aircraft on approach to HIA.

### 5.0 POTENTIAL NOISE IMPACT ON THE PROJECT AND NOISE MITIGATION

#### 5.1 Traffic

Two major arterials will access the proposed project. The proposed North-South Road will connect Varona Village Phase II to the H-1 Freeway and the existing Renton Road will connect Varona Village Phase II to Fort Weaver Road as shown on Figure 5. Traffic noise levels radiating from these roadways were calculated for the existing and future morning and afternoon peak hour travel periods. The traffic noise levels were estimated using the Federal Highways Administration Traffic Noise Prediction Model [Reference 7] in conjunction with existing and predicted peak hour traffic volumes [Reference 8]. The predicted existing and future peak hour traffic noise levels and the increases in future peak hour traffic noise levels due to the project, at fifty feet from the proposed North-South Road ROW and Renton Road ROW, are summarized in Tables 4 and 5, respectively.

It is standard practice to calibrate the computer model prior to calculating traffic noise levels from existing roadways. This calibration is accomplished by sampling traffic noise along existing roadways while counting the corresponding number of automobiles and medium and heavy trucks passing the measurement location. This information, together with the traffic speeds, roadway dimensions, barrier dimensions (if any), etc., is then entered into the computer and the output is adjusted to the

measured level. However, at the time of the measurements, the volume of traffic traveling on Renton Road in the vicinity of the project site was too small for traffic noise to dominate the noise environment. The computer generated traffic noise levels used in this study are based solely on the data provided by the project traffic/civil engineer [References 8 and 9].

As previously discussed in Section 3.5, HUD has established Site Acceptability Standards for exterior noise exposure at housing areas. These standards are based on  $L_{dn}$  levels and identify the need for noise abatement. Traffic noise from adjacent roadways and the internal roadways within each parcel should be considered in determining the use for lands contiguous to these roadways.

In addition to defining acceptable land uses according to the annual average day-night sound level,  $L_{dn}$ , HUD has developed a procedure to estimate traffic generated  $L_{dn}$  for sites in the vicinity of major roadways. An estimate of the  $L_{dn}$  can be made from the peak hour  $L_{eq}$  provided heavy trucks do not exceed 10 percent of the total traffic flow in vehicles per 24 hours, and the traffic flow between 10 pm and 7 am does not exceed 15 percent of the average daily traffic flow in vehicles per 24 hours [Reference 5].

The annual day-night average sound levels,  $L_{dn}$ , due to traffic were calculated for the portions of the project site adjacent to the proposed North-South Road and Renton Road. The  $L_{dn}$  contours, illustrated in Figure 6, have been plotted in 5 dB increments and represent the distance to each roadway right-of-way (ROW). The  $L_{dn}$  contours do not account for any shielding that may be provided by a structure(s) between each contour and the subject roadway ROW. The  $L_{dn}$  contours are intended to serve as an aid in determining building setbacks and/or necessary noise mitigation based on the intended land use of adjacent lands. Effective noise mitigation might include:

- constructing barrier walls and/or earthen berms along roadways;
- providing air-conditioning in buildings instead of relying on natural ventilation;
- acoustically softening interior spaces by the addition of thick carpeting with padding, an acoustical tile ceiling, lowered closet doors, etc.; or
- using exterior wall constructions which exhibit high noise reductions.

Typical exterior-to-interior noise reductions for naturally ventilated homes, i.e. with open windows, are approximately 9 dB. Adding absorption to interior spaces, (acoustically softening), can further reduce the noise levels by 1 to 5 dB, depending on the amount of absorption added to the space. Air-conditioned or mechanically

ventilated homes will also typically exhibit higher exterior-to-interior noise reductions by allowing the windows to be closed. An estimate of the noise reductions achieved by several types of building constructions are presented in Table 6 [Reference 10]. Estimating the noise reduction provided by a barrier, however, is more difficult to generalize. Factors such as distances to roadways and setbacks, intervening ground conditions, barrier construction, barrier height, roadway elevations, etc., will determine the noise reduction afforded by a traffic noise barrier. Projected sound levels with the presence of a barrier located ten feet from the proposed North-South Road ROW are presented in Table 7.

Traffic noise levels can also be reduced by altering the traffic flow. For example, reducing the average speed of automobiles from 35 to 30 mph will reduce the traffic  $L_{dn}$  by nearly 2 dB. Added signalization can also reduce the traffic noise levels, however the net reduction will vary along the roadways. The reduction of traffic noise will be greater for areas nearer to signalized intersections than for areas farther away, and as the traffic volume increases, this reduction will be noticed at greater distances from the intersections along these roadways.

The  $L_{dn}$  contours due to traffic on the internal roadways are not included in this study because of the unavailability of necessary information about these roadways such as right-of-way dimensions, the number of traffic lanes, design speed limits, etc. However, due to the low volume of the estimated future peak hour traffic [Reference 8], no significant impact is anticipated.

As can be seen from Table 4 and Figure 7, the largest increases in traffic noise levels due to the project occurs at locations along Renton Road west of the proposed North-South Road. The minimum change in noise levels perceptible to the average listener is generally taken to be 3 dB; therefore, the increases at these locations will be perceptible to most people along Renton Road. Although the increase in traffic noise levels may be significant, the peak hour traffic noise levels, (less than 58 dBA at 50 feet from the ROW), should not be excessive for residential uses.

## 5.2 Aircraft

The project is located just beyond the northeast corner of the Barbers Point Naval Air Station (BPNAS) boundary and approximately 6 miles west of Honolulu International Airport (HIA), including Hickam Air Force Base as shown in Figure 8. The  $L_{dn}$  contours due to aircraft operations associated with BPNAS and HIA are presented in Figure 9 [Reference 11]. These contours represent the average level of military operations from BPNAS for the years 1983 to 1987 combined with the average level of 1987 HIA daily aircraft operations.

As indicated by Figure 9, the project site is situated entirely within the  $L_{50}$  55 contour with some western portions encompassed by the  $L_{50}$  60 contour. However, the Department of the Navy is in the process of disposing of BPNAS under the Defense Base Closure and Realignment Act of 1990 (P.L. 101-510, as amended) [Reference 12], which is scheduled to be completed by July, 1999. The BPNAS Redevelopment Commission is now studying the possible future uses for the base, which may include a racetrack and/or general aviation airport. In any event, the contribution by BPNAS to the noise environment should cease by July, 1999 [Reference 13].

The 1987  $L_{50}$  contours for HIA [Reference 3], as shown in Figure 10, indicates that, without BPNAS activity, all portions of the project site lie to the north and outside of the  $L_{50}$  55 contour. The projected future HIA noise contours for the year 2007, as shown in Figure 11, also places the project site outside of the  $L_{50}$  55 contour. In fact, the 2007  $L_{50}$  55 contour should be located further to the south of the project site than the 1987  $L_{50}$  55 contour.

If it is determined that the combined contours from BPNAS and HIA are to be used as being representative of the noise environment, then for the portions of the project site exposed to  $L_{50}$  of 60 to 65, the Hawaii Department of Transportation, Airports Division guidelines, presented in Table 1, states:

"Where the community determines that these uses must be allowed, Noise Level Reduction (NLR) measures to achieve interior levels of 45  $L_{50}$  or less should be incorporated into building codes and be considered in individual approvals. Normal local construction employing natural ventilation can be expected to provide an average NLR of approximately 9 dB. Total closure plus air conditioning may be required to provide additional outdoor to indoor NLR, and will not eliminate outdoor noise problems."

However, if the contribution from BPNAS is eliminated from the noise environment, then the project site should be exposed to  $L_{50}$  below 55 (due to aircraft) and should not require any additional NLR measures beyond what is provided by normal local construction employing natural ventilation.

The  $L_{50}$  contours associated with air traffic from HIA nearest to the project site are due primarily to the proximity of arrival flight tracks 17, 18, 19, and 20 as shown in Figure 12. These flight tracks are used by most of the heavy and large four engine turbojet aircraft landing at HIA during tradewind conditions. In 1987, the number of average daily arrivals utilizing flight tracks 17, 18, 19, and 20 was 140.66 during daytime hours (7:00 am to 10:00 pm), and 0.06 during nighttime hours (10:00 pm to

7:00 am) [Reference 3]. Aircraft on these flight tracks should usually be audible, and at times, could prove to be somewhat annoying to the future residents of the project site. However, since some of the intended homeowners currently reside in the vicinity of the project site [Reference 14], and therefore, are accustomed to the noise environment, perhaps such flights will not be very disturbing.

### 5.3 Honolulu Wastewater Treatment Plant

As shown in Figure 13, the Honolulu Wastewater Treatment Plant (WWTP) is located several hundred feet southeast of the Makai Area parcel. This facility most likely contains pumps, scrubbers, compressors, fans, and other noisy equipment. When ambient noise level measurements were conducted at the project site, no noise from the WWTP was audible at the nearest measurement location. During nighttime hours, however, it is not unusual for ambient noise levels to be as much as 10 dB less than daytime levels and, thus, noise from the WWTP may be audible to the future residents of the Makai Area during the nighttime if this area is developed for housing. The Department of Health allowable noise levels, shown in Figure 2, permit noise levels of 70 dBA at the WWTP property line during daytime and nighttime hours since the property is zoned for industrial uses.

### 6.0 POTENTIAL NOISE IMPACT DUE TO THE PROJECT AND NOISE MITIGATION

#### 6.1 Traffic

The increase in traffic noise levels due to the project should not be significant for existing residences adjacent to the proposed North-South Road. The projected increase in peak hour traffic noise levels at fifty feet from the proposed North-South Road right-of-way (ROW) is equal to, or less than 0.2 dB as shown in Table 4.

Portions of the existing Varona Village bordering Renton Road will likely experience a significant increase in traffic noise level due to the project. The largest increase is anticipated to occur between the proposed North-South Road and the Makai Area access road. While the 4.2 dB increase is significant, the projected peak hour level with the project, 57.5 dBA at a distance of 50 feet from the Renton Road ROW, would not normally be considered excessive. The peak hour traffic noise levels for the existing Varona Village along Renton Road will still be 5 to 6 dB lower at fifty feet from the ROW than that portion of Renton Road immediately east of the proposed North-South Road where no increase is anticipated, as can be seen at Locations 7 and 8 in Table 5.

## 6.2 Construction Noise

Development of the project will involve excavation, grading, and the construction of infrastructure and buildings. The various construction phases of the project may generate significant amounts of noise, which may impact nearby residential areas. The actual noise is dependent upon the methods employed during each stage of the construction process. Typical ranges of construction equipment noise are shown in Figure 14. Earthmoving equipment, such as bulldozers and diesel-powered trucks, will probably be the loudest equipment used during construction.

When construction noise exceeds, or is expected to exceed, the DOH's allowable property line limits, a permit must be obtained from the DOH to allow the operation of vehicles, construction equipment, power tools, etc. which emit noise levels in excess of the allowable limits. Required permit conditions for construction activities are:

"No permit shall allow construction activities creating excessive noise...before 7:00 am and after 6:00 pm of the same day."

"No permit shall allow construction activities which emit noise in excess of ninety-five dB(A)...except between 9:00 am and 5:00 pm of the same day."

"No permit shall allow construction activities which exceed the allowable noise levels on Sundays and on...[certain] holidays. Activities exceeding ninety-five dB(A) shall [also] be prohibited on Saturdays."

In addition, construction equipment and on-site vehicles or devices requiring an exhaust of gas or air must be equipped with mufflers. Also, construction vehicles using traffic-ways must satisfy the DOH's vehicle noise requirements [Reference 15].

## 6.3 Community Facilities

Development of community facilities within the Makai Area including, for example, a pool or gymnasium, may adversely impact nearby residences if noise from the facility is not properly controlled. Potential noise sources of such a facility could include refrigeration and air-conditioning equipment, public address systems, children, etc. All equipment should meet DOH noise regulations at the adjacent property lines. Mitigation of equipment noise may include acoustic enclosures, sound barriers, and

exhaust silencers. To mitigate the noise impact of a sound system on the nearby homes, use of any interior sound system should be limited to times when the building's air-conditioning system is in use and, thus, when windows and doors are shut. Additionally, any sound system loudspeakers located outside the facility should be oriented as not to directly impact nearby homes.

**REFERENCES:**

1. *Chapter 43, Community Noise Control for Oahu*, Department of Health, State of Hawaii, Administrative Rules, Title 11, November 6, 1981.
2. *Section 3.100-2 and Table A, Noise Regulations*, Land Use Ordinance, City and County of Honolulu, December, 1993.
3. *Honolulu International Airport Master Plan Update and Noise Compatibility Program*, State of Hawaii Department of Transportation, Airports Division, Vol. 2, December 1989.
4. *Department of Transportation, Federal Highway Administration Procedures for Abatement of Highway Traffic Noise*, Title 23, CFR, Chapter 1, Subchapter J, Part 772, 38 FR 15953, June 19, 1973, Revised at 47 FR 29654, July 8, 1982.
5. *HUD Environment Criteria and Standards*, 24 CFR 51, Federal Register, Volume 44, No. 135, July 12, 1979; Amended 49 FR 880, January 6, 1984.
6. *Toward a National Strategy for Noise Control*, U.S. Environmental Protection Agency, April 1977.
7. *FHWA Highway Traffic Noise Prediction Model*, FHWA - RD - 77 - 108; U.S. Department of Transportation, December 1978.
8. *Revised Traffic Report*, Parsons Brinkerhoff Quade & Douglas, Received from PBR Hawaii, June 6, 1996.
9. *Telephone Contact Record of communication between Steven S. Black of Darby & Associates and Wayne Yoshioka*, Parsons Brinkerhoff Quade & Douglas, June 5, 1996.
10. *Highway Traffic Noise Analysis and Abatement Policy and Guidance*, Department of Transportation, Federal Highways Administration, June 1995.
11. *Naval Air Station Barbers Point Air Installations Compatible Use Zones (AICUZ) Noise Contours and Supporting Data*, Naval Facilities Engineering Command, Alexandria, VA, July 1989.
12. *Letter from Dennis Pecht*, Department of the Navy, Pacific Division, Naval Facilities Engineering Command, to Paul O'Connor, Executive Director, Barbers Point Naval Air Station Redevelopment Commission, dated October 17, 1995.
13. *Telephone Contact Record of communication between Steven S. Black of Darby & Associates and Paul O'Connor*, Executive Director, Barbers Point Naval Air Station Redevelopment Commission, June 7, 1996.
14. *Facsimile Transmittal from PBR Hawaii to Darby & Associates*, Varona Village Phase II - Draft Project Description, June 3, 1996.
15. *Chapter 42, Vehicular Noise Control for Oahu*, Department of Health, State of Hawaii, Administrative Rules, Title 11, November 6, 1981.

TABLE 1  
DEPARTMENT OF TRANSPORTATION, AIRPORTS DIVISION,  
RECOMMENDED YEARLY DAY-NIGHT AVERAGE SOUND LEVELS  
(L<sub>50</sub>) BASED ON LAND USE  
(Reference 3)

LAND USE	BELOW 40	40-55	55-70	70-85	85-100	100-115	115-130	130-145
<b>Residential</b>								
Low density residential, resort, and hotels, with extensive outdoor use								
Low density apartment with moderate outdoor use	Y(0)	N(0)	N	N	N	N	N	N
High density apartment with limited outdoor use	Y	N(0)	N(0)	N	N	N	N	N
Transient lodging with limited outdoor use	Y	N(0)	N(0)	N	N	N	N	N
<b>Public Use</b>								
Schools, day-care centers, libraries, and churches	Y	N(0)	N(0)	N(0)	N	N	N	N
Hospitals, nursing homes, clubs, and health facilities	Y	Y(0)	Y(0)	Y(0)	N	N	N	N
Police substations and concert halls	Y(0)	Y(0)	Y(0)	Y(0)	N	N	N	N
Government service and office buildings serving the general public	Y	Y	Y(0)	Y(0)	N	N	N	N
Transportation and parking	Y	Y	Y(0)	Y(0)	Y(0)	Y(0)	Y(0)	Y(0)
<b>Commercial and Government Use</b>								
Office - government, business, and professional	Y	Y	Y(0)	Y(0)	Y(0)	Y(0)	N	N
Wholesale and retail - banking, mercantile, hardware and heavy equipment	Y	Y	Y(0)	Y(0)	Y(0)	Y(0)	N	Y(0)
Airport business - travel, hotel, food, retail office, etc.	Y	Y	Y(0)	Y(0)	Y(0)	Y(0)	N	N
Retail trade, restaurants, shops, dry cleaning, etc.	Y	Y	Y(0)	Y(0)	Y(0)	Y(0)	N	N
Power plants, storage terminals, and bus yards	Y	Y	Y(0)	Y(0)	Y(0)	Y(0)	N	N
Service without outdoor use, broadcasting, production facilities, etc.	Y(0)	Y(0)	N	N	N	N	N	N
<b>Manufacturing, Production and Storage</b>								
Manufacturing, general	Y	Y	Y(0)	Y(0)	Y(0)	Y(0)	N	N
Photographic and optical	Y	Y	Y(0)	Y(0)	Y(0)	Y(0)	N	N
Agriculture (except livestock) and forestry	Y	Y(0)	Y(0)	Y(0)	Y(0)	Y(0)	N	Y(0)
Livestock raising and breeding	Y	Y(0)	Y(0)	Y(0)	Y(0)	Y(0)	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y	Y	Y
<b>Recreational</b>								
Outdoor sports areas and recreation areas	Y	Y(0)	Y(0)	Y(0)	Y(0)	Y(0)	N	N
Outdoor music stands, amphitheaters	Y	Y	Y	Y	Y	Y	N	N
Swimming, fishing, and other water recreation	Y	Y	Y	Y	Y	Y	N	N
Amusement, beach parks, active play areas, etc.	Y	Y	Y	Y	Y	Y	N	N
Public golf courses, riding stables, equestrian, etc.	Y	Y	Y	Y	Y	Y	N	N
Professional/semi-pro facilities, locations of media events, etc.	Y(0)	Y(0)	Y(0)	Y(0)	Y(0)	Y(0)	N	N
Executive retreats, wildlife and recreation areas	Y(0)	Y(0)	Y(0)	Y(0)	Y(0)	Y(0)	N	N

Numbers in parentheses refer to noise.

Key to Table:

Y (Y(0)) - Land use and related structures compatible without restrictions.

N (N(0)) - Land use and related structures are not compatible and should be prohibited.

Notes to Table:

- (1) A noise level of 60 Ldn does not eliminate all risks of adverse noise impacts from aircraft noise. However, the 60 Ldn planning level has been selected by the State Airport Division as an appropriate compromise between the minimal risk level of 55 Ldn and the significant risk level of 65 Ldn.
- (2) Where the community determines that there are noise issues that must be addressed, Noise Level Reduction (NLR) measures to achieve interior levels of 45 Ldn or less should be incorporated into building codes and be considered in individual approvals. Normal local construction employing natural ventilation can be expected to provide an average NLR of approximately 9 dB. Total climate plus air conditioning may be required to provide additional outdoor to indoor NLR, and will not eliminate outdoor noise problems.
- (3) Because the Ldn noise descriptor requires a 24-hour average of individual aircraft noise events, such as which can be unique in respect to amplitude, duration, and sound content, the NLR requirements should be evaluated for the specific land use, interior acoustical requirements, and properties of the aircraft noise event. NLR requirements should not be based solely upon the exterior Ldn exposure level.
- (4) Measures to achieve required NLR must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.
- (5) Residential buildings require NLR. Residential buildings should not be located where noise is greater than 65 Ldn.
- (6) Impacts of amplitude, duration, frequency, and total content of aircraft noise events should be evaluated.

TABLE 2  
FEDERAL HIGHWAYS ADMINISTRATION RECOMMENDED  
EQUIVALENT HOURLY SOUND LEVELS BASED ON LAND USE

Activity Category	L <sub>eq</sub> (d)	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	---	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

TABLE 3  
PROJECT SITE AND VICINITY NOISE LEVEL MEASUREMENTS

Location*	Duration	Comments / Noise Source(s)	L <sub>eq</sub> (dBA)
1	10 min	2 DC-10's, 1 707 flyover rooster crowing, birds chirping distant construction, occasional automobile driveby	55.9
	33 sec	Single event measured - Pair of F-15's flyover	56.7
2	10 min	2 747's, 1 737, 1 commercial twin prop flyover	56.8
3	10 min	Measurement paused during aircraft flyovers - Dominant noise source from rustling foliage	47.3

\*As shown in Figure 4.

TABLE 4

ESTIMATED FUTURE DAY-NIGHT AVERAGE SOUND LEVELS (L<sub>dn</sub>) DUE TO TRAFFIC AT FIFTY FEET FROM THE PROPOSED NORTH-SOUTH ROAD RIGHT-OF-WAY

Location*	Future, (2005), L <sub>dn</sub> w/o Project	Future, (2005), L <sub>dn</sub> w/ Project	Increase Due to Project
1	67.8	68.0	0.2
2	67.8	67.9	0.1
3	67.5	67.7	0.2
4	67.5	67.7	0.2
5	66.6	66.7	0.1
6	67.0	67.1	0.1

\*As shown in Figure 7.

TABLE 5

ESTIMATED DAY-NIGHT AVERAGE SOUND LEVELS (L<sub>dn</sub>) DUE TO TRAFFIC AT FIFTY FEET FROM THE RENTON ROAD RIGHT-OF-WAY

Location*	Existing, (1996), L <sub>dn</sub>	Future, (2005), L <sub>dn</sub> w/o Project	Future, (2005), L <sub>dn</sub> w/ Project	Increase Due to Project
7	54.0	63.3	63.3	0
8	53.2	63.2	63.2	0
9	53.2	53.3	57.5	4.2
10	54.0	54.6	57.3	2.7
11	54.0	54.6	56.8	2.2
12	53.2	53.3	56.6	3.3

\*As shown in Figure 7.

TABLE 6  
BUILDING NOISE REDUCTION FACTORS [Reference 10]

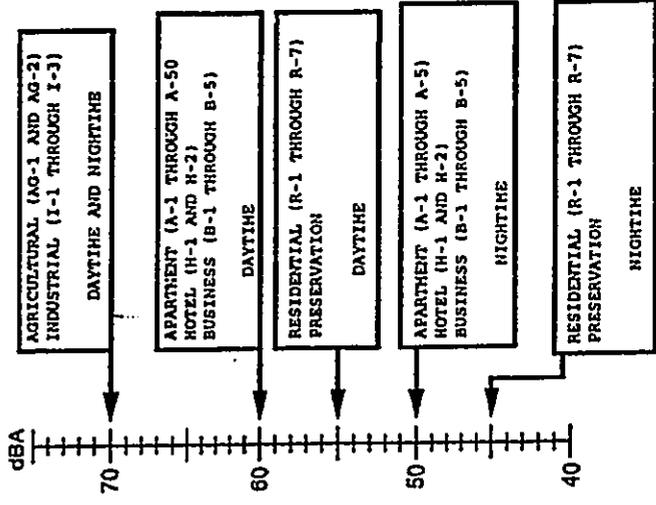
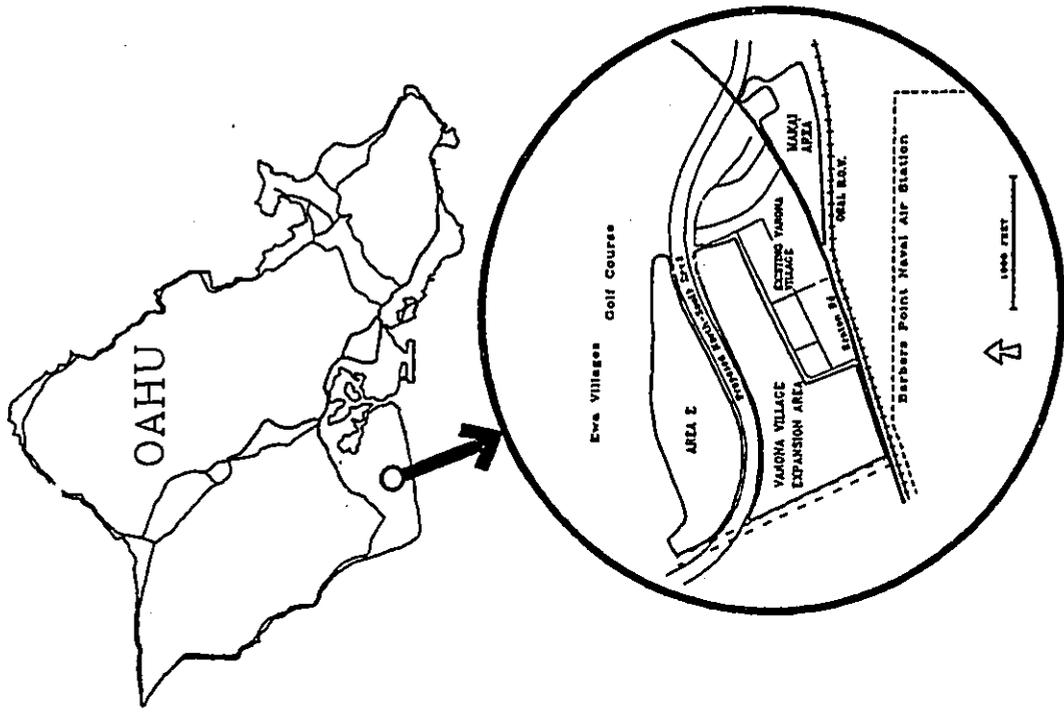
Building Type	Window Condition	Noise Reduction Exterior-to-Interior
All	Open	10 dB
Light Frame	Ordinary Sash (closed)	20 dB
	Storm Windows	25 dB
Masonry	Single Glazed	25 dB
	Double Glazed	35 dB

TABLE 7  
PROJECTED SOUND LEVELS WITH BARRIER AT 10 FEET FROM THE  
PROPOSED NORTH-SOUTH ROAD RIGHT-OF-WAY

Location <sup>(1)</sup>	Barrier Height [ft] <sup>(2)</sup>	L <sub>4a</sub> [dBA]
Area E	9	64.5 @ 10 ft above ground 67.1 @ 20 ft above ground <sup>(3)</sup>
	15	57.4 @ 10 ft above ground 65.0 @ 20 ft above ground
Varona Village Expansion Area	6	64.3 @ 10 ft above ground

1. For residences located 20 feet beyond the barrier in Area E, and for residences located 75 feet beyond the barrier in Varona Village Expansion Area.
2. Based on the assumption that the project site and proposed North-South Road have the same elevation.
3. HUD classifies sites with an L<sub>4a</sub> greater than 65, but less than 70 "normally unacceptable" unless an additional 5 dB attenuation is incorporated into the building construction. Air-conditioning residences, and thus, closing windows, will normally provide an additional 10 dB attenuation.

NOISE LEVELS (dBA) FOR THE PROPOSED NORTH-SOUTH ROAD RIGHT-OF-WAY



NOTE: ALLOWABLE LEVELS THAT SHALL NOT BE EXCEEDED FOR TEN PERCENT OF THE TIME WITHIN ANY THIRTY MINUTE PERIOD.

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PHONE 808/731-3319 FAX 808/731-3379

**PROJECT SITE & VICINITY**  
Varona Village, Phase II

Date: June 1998 Project No. 96-18  
Drawn By: SSB

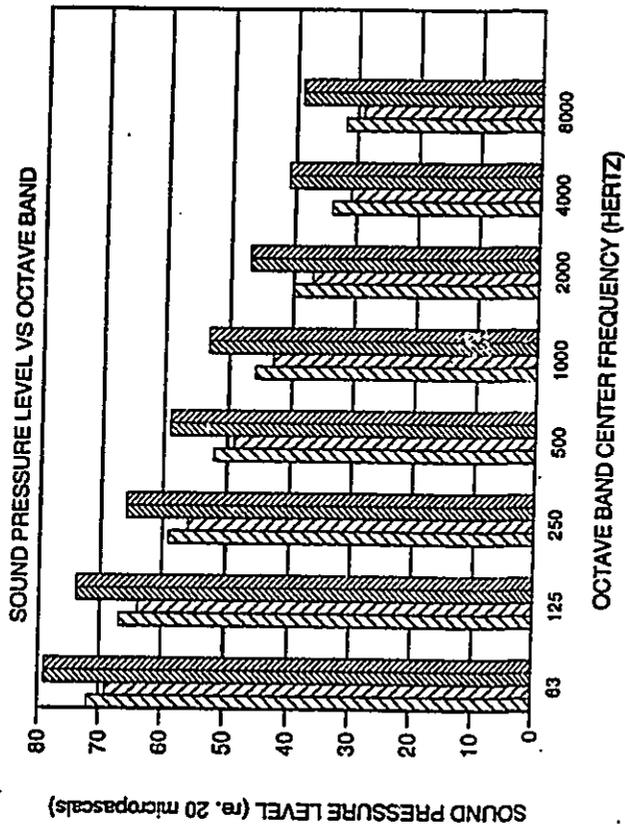
Figure No. 1

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HONOLULU, HAWAII 96813  
PHONE 808/731-3319 FAX 808/731-3379

**DOH NOISE REGULATIONS**  
Varona Village, Phase II

Date: June 1998 Project No. 96-18  
Drawn By: SSB

Figure No. 2



**LUO NOISE REGULATIONS**

Varona Village, Phase II

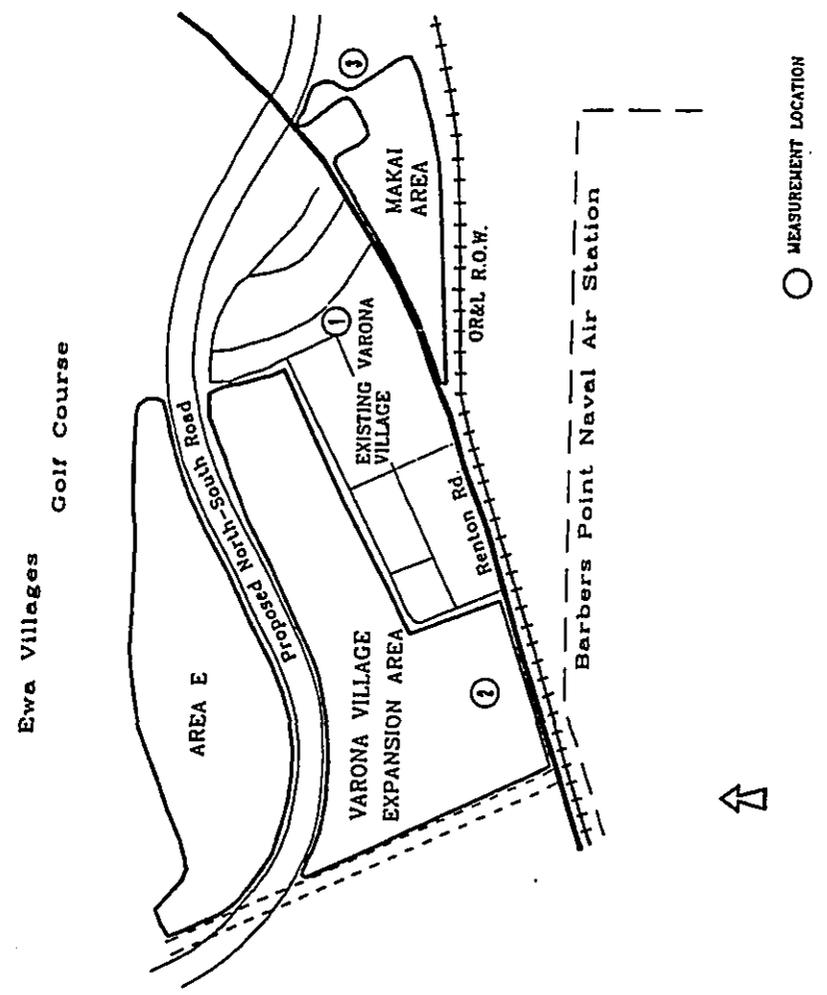
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Figure No. **3**

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 TEL: 808/734-3311      FAX: 808/734-1818



**AMBIENT NOISE MEASUREMENTS**

Varona Village, Phase II

---

Date: June 1998      Project No.: 98-18      Drawn By: SSB

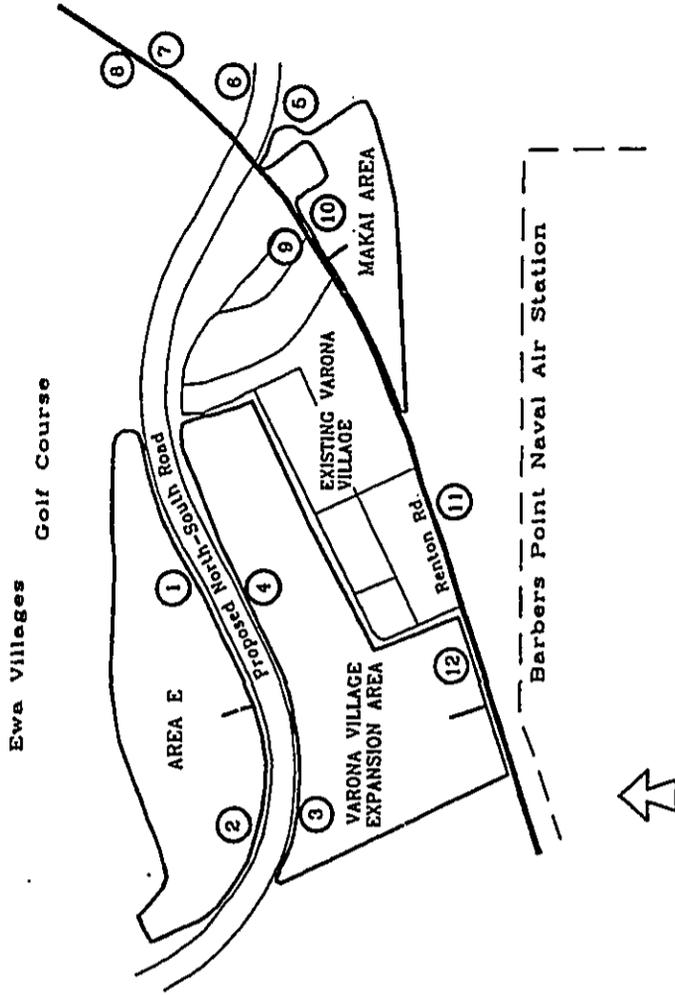
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Figure No. **4**

DL AGUIAR & ASSOCIATES, LTD.  
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

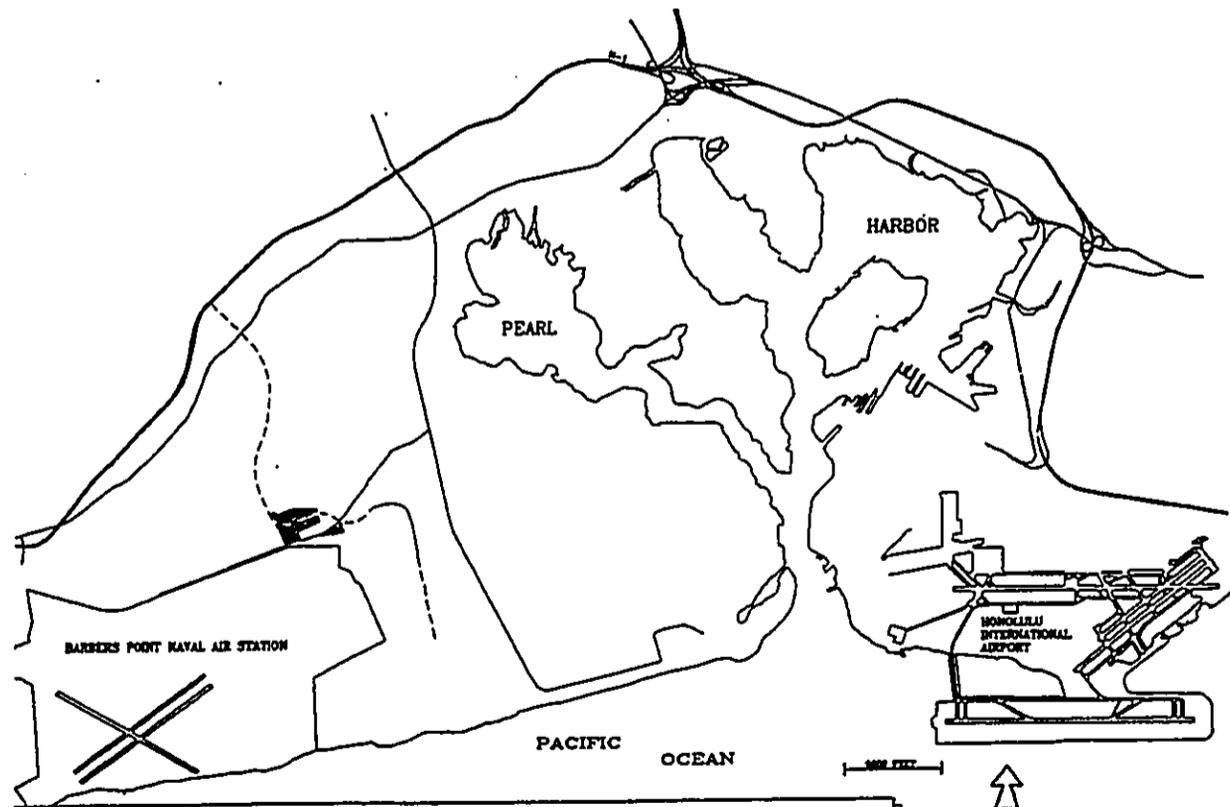




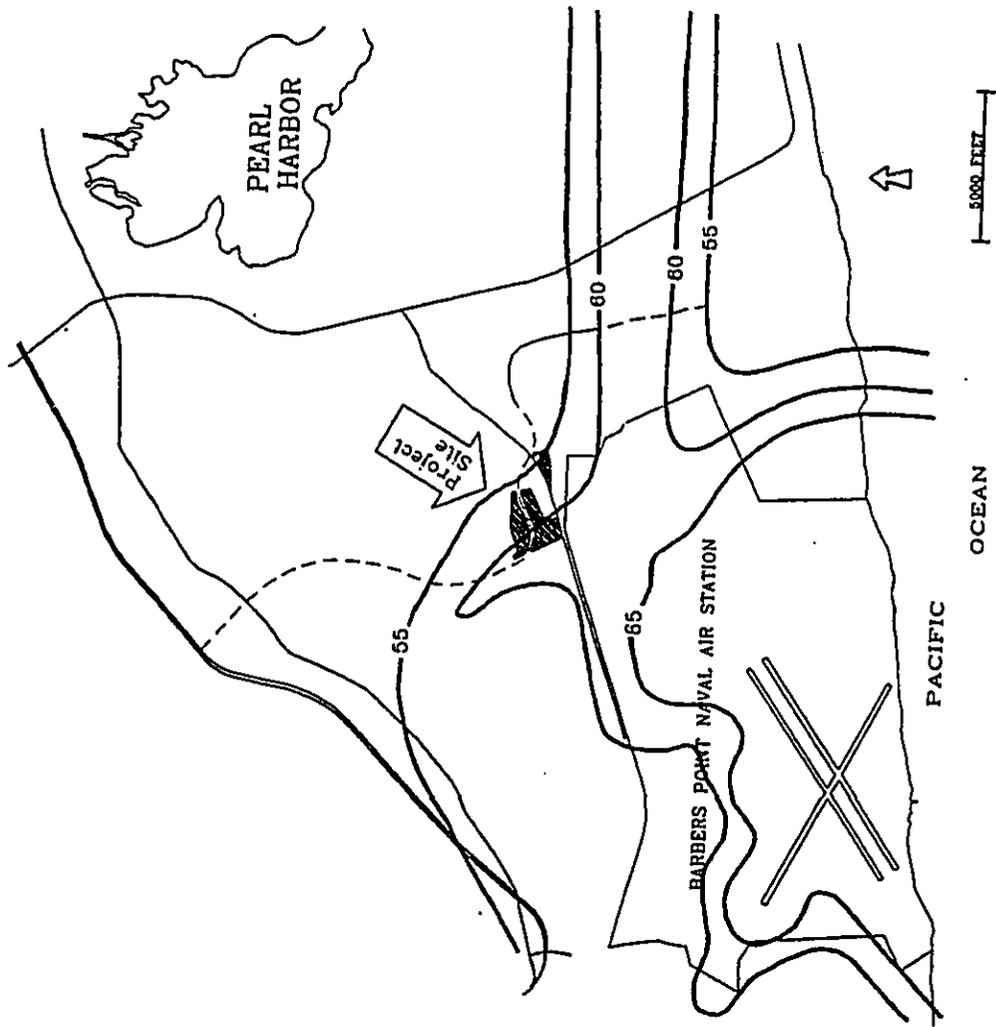
○ Location Of Projected Traffic Noise Levels

No Scale

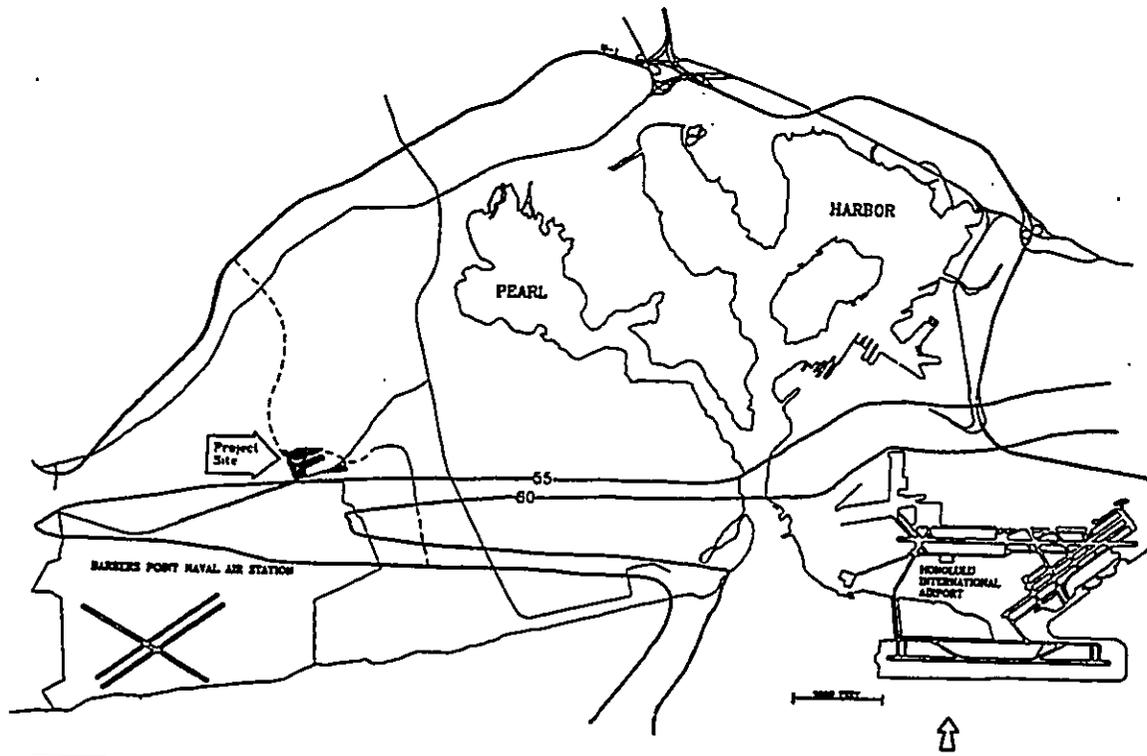
D.L. ARMS ASSOCIATES, LTD. DARBY & ASSOCIATES ARCHITECTURAL CONSULTANTS PALI PALMS PLAZA 600 N. KALANIO AVENUE, SUITE 4-211 HONOLULU, HAWAII 96821 808/241-3315 FAX 808/241-1199	<b>TRAFFIC NOISE LOCATIONS</b>		Figure No.
	Varona Village, Phase II		7
	Date	Project No.	Drawn By
	June 1996	96-18	SSB



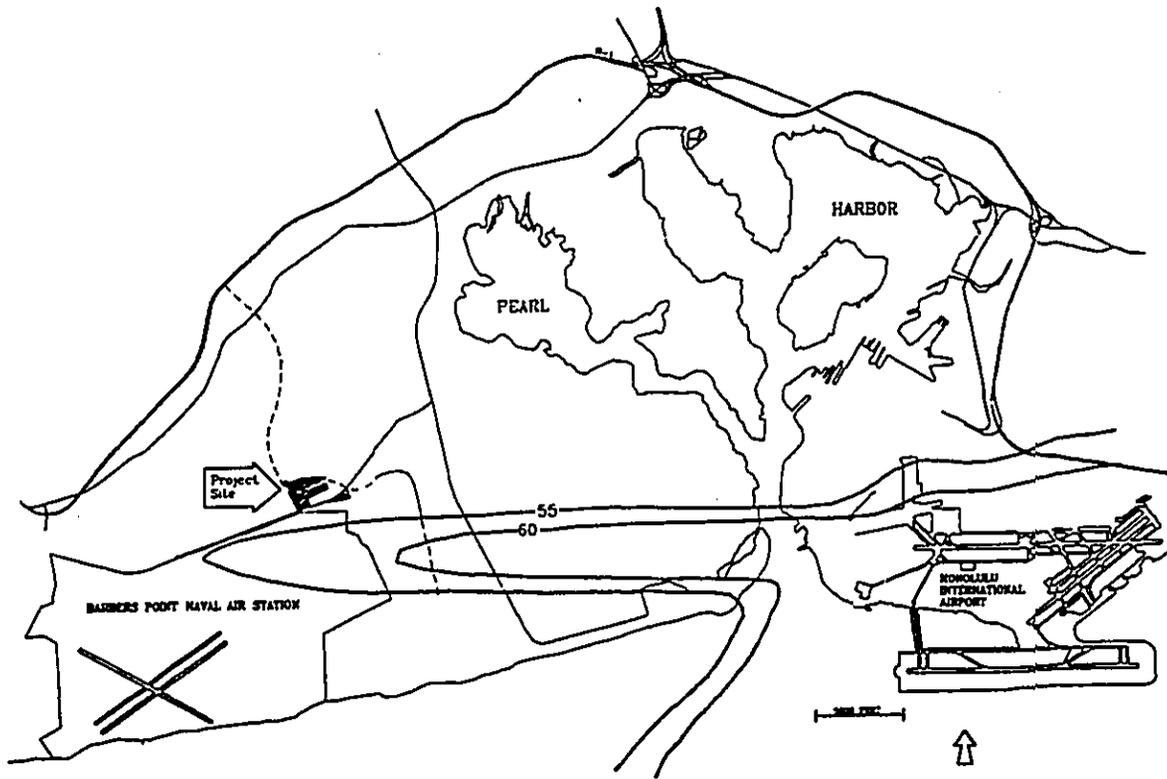
D.L. ARMS ASSOCIATES, LTD. DARBY & ASSOCIATES ARCHITECTURAL CONSULTANTS PALI PALMS PLAZA 600 N. KALANIO AVENUE, SUITE 4-211 HONOLULU, HAWAII 96821 808/241-3315 FAX 808/241-1199	<b>PROXIMITY TO MAJOR AIRPORTS</b>		Figure No.
	Varona Village, Phase II		8
	Date	Project No.	Drawn By
	June 1996	96-18	SSB



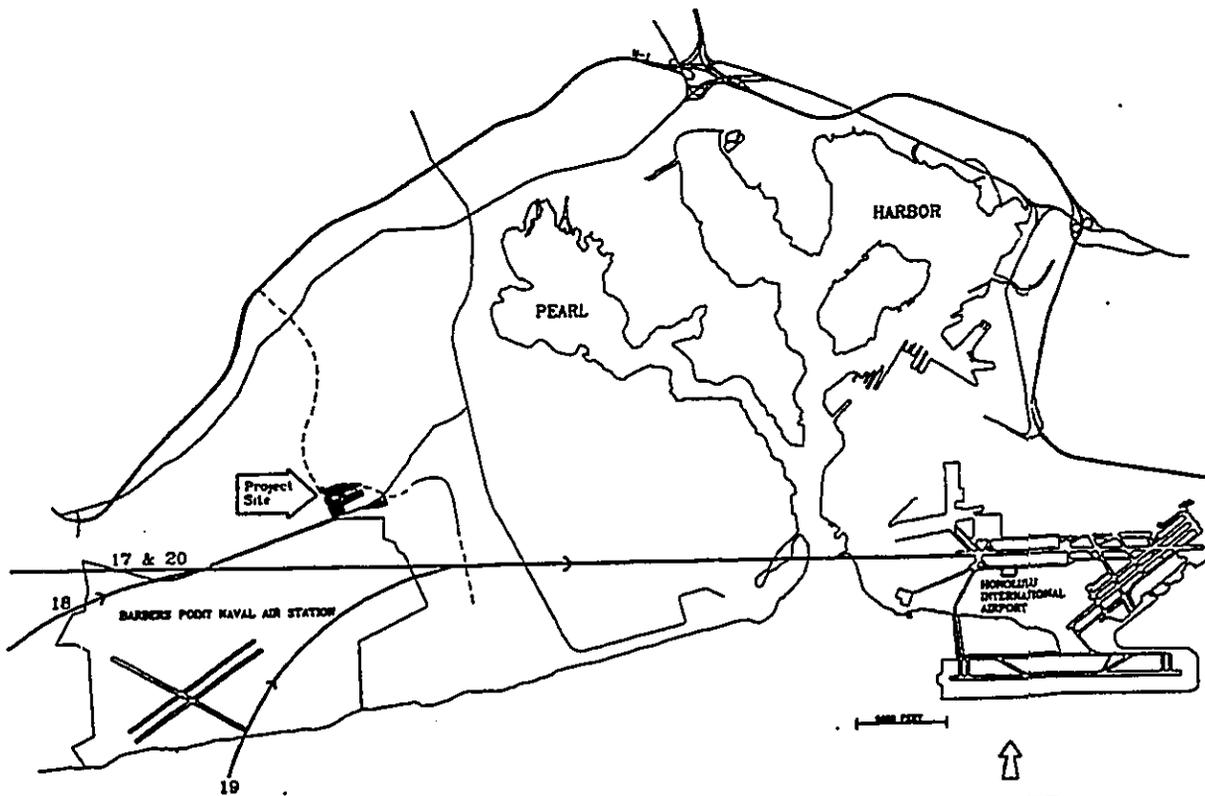
D.L. ADAMS ASSOCIATES, LTD. and <b>DARBY &amp; ASSOCIATES</b> ARCHITECTURAL CONSULTANTS PALLI PALMS PLAZA 670 N. KALANOA AVENUE, SUITE 1-211 HAWAII, HONOLULU 96813 808/724-2318 FAX 808/724-6288	<b>COMBINED Ldn AIRPORT CONTOURS</b>		Figure No.
	Verona Village, Phase II		9
Date		Reference 11	Drawn By
June 1986		Project No. 96-18	SSB



D.L. ADAMS ASSOCIATES, LTD. and <b>DARBY &amp; ASSOCIATES</b> ARCHITECTURAL CONSULTANTS PALLI PALMS PLAZA 670 N. KALANOA AVENUE, SUITE 1-211 HAWAII, HONOLULU 96813 808/724-2318 FAX 808/724-6288	<b>1987 HIA Ldn CONTOURS</b>		Figure No.
	Verona Village, Phase II		10
Date		Reference 3	Drawn By
June 1986		Project No. 96-18	SSB



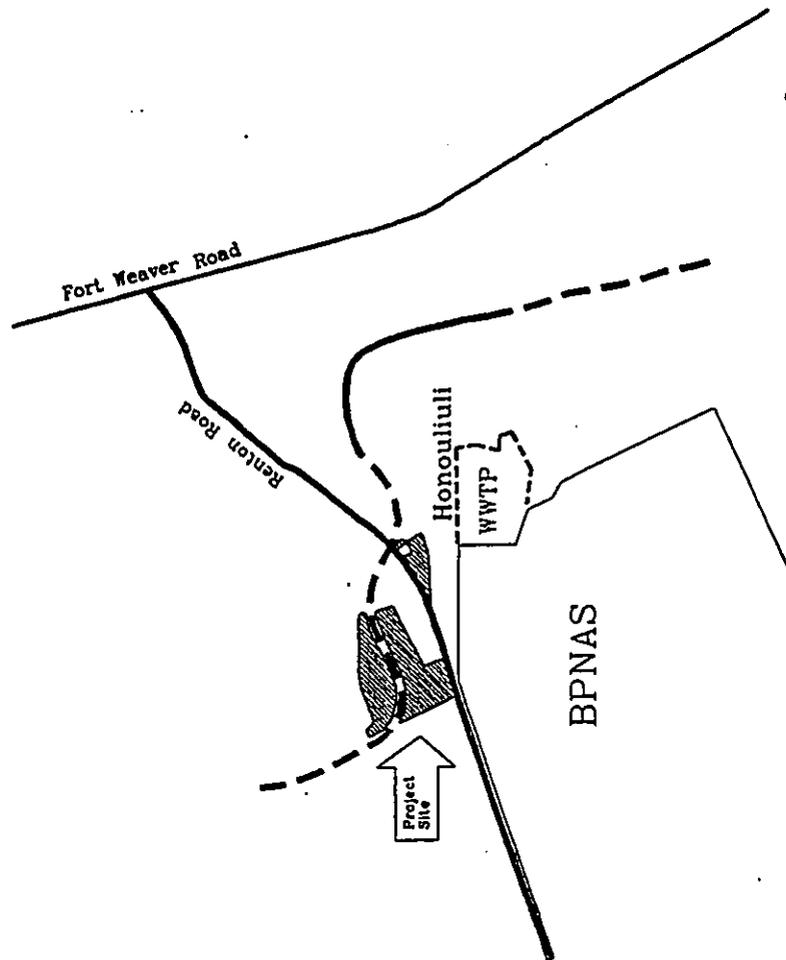
D.L. ADAMS ASSOCIATES, LTD. <b>DARBY &amp; ASSOCIATES</b> ARCHITECTURAL CONSULTANTS PALM PALMS PLAZA 970 N. KALANEO AVENUE, SUITE A-311 KAILUA, HAWAII 96734 808/254-3318 FAX 808/254-6295	<b>2007 HIA Ldn CONTOURS</b>		Figure No.
	Varona Village, Phase II		11
	Reference 3		
	Date June 1996	Project No. 96-18	Drawn By SSB



D.L. ADAMS ASSOCIATES, LTD. <b>DARBY &amp; ASSOCIATES</b> ARCHITECTURAL CONSULTANTS PALM PALMS PLAZA 970 N. KALANEO AVENUE, SUITE A-311 KAILUA, HAWAII 96734 808/254-3318 FAX 808/254-6295	<b>HIA ARRIVAL FLIGHT TRACKS</b>		Figure No.
	Varona Village, Phase II		12
	Reference 3		
	Date June 1996	Project No. 96-18	Drawn By SSB

	NOISE LEVEL (dBA) AT 50 FT					
	60	70	80	90	100	110
COMPACTERS (ROLLERS)			H			
FRONT LOADERS						
BACKHOES						
TRACTORS						
SCRAPERS, GRADERS						
PAVERS				H		
TRUCKS						
CONCRETE MIXERS						
CONCRETE PUMPS				H		
CRANES (MOVABLE)						
CRANES (DERRICK)					H	
PUMPS						
GENERATORS						
COMPRESSORS						
PNEUMATIC WRENCHES						
JACK HAMMERS AND ROCK DRILLS						
PILE DRIVERS (PEAKS)						
VIBRATOR						
SAWS						
OTHER						
MECH EQUIPMENT						
JACK HAMMERS AND ROCK DRILLS						
PILE DRIVERS (PEAKS)						
VIBRATOR						
SAWS						

Note: Based on Limited Available Data Samples



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**PROXIMITY TO HONOULIULI WWTP**

Varona Village, Phase II

Date June 1998 Project No. 98-18 Drawn By SSB

Figure No. 13

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**EQUIPMENT NOISE LEVELS**

Varona Village, Phase II

Date June 1998 Project No. 98-18 Drawn By SSB

Figure No. 14

## APPENDIX A

### ACOUSTICAL TERMINOLOGY

#### Sound Pressure Level

Sound or noise consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. It is measured in terms of decibels (dB) using precision instruments known as sound level meters. Noise is defined as "unwanted" sound.

Technically, sound pressure level (SPL) is defined as:

$$\text{SPL} = 20 \log (P/P_{\text{ref}}) \text{ dB}$$

where P is the sound pressure fluctuation (above or below atmospheric pressure) and  $P_{\text{ref}}$  is the reference pressure, 20 micropascals, which is approximately the lowest sound pressure that can be detected by the human ear. For example, if P is 20 micropascals, then  $\text{SPL} = 0 \text{ dB}$ , or if P is 200 micropascals, then  $\text{SPL} = 20 \text{ dB}$ . The relation between sound pressure in micropascals and sound pressure level in decibels (dB) is shown in Figure A-1.

The sound pressure level that results from a combination of noise sources is not the arithmetic sum of the individual sound levels, but rather the logarithmic sum. For example, two sound levels of 50 dB produce a combined level of 53 dB, not 100 dB; two sound levels of 40 and 50 dB produce a combined level of 50.4 dB.

Human sensitivity to changes in sound pressure level is highly individualized. Sensitivity to sound depends on frequency content, time of occurrence, duration, and psychological factors such as emotions and expectations. However, in general, a change of 1 or 2 dB in the level of a sound is difficult for most people to detect. A 3 dB change is commonly taken as the smallest perceptible change and a 5 dB change corresponds to a noticeable change in loudness. A 10 dB increase or decrease in sound level corresponds to an approximate doubling or halving of loudness, respectively.

#### A-Weighted Sound Level

The human ear is more sensitive to sound in the frequency range of 250 Hertz (Hz) and higher, than in frequencies below 250 Hz. Due to this type of frequency response, a frequency weighting system, was developed to emulate the frequency response of the human ear. This system expresses sound levels in units of A-weighted decibels (dBA). A-weighted sound levels de-emphasizes the low frequency portion of the spectrum of a signal. The A-weighted level of a sound is a good measure of the loudness of that sound. Different sounds having the same A-weighted sound level are perceived as being about equally loud. Typical values of the A-weighted sound level of various noise sources are shown in Figure A-1.

#### Statistical Sound Levels

The sound levels of long-term noise producing activities, such as traffic movement, aircraft operations, etc., can vary considerably with time. In order to obtain a single number rating of such a noise source, a statistically-based method of expressing sound or noise levels developed. It is known as the Exceedence Level,  $L_n$ . The Exceedence Level,  $L_n$ , represents the sound level which is exceeded for n% of the measurement time period. For example,  $L_{10} = 60 \text{ dBA}$  indicates that for the duration of the measurement period, the sound level exceeded 60 dBA 10% of the time. Commonly used Exceedence Levels include  $L_{10}$ ,  $L_{50}$ ,  $L_{90}$  and  $L_{95}$ , which are widely used to assess community and environmental noise. Figure A-2 illustrates the relationship between selected statistical noise levels.

#### Equivalent Sound Level

The Equivalent Sound Level,  $L_{\text{eq}}$ , represents a constant level of sound having the same total acoustic energy as that contained in the actual time-varying sound being measured over a specific time period.  $L_{\text{eq}}$  is commonly used to describe community noise, traffic noise, and hearing damage potential. It has units of dBA and is illustrated in Figure A-2.

#### Day-Night Equivalent Sound Level

The Day-Night Equivalent Sound Level,  $L_{\text{dn}}$ , is the Equivalent Sound Level,  $L_{\text{eq}}$ , measured over a 24-hour period. However, a 10 dB penalty is added to the noise levels recorded between 10 pm and 7 am to account for people's higher sensitivity to noise at night when the background noise level is typically lower. The  $L_{\text{dn}}$  is a commonly used noise descriptor in assessing land use compatibility, and is widely used by federal and local agencies and standards organizations. Qualitative descriptions, as well as local examples of  $L_{\text{dn}}$ , are shown in Figure A-3.

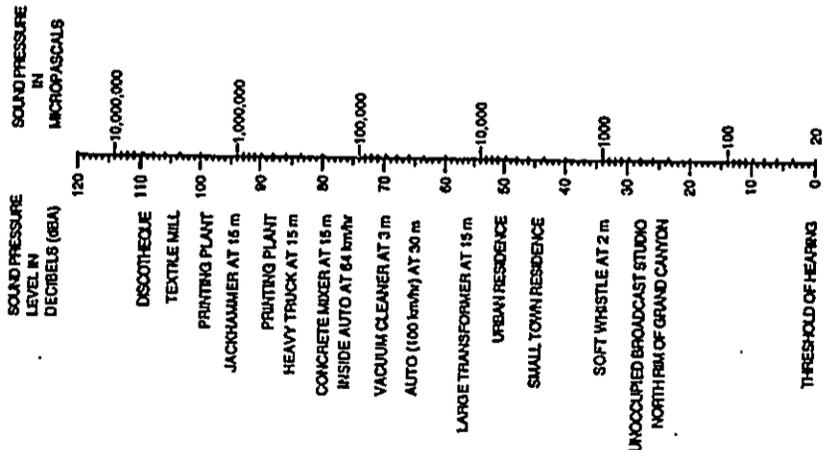


FIGURE A-1 THE RELATION BETWEEN SOUND PRESSURE, P, AND SOUND PRESSURE LEVEL, SPL, ALSO SHOWN ARE TYPICAL VALUES OF A-WEIGHTED SOUND LEVELS OF VARIOUS NOISE SOURCES.

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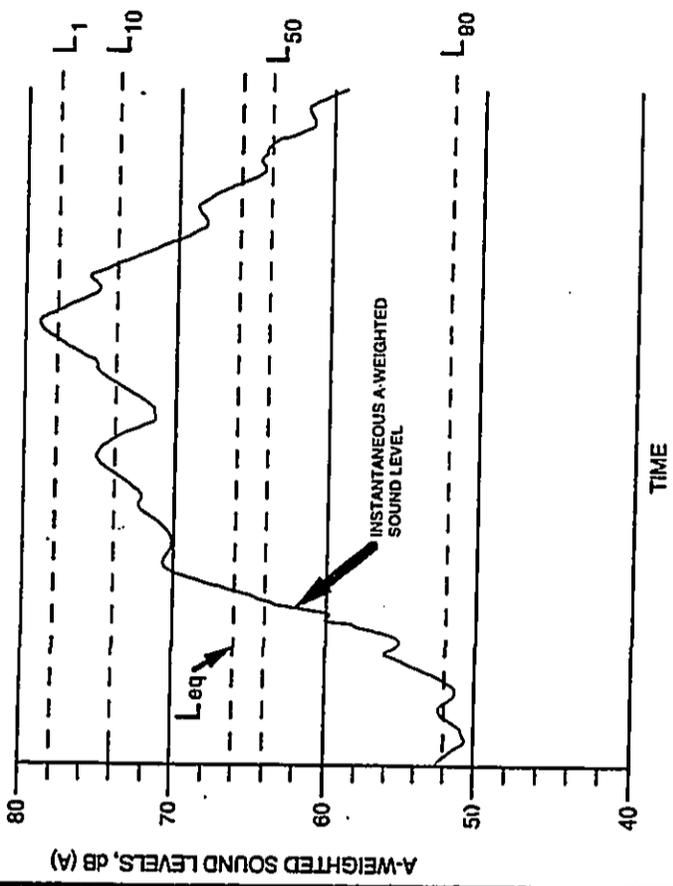


FIGURE A-2 COMPARISON OF AN INSTANTANEOUS SOUND LEVEL AND THE CORRESPONDING STATISTICAL SOUND LEVELS

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**VARONA VILLAGE PHASE II**

**APPENDIX H**

**Archaeological Survey**

# Archaeological Reconnaissance of the 'Ewa Villages Project Site Honouliuli, 'Ewa, O'ahu

By

Hallett H. Hammit, Ph.D.  
David W. Shideler, M.A.  
William H. Folk, B.A.

Prepared for

R. M. Towill Corporation

by

*Cultural Surveys Hawaii*  
September 1990

## Abstract

An archaeological reconnaissance survey of an approximately 616 acre 'Ewa Village project area in Honouliuli, 'Ewa, O'ahu was conducted by Cultural Surveys Hawaii at the request of R.M. Towill Corporation as a part of an E.I.S. for their client, the City and County of Honolulu. The project area includes three extant plantation villages (Kenton Village, Tenney Village and Varona Village), the sites of three former plantation villages (C Village, Hill Village, Middle Village) and several other sites associated with the 'Ewa Plantation infrastructure, including the Plantation Cemetery, the site of the 'Ewa Depot, the site of a previous Buddhist temple and the 'Ewa Japanese School, the site of a reservoir, and fields presently under sugar cane cultivation.

The 'Ewa Villages have been a focus of historic preservation concern at the City and County, State and National levels and have been found to have national significance and to be eligible for nomination as a National Historic Landmark -- the highest national historic designation. The 'Ewa Villages are presently a focus of study by the National Park Service, the State Historic Preservation Office and the City and County Department of Land Utilization.

This archaeological reconnaissance survey found no evidence of any prehistoric activity within the project area and recommends no further archaeological research in association with concerns for Hawaiian prehistory.

However, because of the historic preservation concern the 'Ewa Villages have merited, further documentation of some ruined sites is recommended. It is also recommended that the issue of subsurface archaeology in association with areas in which pre-WWII plantation structures are known to have existed be explicitly resolved by the State Historic Preservation Office prior to the development of any of these areas. These areas are specifically indicated.

Data is provided to facilitate resolution of the question of subsurface archaeology but the determination is left to the appropriate agency and may require extensive background research, which is beyond the scope of this research, or subsurface testing. Our assessment is that because of the nature of the structures, the disposal pattern and subsequent land modification the potential of subsurface archaeology is quite limited. Some surface features, including the remains of the Roundhouse, the long store and the community bathhouse (kuro), are recommended for further study.

It is recommended that attention be given to avoid impacting the O.R. & L. Right-of-Way, and the importance of two opportunities of the Right-of-Way within the project area is discussed.

#### Acknowledgements

We would like to thank Mr. Chester Koga and Ms. Laura Fujioka of R.M. Towill Corporation for providing maps and research materials. We would like to thank Mr. Takeo Yasui, Mr. Susumu Ishii, Mr. Tony Bise, Ms. Miko Ogawa, Ms. Imogene Martin, Mr. Fred and Audrey Toopes, and Pastor David Parker for their wealth of information about the history of 'Eva. We would like to thank Mr. Jim Charleton of the National Park Service for his input. The authors are completely responsible for any errors of fact. Fieldwork was performed by Mr. William Folk and Mr. David Shidaler. Typing services were by Dr. Vicki Creed of Windword Processing.

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### I. Introduction

An archaeological reconnaissance survey of an approximately 616 acre 'Eva Village project area (Figs. 1-3, 7) was conducted by Cultural Surveys Hawaii during August and September of 1990 at the request of R.M. Towill Corporation for their client, the City and County of Honolulu.

The purpose of this survey was to provide information on the presence of any sites or features of possible archaeological significance within the project area limits appropriate to and sufficient for an Environmental Impact Statement (E.I.S.) being prepared in accordance with Chapter 343 - Hawaii Revised Statutes. Written statements of our findings were given to Ms. Laura Fujioka and Mr. Chester Koga of R.M. Towill on August 26, 1990 and September 10, 1990. Arrangements were made to discuss our findings and concerns with Dr. Don Hibbard of the State Historic Sites section. Discussions were held with the Friends for 'Eva and Mr. Jim Charleton of the National Park Service.

#### A. Scope of Work

Our Scope of Work for the archaeological reconnaissance survey of the 'Eva Villages project area consists of the following:

1. Performance of a surface archaeological reconnaissance of the project area. The study was to include the notation of any significant archaeological or cultural site(s). The identification of the sites was to



Figure 1 State of Hawaii



Figure 2 General Location Map, O'ahu Island

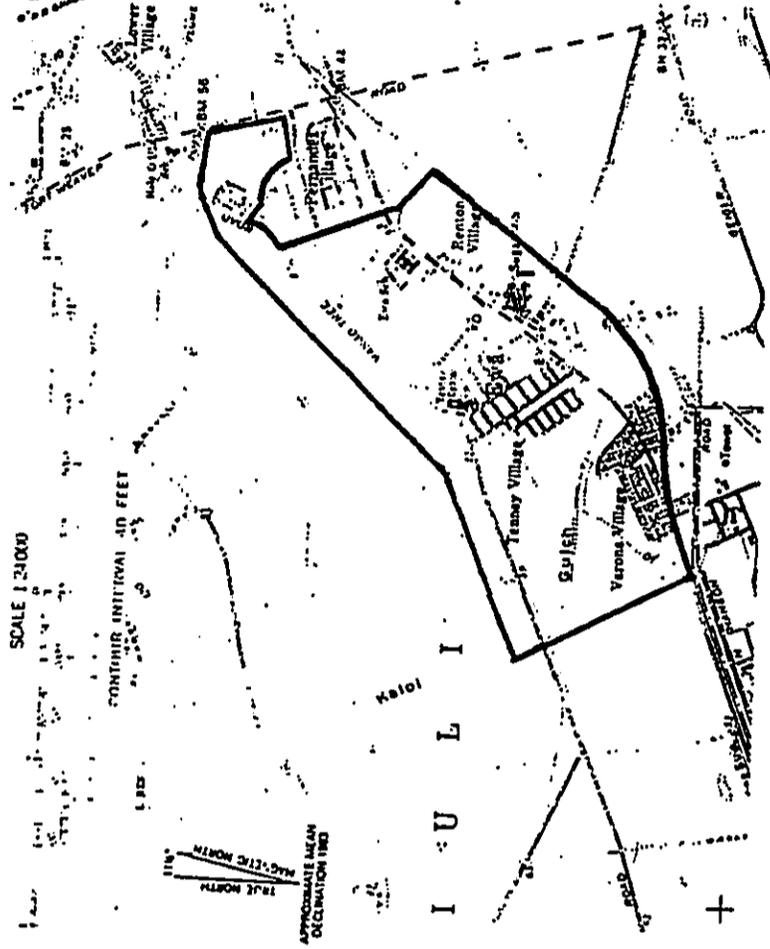


Fig. 3 U.S.G.S. Map, 'Eva Quad Showing Project Area  
1983

conform to procedures recognized by the Historic Site Section, of the Department of Land and Natural Resources (DLNR).

2. Literature research on the area to identify former land use and assess the potential for subsurface archaeological remains and that would identify the site as an historical area or as any area with the potential for the uncovering of historic/cultural remains.
3. Preparation of a report detailing the findings and suitable for inclusion in an Environmental Impact Statement (E.I.S.) for the project with a brief introduction, methodology used, and the findings and conclusions.
4. Consultation with the State Historic Sites Section or the DLNR regarding the findings and conclusions.

#### B. Methods

The parcel was traversed by foot and vehicle. As the project area is a focus of historic preservation concern at the City and County, State, and National levels and has been found eligible for nomination as a National Historic Landmark, particular attention was given to identify the location of plantation camps and other historic features -- no longer extant -- which might have associated archaeological deposits which might be of significance in the documentation of the history and lifestyle of 'Eva Plantation. This focused on a literature survey of maps, photographs, records of 'Eva plantation, and previous research --

which has been extensive. Discussions were held with four long-time (40 years or more) employees of the plantation to gain a better understanding of the distribution of the historic sites of the 'Eva Villages.

As any further documentation of structures at 'Eva is best left to professional architectural historians, we have no comment to make on any existing structures. Similarly, an evaluation of the adequacy of present documentation of these structures is outside of the sphere of our expertise. Unfortunately, portions of the 'Eva Villages have been destroyed without documentation in accordance with present standards. As portions of the project area have been found to have national significance and to be eligible for nomination as a National Historic Landmark, we have judged it as prudent to approach the sites of former plantation villages and other structures conservatively until decisions regarding the adequacy of documentation and the role of subsurface archaeology in further documentation has been fully addressed by the State Office of Historic Sites. We have attempted to provide data that will facilitate that assessment.

## II. Project Area Description

The approximately 616-acre 'Eva Villages project area lies in the *ahupua'a* of Honolulu in the District of 'Eva in the SW corner of the Island of O'ahu. Lying between approximately 38'-66' (11.6m. - 20.1 m.) elevation, the project area is located on the 'Eva Plain, which is a Pleistocene reef platform overlain by alluvium from the southern end of the Waianai Mountain Range. This alluvium has supported commercial sugar cane cultivation for over a century and much of the project area is still under a dense cover of sugar cane (*Saccharum sp.*). The project area is hot and dry with an average mean temperature of 74° F and with rainfall of 25 inches per year. Despite the aridity, the area is prone to flooding with the floods of 1916, 1917 1923, and 1927 well documented by Bishop Museum photos (1974.87.1288); some of which show standing water as far as the eye can see. The only landform to speak of within the project area is Kale'i Gully which cuts across the width of the south portion of the project area. Substantial occupation of the project area began in 1890 with the construction of housing for over 500 plantation workers. Much of the project area underlies three extant plantation villages: Renton Village, Tenney Village and Varona Village. The project area is perhaps best known for the well executed statue of Abraham Lincoln on the grounds of 'Eva Elementary School. It has been said that Mr. Lincoln was known as a particularly fair cock-fighting judge.

The S.W. boundary for a distance of approximately 2 kms is the Oahu Railway and Land roadbed (Site 50-80-12-9714). The SW

boundary extends from the southern tip of Varona Village NW to Mango Tree Road. The north boundary runs roughly parallel and just NW of Mango Tree Road until crossing the road just SW of Hale Ulu School. A northern neck of the project area extends east to Fort Weaver Road and then curves around the northern edge of Fernandez Village (outside the project area) before heading SE back to the railway bed just east of 'Eva Elementary School.

The 'Eva Villages have been under study by agencies of the City and County of Honolulu, the State Historic Sites Preservation Office and the National Park Service for some time. The National Park Service has completed fieldwork and has determined that this area has national significance and is eligible to be nominated as a National Historic Land Mark; the highest national historic designation. A decision has not been made (as of 9/8/90) on the boundaries of the parcel to be nominated. It is anticipated that National Park Service Historians will have completed their study and will mail it out for review around February 1, 1991. The City and County Department of Land Utilization is looking to establish a special district for the area, but as of this date no final decision has been made.

### III. Previous Archaeological Research

To our knowledge no previous archaeological research has been undertaken within the present project area. Three recent archaeological studies have been undertaken in adjacent parcels. An archaeological reconnaissance survey (Rosendahl, 1987) was conducted in association with the development of the 232-acre West Loch Estates Residential Increments I and II project, part of which lies just east of the north portion of the present study area. An archaeological reconnaissance (Kennedy, 1988) and subsequent archaeological subsurface survey (Davis, 1988) were conducted in association with the development of the 1016-acre 'Ewa Gentry project area which lies immediately to the SE, across the O.R. & L. right-of-way from the present study area.

The combined surface and subsurface reconnaissance survey of the West Loch Estates project area confirmed an initial impression that the project area had been extensively and almost entirely modified by decades of commercial sugar cane cultivation (Rosendahl, 1987:9). This study identified a modern cemetery, two historic sites of minimal integrity and a midden deposit which was ambiguous as to whether or not it even was a cultural feature (Ibid.:7,9). One of the historic sites noted (T-3) was related to the plantation settlement of Lower Village. It was noted that some artifacts "indicate the possibility of pre-1900 occupation" (Ibid.:8).

In the 'Ewa Gentry project area the initial reconnaissance (Kennedy, 1988) found no surface evidence of potentially significant cultural/historic remains. A subsequent subsurface

exploration was undertaken. Eighteen backhoe trenches were excavated including two trenches (Trenches 17 and 18) which were just SW (approx. 50 m.) from the present project area. "No evidence of past in situ cultural activity was found anywhere in the 'Ewa Gentry project area" (Davis, 1988:10).

The southeast boundary of the project area is the alignment of the O'ahu Railroad and Land Company (O.R. & L.) Right-of-Way. This railroad bed, from the intersection with Fort Weaver Road to the intersection of Farrington Highway and Luualalei Road in NanaKuli is currently listed on the National Register of Historic Places (Site 50-80-12-9714) and thus any development activities must take particular care to avoid impacting the remains of this railroad bed.

#### IV. History of Land Use

##### A. Prehistory and Early History

No evidence of prehistoric occupation was found within the present project area. However, this is not surprising considering the intensive use of this area for over a hundred years for sugar cane cultivation and as the hub of a plantation community. Three archaeological studies on two adjacent parcels totaling 1,248 acres documented no clear evidence of any prehistoric occupation. The vast majority of these lands had similarly been impacted by decades of intensive sugar cane cultivation. Traditional sources, the earliest maps, and early archaeological studies are mute regarding this portion of Honouliuli Ahupua'a.

Kalo'i Gully was of particular interest as the only known Hawaiian named land form within the project area. Puku'i (1984:77) translates the name to mean "the taro patch" and Sterling and Summers (1978:35) relate a number of vignettes regarding the "Ma'huna" or "Punahuna" hidden spring. Ida E.K. von Holt (in Sterling and Summers, 1978:35) relates the account of "two old Hawaiians" that the hidden spring "had been one of the principle sources of water for all that country, which was quite heavily populated before the smallpox epidemic of 1840." We believe this spring and any associated taro patches would most likely have been upslope (north) of the project area. Possibly the naming of 'Eva "crooked" relates to the meandering nature of Kalo'i Stream which turns 60° to the east as it enters the project area.

In discussing the trails of Honouliuli, John Papa Ii

(1983:97) suggests that the most common traditional Hawaiian trail from the West Loch area to the northern Waianae Coast was via Kolekole Pass. He mentions another trail from Pu'uoloa (Pearl Harbor) to Pu'u Kapolei and Waimanalo ('Eva). It seems most likely that this trail followed the route drawn by Paul Rockwood (Ibid.:96) which was roughly the alignment of Farrington Highway (approx. 3.5 km) north of the project area.

The earliest detailed map of the area (Alexander, 1873) shows no habitation closer than the western edge of West Loch in the vicinity of Papapapuhi Point some 2.5 km. distant. The Monsarrat survey map of 1878 documents substantial settlement at the "Honouliuli Taro Lands" in the Papapapuhi Point area and it seems clear that in early historic times that was the focus of the population of Honouliuli Ahupua'a (See Dicks et al., 1987). The amenities of that area, such as fishponds, taro lo'i, shellfish collecting, and salt drying would have focused population there in prehistoric times and the name of that place must have secondarily come to apply to the entire Ahupua'a.

A search for Hawaiian Land Commission Awards (L.C.A.) in the project area similarly showed no evidence of small private land holdings in the vicinity. The only land commission award in the vicinity is Royal Patent 6071, LCA 11216, Apana 8 to Miriam Ke'ahi-Kuni Kekau'ono'hi who was granted the Ahupua'a of Honouliuli, 'Eva, O'ahu by Kamehameha III on 28 January 1848 (Native Register).

Kamekahu (1961:208-209) relates the following: "Kamehameha's granddaughter, Ke-ahi-Kuni Kekau-'ono'hi ... was also a tabu

chiefess in whose presence the other chiefesses had to prostrate and uncover themselves, and Kamehameha would lie face upward while she sat on his chest." She was one of Liholiho's (Kamehameha II's) wives, and after his death, she lived with her half-brother, Luanu'u Kahala'i'a, who was governor of Kaua'i (Kelly, 1983:21). Subsequently, "that mischievous girl" (Kamakau, 1961:280) ran away with Queen Ka'ahumanu's stepson, Keli'i-ahonui, and then became the wife of Chief Levi Ho'alealea. Ke-ahi-Kuni Kekau-'onohi inherited Honouliuli from Levi Ha'alealea. She is listed as having received a total of 55 lands in the Mahele, one of which was 43,250 acres at Honouliuli which included the entire project area.

The earliest archaeological study in Honouliuli by McAlister (1933) documented Site 146. "The 'Eva coral plains contain many sites throughout the area. The greatest extent of old stone walls, particularly near the Pu'u'loa Salt Works, belongs to the ranching period of about 75 years ago [circa 1858]." The type locale for this site lies more than 3 kms to the SE. The only other early documented site in the vicinity was a heiau on Pu'u Kepolei, located more than 3 kms to the west.

In brief, very little is known about the prehistory of the immediate vicinity of the project area but there is no indication of occupation or any other utilization.

#### B. A Brief Summary of the History of 'Eva Plantation

In 1871, Ke-ahi-Kuni Kekau-'onohi rented much of Honouliuli to James Dowsett and John Meek for stock running and grazing

(Frierson 1973:13). When James Campbell paid \$95,000 for most of Honouliuli in 1877 he drove off the land 32,347 head of stock belonging to Dowsett, Meek and James Robinson (Dillingham in Frierson, 1973:13)

Up until 1889 the lands of the project area were used exclusively for cattle ranching. At that time, one planter remarked "the country was so dry and full of bottomless cracks and fissures that water would all be lost and irrigation impracticable" (Eva Plantation Co. 1923:6 7). But the vision and capital of men like James Campbell, Benjamin Dillingham and W. R. Castle and the rapid development of artesian water made 'Eva Plantation happen. A Hawaii Visitor Bureau marker, located about 1 km. north of the project area, points to a plaque bearing the inscription "Site of First Artesian Well in the Hawaiian Islands drilled by James Ashley for James Campbell owner of Honouliuli Ranch brought in on Sept. 22, 1879." This well was "near Campbell's ranch house" (Kuykendall, 1967:III,67).

The plantation grew relatively quickly. This growth included the deliberate inducement of erosion by plowing slopes vertically just before the rainy season in order to induce erosion, cause soil deposition on the limestone plain, and increase arable land (Frierson, 1973:17).

The 'Eva Plantation Company annual reports provide a fairly detailed chronology of construction, but are extremely vague as to where that construction occurred. The most valuable maps we have thus far identified (Figs 3-6, 7) are mostly U.S.G.S. or War Department maps.

In the decade of the 1890s the plantation built 72 houses, cottages or dwellings; in the first decade of this century, 536; in the 19-teens, 132; in the 20s, 285; in the 30s, 168; and in the 40s, only 35. Census of population of 'Eva Plantation are only given for 1928 (4967), 1929 (4477), and 1932 (4100). It seems probable that 1928 had about the highest population. The military aerial photograph of 'Eva (Fig. 6) in 1940 looks superficially much like the 'Eva of today. The outbreak of WWII siphoned off a lot of manpower from the plantation and after the changeover to practically complete reliance on mechanical harvesting in 1938 there was little need of the large multiracial (Japanese, Chinese, Okinawan, Korean, Portuguese, Spanish, Hawaiian, Filipino, European) labor force that had characterized most of the early history of the plantation.

It is to be noted that in the history of construction buildings were moved, demolished and replaced all the time. As early as 1899 the plantation moved "the lower camp of thirty houses to a position on the bluffs nearby ... principally for sanitary reasons" ('Eva Plantation Company Annual Report). In 1921 "all of the old barracks in the Chinese-Korean Village were torn down and new cottages and dormitories erected" (Ibid.). Thus all of the earliest workers' dwellings were likely to have been moved or demolished, leaving no trace as early as 1921. On the other hand, several vestiges of plantation life remains as amazing testimonies to a world that has now largely passed away. In researching the history of 'Eva one commonly comes across photos such as the one of six 'Eva Mill engines ensconced within the

Round House or references to the presence of 3 general stores, a butcher shop, soda water and ice manufacturing plant, ranch, dairy and bank ('Eva Plantation Annual Report, 1928).

The study of some specific archaeological sites, such as the Roundhouse, the long store and the community bath house (KUKG), in conjunction with oral histories and written and photographic records can more adequately document life at 'Eva Plantation.



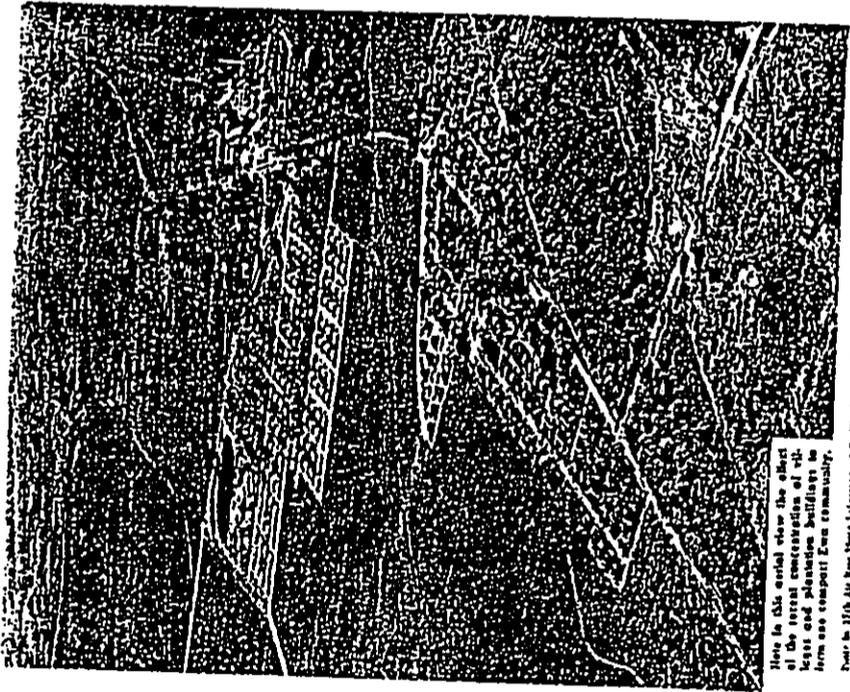
#### V. Results of Fieldwork

Fieldwork was first focused on identifying any possible Hawaiian sites or features within the project area. The entire project area was found to have been extensively disturbed by more than a century of cane cultivation and plantation infrastructure construction as background research had suggested. Kalo'i Gully (Fig. 8) was a particular focus for its known cultural associations but the gulch is little more than a 5 m. wide, 2 m. deep ditch as it traverses the project area. The frequent flooding mentioned previously and 100 years of sugar cane cultivation would have severely impacted any trace of prehistoric cultural association. There was no sign of prehistoric occupation along Kalo'i Gully or anywhere else within the project area.

No historic sites predating the beginning of the 'Ewa Plantation were observed. The results of archaeological reconnaissance of post 1890 sites (Fig. 7) will be discussed in the following order: the 'Ewa Plantation Cemetery, the Reservoir (Reservoir #1), the demolished Korean Village (Middle Village), the demolished Mill Village, the demolished "c" Village, the 'Ewa Depot, the potential of archaeology in Renton Village and the mill, the potential of archaeology in Tenney Village, and the potential of archaeology in Varona Village.

#### 'Ewa Plantation Cemetery

The 'Ewa Plantation Cemetery served the final needs of the remarkably diverse population of 'Ewa Plantation from approxi-



Here in this aerial view the effect of the total concentration of villages and plantation buildings in form one compact 'Ewa community.

Photo by 11th Air Reconnaissance Squadron, U.S. Marine Corps, 1940.

Fig. 6 Aerial View of 'Ewa Showing Most of the Project Area in Sugar Cane and Villages (1940)

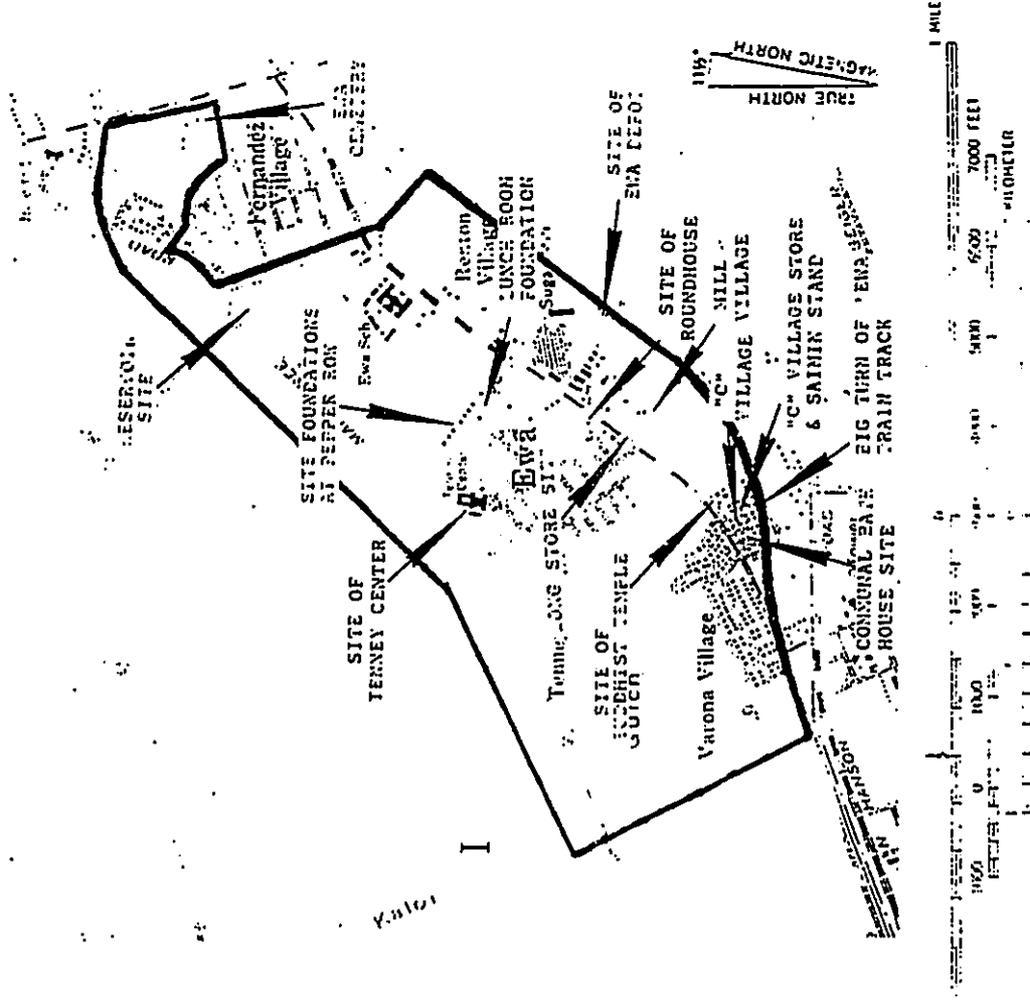


Fig. 7 Map Showing Location of Known Foundations



Fig. 8 View of Kalo'i gully from Mango Tree Road, View To SE

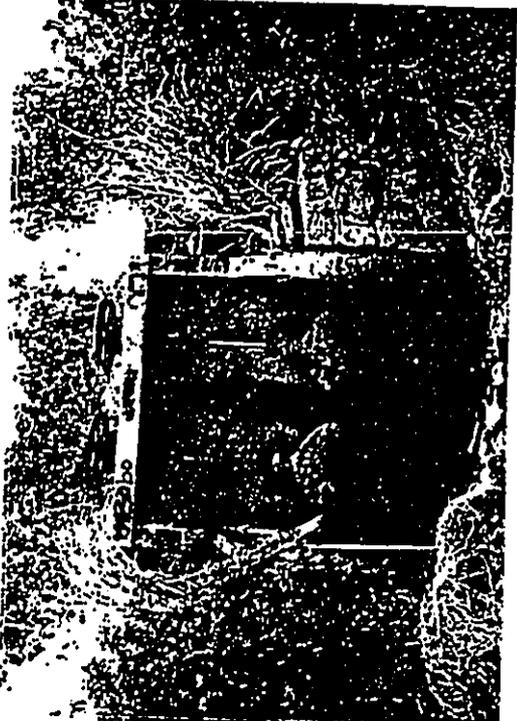


Fig. 9 Interior View of the Gates of the Reservoir View To SE

rately 1900-1970. There is no evidence of previous interment there. It is one of the largest, if not the largest, cemetery in SW O'ahu. The cemetery is bounded on the east by Fort Weaver Road, on the south by Karayan Street which is a major access road to Fernandez Village, on the west and north by narrow dirt roads, and on the northeast by a cemented culvert. The cemetery is dominated by a large stone memorial to the Pioneers, erected in 1947 by three Buddhist sects. Interment there ceased very close to 1970 and many of the remains were removed to Millilani Cemetery at about that time. The celebration of annual Buddhist rituals there seems to have largely ceased about three years ago and the cemetery is notably forlorn. Unmarked graves are believed to exist within the cemetery and other graves, marked at present by as little as a piece of iron rebar, may be unmarked soon.

Informants have mentioned that some grave markers have been removed by family members with the interment left in situ. The cemetery is quite discrete and is unlikely to extend beyond the dirt road perimeter but if any subsurface excavation is ever to be performed on these dirt roads or within their bounds it would be prudent to have an archaeological monitor present.

#### Reservoir #1

Reservoir #1, presently dry, is located just south of Mango Tree road, just west of Fernandez Village, and about 200 m. north of 'Ewa Elementary School. In the past the State Historic Sites Section has expressed concern for notable historic reservoirs and the 'Ewa Plantation Reservoir #1 would seem a likely candidate to

merit further data recovery if it is to be impacted by development. The date of construction is uncertain but the exterior spillway bears the date April 1926 and it appears in its present configuration on the 1928 U.S.G.S. map. Reservoir #1 may well be significantly older as by 1928 the irrigation system of 'Ewa Plantation was quite elaborate. Its cultural importance is primarily as the most concrete symbol of the genius in water management that made 'Ewa Plantation possible, as well as in the uniqueness of its valves (Fig. 9).

#### Korean Village (Middle Village)

Korean Village, as it is called on the U.S.G.S. map of 1928 and by many of the longtime residents of 'Ewa, or Middle Village as it is called on the 'Ewa Hill Camp Map of 1968 and in the 'Ewa Plantation Villages Housing Study (Phillips et al., 1979) was located on the "bluffs" just a few meters north of Fernandez Village abutting Mango Tree Road. In the 'Ewa Plantation Villages study it is asserted that this was the oldest village (1979:II,265) and it is dated to 1924. The 1979 housing survey and the 1983 U.S.G.S. map show 16 houses present. Today there is only limestone gravel, cement rubble and a few shards of broken pipe left to demarcate this village. The thoroughness of the obliteration is quite striking and the potential of significant subsurface deposits is thought to be very low. No further archaeological work is recommended there. The thoroughness of the obliteration of this village, which appears on a 1983 U.S.G.S. map, suggests that there is likely to be little trace of

any sites within the project area that were converted to cane cultivation at an earlier date.

#### Hill Village

Hill Village was located just SW of the mill on the SE side of Renton Road. In the 1928 U.S.G.S. map this is shown as a very populous area with nearly 150 structures between Renton Rd. on the west, Kalo'i Gully to the south, the O.R. & L. Right-of-Way to the east and Depot Rd. to the north. The 1968 Hill Camp Map shows 9 houses and two other complexes. The 1979 housing study cited 8 houses as present, dated them as 50+ years old (pre 1929) and recommended that the village be discontinued. The Bishop Museum visual collection (1974.87.1238, pgs 14-19) documents New Hill Village" in 1925 but photos of "Old Hill Village" dated 1924 suggest that the origin of the village may go back to the turn of the century or earlier. Almost nothing is standing at Hill Village. Reconnaissance indicated that archaeological survey could be of value in gleaning more information about Hill Village than might be available from other sources.

Of particular interest was the foundation of Long Store (1694 Renton Road; Fig. 10). This 2-story Long store (more than 30 m. long) was evidently one of the first foci of private enterprise at 'Eva and a survey of the slab could augment oral history and literature research. There is debris and foundation remnants of a number of domestic structures as well.

#### "C" Village

"C" Village was bounded to the NW by Renton Road, to the south of the O.R. & L. Right-of-Way and to the NE by field 046 and Kalo'i Gully and was built on a constructed terrace (Fig. 11). The Bishop Museum visual collection (1974.87.1288: pgs 17-19) has photos of "C Village Remodeled Annex Camp" dated 1926 and photos of "Old C Village" dated 1924 that suggest that the origin of "C" Village may go back to the turn of the century or earlier. The 1928 and 1943 U.S.G.S. maps indicate about 50 houses and the 'Eva Japanese School. The 1968 survey indicates about 45 houses and the 'Eva Hongwanji mission. The 1979 study indicates 38 structures as present and recommended demolition. Today only the Buddhist Mission and a couple of associated structures still stand, the rest has been leveled. However, reconnaissance indicates there is much of interest still extant. Foremost is the slab of a Japanese furo or bathhouse (Fig. 12). This may be one of the oldest extant sites of a communal bathhouse in the United States. The Annual Reports of 'Eva Plantation Company mention bath house construction only during 3 years 1899, 1903, and 1921 and only in 1899 is a communal bath house suggested - "the bath houses furnished for the comfort of laborers [were] consolidated." This bathhouse appears to be located on the 1928 U.S.G.S. map as a small circle. Also of interest are the slabs of two "single men's lunch rooms" (Fig. 13) and the site of a WWII bomb shelter. The site of the 'Eva Mill Railroad as it left the O.R. & L. alignment and doubled back to the NE to the mill was tentatively identified (Fig. 14) as it curves through "C"



Fig. 10 View of Long Stone Foundations, Hill Village, View  
TO SW



Fig. 11 View of 1 m. High Terrace at South Edge of Former  
"C" Village Site, View to N

Village. This alignment linked the O.R. & L, which is on the National Register of Historic Sites, with the heart of 'Ewa Plantation. The route of this appurtenance is still free of later construction. At least one previous Buddhist structure stood near the site of the 'Ewa Hongwanji Mission and was burned down during WWII (erson by a marine was suspected). Just south-east of the present 'Ewa Hongwanji Mission fence are two small boulder platforms which may relate to earlier constructions. Much might be learned by a survey of what remains of the layout of "C"-village and limited subsurface testing might reveal more.

#### 'Ewa Depot

The 'Ewa Depot (Fig. 15) was the way out of the plantation in more ways than one as high school students would ride to A'ala Park, transfer to a streetcar to McKinley School and repeat the process at the end of the day. A Bishop Museum photograph (BM46983) dated 1943 shows a wooden platform flush with the O.R. & L. track and elevated on the NW side. Other photos depict the architectural well (Fig. 15). This site has been visually impacted by recent 2-story housing construction, but the specific site is undeveloped and merits further consideration by appropriate parties.

#### Renton Village

The reconnaissance of Renton Village noted house slabs at vacant lots (49, 53, 57) of Pepper Row (Fig. 16). A map of 'Ewa houses by Fernando Ziaicita dates some of the earliest houses in



Fig. 12 View of Communal Bath House Foundation, View to NW



Fig. 13 View of Foundation of "C" Village Store and Attached Saimin Stand



Fig. 14 View of a Portion of the Probable Alignment of the 'Ewa Hill Railroad As It Turns Away From the O.R. & L. and Bends Back NE Towards the Hill, View to North

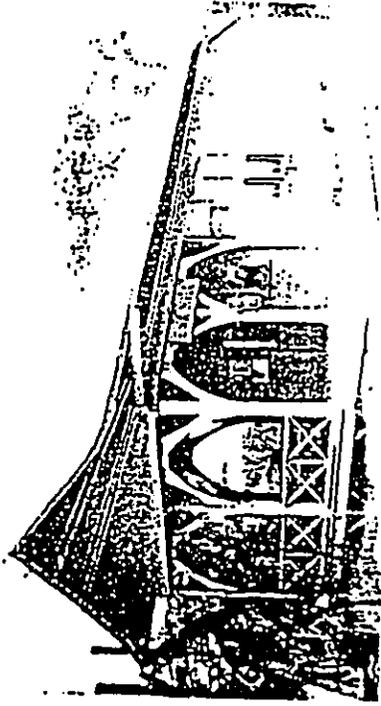


Figure 15 Photo of 'Ewa Hill Station of O.R. & L. Co. (from Conde and Best, 1973)

Renton Village to this vicinity (circa 1907). A Bishop Museum photo (dated 1908) shows "first residences built in Pepper Row" (1974.87.1288). A survey of these and other house slabs in Renton Village might go far to complete the picture of the history and nature of construction at Renton Village. Just SW of Pepper Row are a number of foundations, like the lunchroom foundation for the Tournahauler Shop and Cane Haul Drivers (Fig. 17) for which it is unclear that documentation adequate for historic preservation concerns exists.

#### Tenney Village

At Tenney Village reconnaissance suggests that survey of vacant house lots would be unlikely to yield significant data on domestic structures. However, slabs and walls believed to be associated with the gas station, and Tenney Center and the slab tracks of the roundhouse (Fig. 18, 19) are still extant and survey coordinated with archival research, photo collection research, and oral history research could result in far better documentation than is presently known to exist.

#### Varona Village

Reconnaissance suggests that survey of vacant house lots would be unlikely to yield significant data on domestic structures. The demolition of the recreation building and of houses forming the central U-shapa lot configuration was so complete that there is little hope of significant data recovery from survey or subsurface testing. There is a ruin of a lamp post on

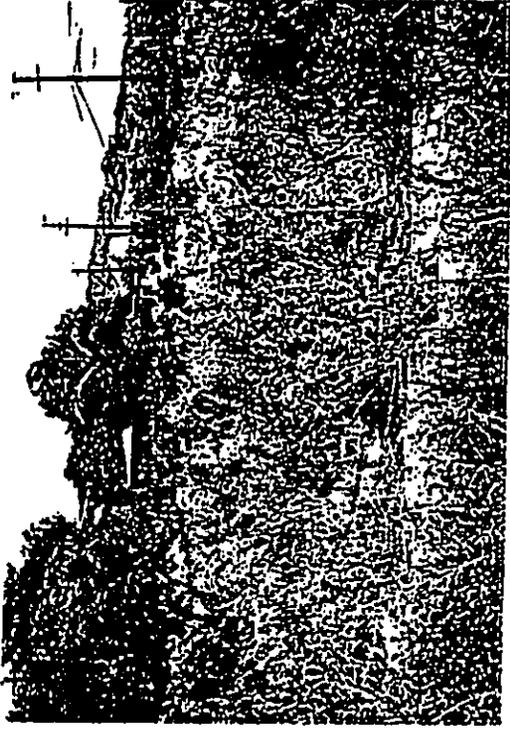


Fig. 16 View to NW of 3 Lots on Pepper Row (49 53, 57), Foundation of House in Foreground

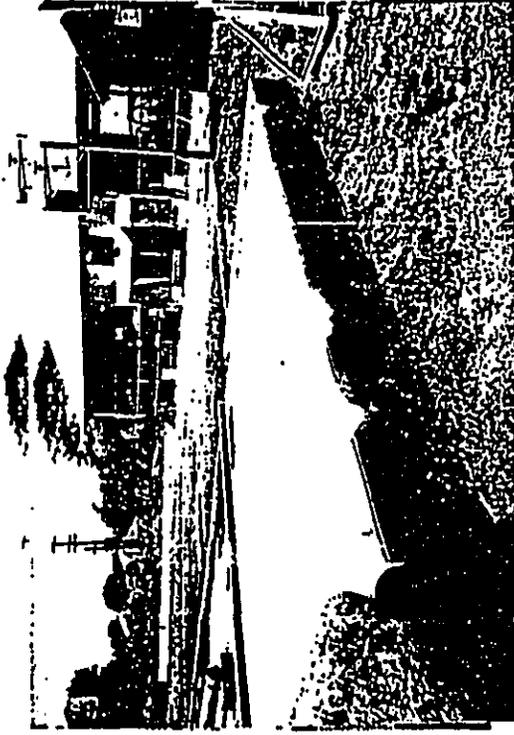


Fig. 17 View of Foundation of Lunch Room for Tournahauler Shop and Cane Haul Drivers. View to NW from Pepper Row



Renton Road that might well merit proper recording or preservation.

Fig. 18 View of Foundation of Roundhouse, View to NW

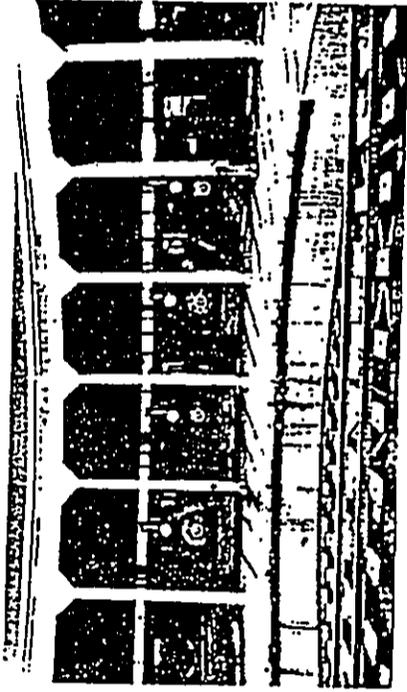


Fig. 19 Photo 'Ewa Plantation Roundhouse (Cande and Best, 1973)

#### VI. Summary and Recommendations

No prehistoric sites were identified during archaeological reconnaissance within the project area. No Land Commission Awards other than the LCA of most of the ahupua'a of Honouliuli to Kekau'onehi (L.C.A. 11216) lie within the project area. Other archaeological surveys on adjacent parcels have identified no prehistoric occupation or utilization of the immediate area. No prehistoric sites are likely to be encountered within the project area. Virtually the entire project area has been extensively graded repeatedly over the past century by the 'Ewa Plantation Company in association with sugar cultivation and the construction of sugar plantation infrastructure.

In light of the findings of previous subsurface testing in the immediate vicinity (Davis, 1988:10ff), the absence of indications prehistoric utilization, and the massive historic alteration of these lands no subsurface testing for traces of Hawaiian prehistory seem warranted and none are recommended.

Within the project area are the (post 1890) sites of a number of plantation villages and other plantation era structures which have been dismantled, bulldozed or otherwise removed. These include the former site of "C" village, the former site of Hill Village, the former site of Middle Village, and the former sites of a number of other plantation structures including early plantation houses, religious structures, and other plantation infrastructure. The project area has been a focus of historic preservation concern by many organizations within the private

sector, in addition to the City and County of Honolulu, the State of Hawaii, and the Federal Government. National Park Service historians have determined that the 'Ewa Villages are eligible for nomination as a National Historic Landmark; the nation's highest historical designation. Because of the clear historic importance of the 'Ewa Villages we must urge caution with regard to the development of any portions of the 'Ewa Villages project area in which historic structures are known to have existed as there may be subsurface archaeology (building foundations, latrines, etc.) relevant to historic preservation concerns. We must recommend that any consideration of development of portions of the 'Ewa Village project area, in which any pre-WWII historic structures are known to have existed, be done in close consultation with the State Historic Sites Preservation Office to evaluate the possible relevance of subsurface archaeology to the further documentation of previously existing structures or other historic preservation concerns. The locations of pre-WWII structures are indicated in Figs 4-7.

An attempt was made to evaluate the possible role of subsurface archaeology with regard to the documentation of pre-WWII historic structures and plantation life in the 'Ewa Villages. Previous subsurface archaeological studies of historic structures we have been involved with at Waiole Mission, Kaula'i; Koele, Lana'i; and Fort Alexander, Kaula'i were fruitful in elucidating the history of these sites in the early twentieth century offering historical information not available in the literature.

However, in the case of the 'Eva Villages project area we foresee little role for subsurface archaeological studies owing to 1) the nature of construction 2) the pattern of discard, and 3) the extent of subsequent land modification.

Most plantation structures were of wood and set lightly upon the earth, often on small cement post supports, leaving little trace of a building print once gone. The plantation and the plantation workers themselves were notably thrifty and the records of the 'Eva Plantation and the recollection of long-time residents, supports a common pattern of utilizing any useful portions of structures (eg. fixtures, boards) in later construction. A Bishop Museum photo (1974.87.128:p98) of the tearing down of the old ('Eva Union) church, dated 1926 suggests that there would be little trace of this structure owing to the thoroughness of the demolition. There is good reason to believe on the basis of the testimony of long-time residents that the disposal of structural debris and other rubbish was outside of the present project area from a very early date. There are Bishop Museum photos of various "nail drives" in which children scoured the camps collecting all the nails they could find. The general thriftiness of the plantation extended to a pattern of quick reutilization of lands once structures were removed by building new structures on the site or placing the land back in sugarcane production. These operations typically involved massive impact to the former site by heavy machinery.

Thus, it is anticipated that subsurface archaeology will

have little role in the historic preservation concerns for 'Eva Plantation. However, because of the historic preservation concern the project area has merited, we recommend that the issue of subsurface archaeology be explicitly raised with the State Historic Preservation Office prior to the development of any land by the City and County upon which pre-WWII plantation structures are known to have existed. This would include the vicinity of Renton Village, Tenney Village, Varona Village, C Village, Mill Village, Middle Village, 'Ewa Mill, 'Ewa Elementary School, 'Ewa Station and the 'Ewa Japanese School site. It is anticipated that in many areas no subsurface archaeological reconnaissance would be deemed necessary and that short-term archaeological monitoring during construction would suffice in other areas but this recommendation should be made by the State Historic Sites Section or their designated authorities.

We recommend that particular attention be given to avoid further impact to the O.R. & L. Right-of-Way, and the two appurtenances of this National Historic Site that lie within the project area. The 'Eva depot site (0.344 acre) was an intrinsic portion of the O.R. & L. and of tremendous importance to the story of 'Eva Plantation. It was one of the few aspects of 'Eva Plantation Life in which Hawaiian people participated (Auwana family). The other appurtenance of the O.R. & L. National Historic Site is the 40' wide (3.43 acre) link to the 'Ewa Mill running through "C" Village and along Renton Road, through which the lifeblood of the plantation, machinery and supplies coming in

and molasses and raw sugar going out, flowed. Regarding recommendations on these matters, and all other areas of historic preservation concern that fall outside of our field of expertise, we can only refer you to the State Historic Preservation Office and must urge thorough consultation with that office in advance of any planned development in the areas previously recommended for consultation on the issue of subsurface testing.

We recommend survey of the Long Store foundation, the foundations of "C" Village, the Roundhouse site, the site of the Tenney Recreation Center, the site of a previous Buddhist temple, and the work area across Renton Road from the Mill in coordination with further oral history and archival research if the State Historic Preservation Office agrees that documentation of these sites is not presently adequate considering the intrinsic importance of these sites to this area of nationally recognized historic preservation concern.

Beyond these recommendations our only area of concern lies with the large 'Ewa Plantation cemetery located in the northeast portion of the project area just west of Fort Weaver Road for which we recommend preservation. Interments in this cemetery are thought to have begun circa 1900 and continued as late as 1970. We have good reason to believe, based on discussions with longtime residents, that there are unmarked graves present and we recommend archaeological monitoring for any grading, grubbing or subsurface trenching within 20' of this cemetery.

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