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'90 JUN 28 DEPARTMENT OF PUBLIC WORKS  
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OFC. OF ENVIRONMENTAL  
QUALITY CONTROL

June 25, 1990

Dr. Marvin Miura  
Director  
State Office of Environmental Quality Control  
465 South King Street, Room 104  
Honolulu, Hawaii 96813

Dear Dr. Miura:

SUBJECT: NOTICE OF DETERMINATION/NEGATIVE DECLARATION  
AGENCY ACTION BY COUNTY OF KAUAI, DEPARTMENT  
OF PUBLIC WORKS KAPAA SEWER PROJECT, PHASE I  
WAILUA-KAPAA AREA, KAPAA, HAWAII

Back in February 1985, we submitted an Environmental Assessment with a Negative Declaration for the subject project which involves the construction of an interceptor/collector sewer line, including pump stations from Kapaa Town to Wailua.

While the scope of the project has not changed, the alignments of the proposed force mains needed to be relocated from the State Highway Bridges to underwater canal crossings.

This change in alignment, more specifically the need to work within the respective canals, prompted the preparation of the enclosed (three copies) environmental assessment for the subject project. We again have determined a Negative Declaration based on the following:

1. This project will not generate any significant impacts upon the environment.
2. The significance of anticipated environmental impacts is adequately evaluated and disclosed within the environmental assessment.

A description of the proposed action and statement of objective is summarized in Chapter Two of the environmental assessment (see Project Alternative B). A description of the affected environment, related maps and other required information are presented in Chapter Three of the environmental assessment.

Dr. Marvin Miura  
June 25, 1990  
Page (2)

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We would appreciate your publishing of this determination as soon as possible as we are faced with a compliance schedule with EPA to initiate and complete construction of the project.

Should you have any questions concerning our determination require or further information, please contact Mr. Harry Funamura, Chief of Sewers Section at Telephone No. (808) 245-4751.

Thank you for your time and consideration.

Very truly yours,



KIYOMI MASAKI  
Acting County Engineer

HF/cu

Attachment

1990-07-08-KA- FEA

FILE COPY

~~KADAI STREET PROJECT, PHASE I~~  
~~ENVIRONMENTAL ASSESSMENT~~

For

COUNTY OF KADAI  
DEPARTMENT OF PUBLIC WORKS  
444 Rice Street  
Hilo, Kailua, Hawaii 96766  
(808) 235-4751

Prepared by

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June 1990

## TABLE OF CONTENTS

<u>Chapter</u>	<u>Title</u>	<u>Page No.</u>
1.0	INTRODUCTION	1-1
1.1	PURPOSE	1-1
1.2	Scope of the Environmental Assessment	1-1
1.3	Report Organization	1-2
1.4	Methodology	1-2
1.5	Agency and Public Consultation	1-4
1.6	Responsibility for Environmental Assessment Preparation	1-5
2.0	PROJECT ALTERNATIVES	2-1
2.1	SIGNIFICANT FACTORS INFLUENCING ALTERNATIVE SELECTION	2-1
2.1.1	General Planning Issues	2-1
2.1.2	Population Growth and Increased Land Development	2-2
2.1.2.1	Island of Kauai	2-2
2.1.2.2	Wailua-Kapaa Area	2-2
2.1.3	Increased Wastewater Flows in the Wailua-Kapaa Area	2-3
2.1.3.1	Existing Wastewater Flow Projections	2-3
2.1.3.2	Anticipated Wastewater Flows to the Year 2000	2-3
2.1.4	Water Quality of Local Streams and Inshore Waters	2-10
2.2	METHOD OF ALTERNATIVE EVALUATION	2-11
2.3	PROJECT ALTERNATIVE A: THE NO PROJECT OPTION	2-12
2.4	PROJECT ALTERNATIVE B: CONSTRUCT A PUBLIC SEWER TRANSMISSION SYSTEM IN THE WAILUA-KAPAA AREA AND DIRECT FLOWS TO THE EXISTING WAILUA WASTEWATER TREATMENT PLANT	2-12
2.5	PROJECT ALTERNATIVE C: CONSTRUCT A PUBLIC SEWER TRANSMISSION SYSTEM AND WASTEWATER TREATMENT PLANT IN KAPAA	2-13
2.6	COMPARISON OF PROJECT ALTERNATIVES	2-13
2.6.1	Conservation of Inshore Water Quality & Stream Biota	2-13
2.6.2	Temporary Construction-Related Impacts	2-14
2.6.3	The Cost of Improved Wastewater Management	2-15
2.6.4	Statistical Comparison Results	2-15
2.7	PROJECT DESCRIPTION OF SELECTED PROJECT ALTERNATIVE B	2-18
2.7.1	Project Objectives	2-18
2.7.2	General Project Scope and Location	2-18
2.7.2.1	Northern Kapaa Town	2-19

Table of Contents (Continued)

<u>Chapter</u>	<u>Title</u>	<u>Page No.</u>
2.7.2.2	Central & South Kapaa Town	2-19
2.7.2.3	Waipouli Area	2-25
2.7.2.4	Wailua Area	2-27
2.7.3	Use of Public Funds	2-27
2.7.4	Construction Schedule	2-27
<b>3.0</b>	<b>ENVIRONMENTAL SETTING</b>	<b>3-1</b>
<b>3.1</b>	<b>PHYSICAL ENVIRONMENT</b>	<b>3-1</b>
3.1.1	Geology and Soils	3-1
3.1.2	Topography of the Kuhio Highway Corridor	3-1
3.1.3	Climate	3-2
3.1.4	Hydrology	3-2
3.1.5	Floods and Tsunamis	3-3
<b>3.2</b>	<b>BIOLOGICAL RESOURCES</b>	<b>3-4</b>
3.2.1	Aquatic Resources of Local Canals and Streams	3-4
3.2.1.1.	Moikeha Canal	3-4
3.2.1.2	Waikaea Canal	3-5
3.2.1.3	Waipouli Canal	3-5
3.2.1.4	Wailua River	3-5
3.2.2	Terrestrial Ecology	3-6
<b>3.3</b>	<b>CULTURAL RESOURCES</b>	<b>3-6</b>
3.3.1	Archaeological and Historical Resources	3-6
3.3.2	Socio-Economic Trends	3-6
<b>3.4</b>	<b>BUILT ENVIRONMENT</b>	<b>3-6</b>
3.4.1	Existing Land Uses	3-6
3.4.2	Existing Wastewater System in the Wailua-Kapaa Area	3-11
3.4.2.1	Kauai County System	3-11
3.4.2.2	Other Wastewater	3-11
3.4.3	Vehicular Traffic Along the Kuhio Highway Corridor	3-11
3.4.4	Recreation	3-13
<b>3.5</b>	<b>PLANS, POLICIES, AND CONTROLS</b>	<b>3-18</b>
3.5.1	Hawaii State Plan, Hawaii Revised Statutes, Chapter 226	3-18
3.5.2	State Land Use Designations	3-18
3.5.3	Kauai County Special Management Area (SMA) Designations	3-18
3.5.4	Kauai County Zoning Designations	3-21
3.5.5	Hawaii Administrative Rules, Title 11, Chapter 62, Wastewater Systems	3-21
3.5.6	Hawaii Administrative Rules, Title 11, Chapter 23, Underground Injection Control	3-21

Table of Contents (Continued)

<u>Chapter</u>	<u>Title</u>	<u>Page No.</u>
4.0	ANTICIPATED ENVIRONMENTAL CONSEQUENCES AND PROPOSED MITIGATIVE MEASURES	4-1
4.1	PHYSICAL IMPACTS	4-1
4.1.1	Trench Excavations	4-1
4.1.2	Site Preparation of Pump Station Sites	4-1
4.1.3	Force Main Installations in Local Streams and Canals	4-2
4.2	BIOLOGICAL AND WATER QUALITY IMPACTS	4-3
4.2.1	Temporary Relocation of Stream Biota During In-Stream Excavation	4-3
4.3	CULTURAL IMPACTS	4-3
4.3.1	Vehicular Traffic Impacts	4-3
4.3.2	Commercial Retail Sales Impacts	4-4
	REFERENCES	REF-1
	APPENDIX A: GOVERNMENTAL PERMIT APPLICATIONS	

LIST OF FIGURES

<u>Figure No.</u>	<u>Title</u>	<u>Page No.</u>
1-1	Regional Location - Kapaa Sewer Project	1-3
2-1	Kapaa Sewer Project, Phase I Northern Kapaa Town Improvements	2-20
2-2	Kapaa Sewer Project, Phase I Central and South Kapaa Town Improvements	2-21
2-3	Kapaa Sewer Project, Phase I Waipouli Area Improvements	2-22
2-4	Kapaa Sewer Project, Phase I Wailua Area Improvements	2-23
2-5	Moikeha Canal Crossing Plan and Profile	2-24
2-6	Waikaea Canal Crossing Plan and Profile	2-26
2-7	Waipouli Canal Crossing (Uhelekawana Stream) Plan and Profile	2-28
2-8	Wailua River Crossing Plan and Profile	2-29
3-1A	Existing Land Uses Northern Kapaa Town Area	3-7
3-1B	Existing Land Uses Central and South Kapaa Area	3-8
3-1C	Existing Land Uses Waipouli Area	3-9
3-1D	Existing Land Uses Wailua Area	3-10
3-2	Peak Hour Traffic Volumes in Wailua-Kapaa Area July, 1988	3-14

List of Figures (Continued)

<u>Figure No.</u>	<u>Title</u>	<u>Page No.</u>
3-3	Average Vehicular Speed (By Direction) Along Kuhio Highway Morning & Evening Traffic July, 1988	3-16
3-4	State Land Use Designations Wailua-Kapaa Area	3-19
3-5	Kauai County "SMA" Boundary (Special Management Area) Wailua-Kapaa Area	3-20
3-6A	Kauai County Zoning Designations Northern Kapaa Town Area	3-22
3-6B	Kauai County Zoning Designations Central and South Kapaa Area	3-23
3-6C	Kauai County Zoning Designations Waipouli Area	3-24
3-6D	Kauai County Zoning Designations Wailua Area	3-25
3-7	State Department of Health Underground Injection Control Limit Wailua-Kapaa Area	3-26



LIST OF TABLES

<u>Table No.</u>	<u>Title</u>	<u>Page No.</u>
2-1	Hotel, Condominium, and Apartment-Hotel Units Wailua-Kapaa Area, 1989	2-4
2-2	Projected Wastewater Flow in 1985 Kapaa Sewer System 1984 Small Community Facility Plan Forecast	2-5
2-3	Projected Wastewater Flow in 2005 Kapaa Sewer System 1984 Small Community Facility Plan Forecast	2-6
2-4	Projected Wastewater Flow in 2025 Kapaa Sewer System 1984 Small Community Facility Plan Forecast	2-7
2-5	Anticipated Average Wastewater Flows Wailua-Kapaa Area Year 2000	2-9
2-6	Comparative Scoring of Project Alternatives Kapaa Sewer System Project	2-16
2-7	Comparison of Three Project Alternatives Kawaa Sewer System Project Total Weighted Alternative Scores	2-17
3-1	Seasonal Median Rainfall Pattern Wailua-Kapaa Area (Millimeters)	3-2
3-2	Estimated Average Wastewater Flow (MGD) Other Private & Public Wastewater Treatment Systems	3-12
3-3	Existing Peak Hour Levels of Service Selected Traffic Intersections In Wailua-Kapaa Area	3-15
3-4	Level of Service Definitions for Two-Way Stop-Controlled Intersections	3-17

**CHAPTER ONE**  
**INTRODUCTION**

# CHAPTER ONE INTRODUCTION

## 1.1 PURPOSE

The intent of this environmental assessment is to provide the Kauai County Planning Department, the State Commission on Water Resource Management and the U.S. Army Corps of Engineers with the information necessary to determine whether the proposed Kapaa Sewer Project will generate any significant environmental effects. This environmental assessment is being submitted as part of three separate permit applications to these agencies. These governmental permit applications (Appendix A) include:

Kauai County Special Use Permit;  
*State Commission on Water Resource Management Stream Channel Alteration Permit;*  
and  
U.S. Army Corps of Engineers General Permit for Utility Lines in or above Navigable Waters.

Following review of this environmental assessment, the Kauai County Department of Public Works will prepare its notice of determination which indicates whether or not the preparation of a more detailed environmental impact statement (EIS) is required. The notice of determination and environmental assessment prepared by the Kauai County Department of Public Works will be submitted to the State Office of Environmental Quality Control which will publish a summary of the project in its bi-monthly OEQC Bulletin to provide public notice.

## 1.2 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

This environmental assessment includes the following information and analyses that conform to the content requirements outlined in Title 11, Chapter 200 of the State Administrative Code. Section 10 of Chapter 200 requires that environmental assessments contain the following information:

1. identification of the applicant;
2. identification of the approving agency, if applicable;
3. identification of the agencies consulted in preparing the assessment;
4. general description of the proposed project's technical, economic, social, and environmental characteristics;
5. summary description of the affected environment, including location and site maps;
6. identification and summary of major impacts and alternatives considered, if any;
7. proposed mitigation measures, if any;

8. an approving agency, e.g. Kauai County Department of Public Works, determination and reasons supporting the determination; and
9. agencies that should be consulted if a more detailed environmental impact statement is required.

The environmental assessment addresses relevant environmental issues influencing the project area, which is situated within the Kuhio Highway corridor, as well as the surrounding Wailua-Kapaa area (Figure 1-1). The assessment examines anticipated wastewater generation in the Wailua-Kapaa area and related water quality concerns along the nearby inshore waters. Proposed stream crossings within the project area are evaluated in the context of potential impacts upon aquatic biota. Land uses and community activities along the Kuhio Highway corridor, between Wailua and Kapaa, are also analyzed to determine the type and extent of community impacts that may be generated during construction of the Kapaa Sewer Project.

### **1.3 REPORT ORGANIZATION**

The environmental assessment document is organized in the following manner:

Chapter 1.0 identifies the purpose of the environmental assessment, the intended use of the information presented, and its relationship to the legal determination that will be made by the Kauai County Department of Public Works.

Chapter 2.0 identifies and compares three project alternatives, including the "no project" alternative.

Chapter 3.0 assesses the significant characteristics and trends influencing Kauai's Wailua-Kapaa area, the Kuhio Highway corridor, and the aquatic resources of Wailua River, Uhelekawana Stream (Waipouli Canal), Waikaea Canal, and Moikeha Canal makai of Kuhio Highway.

Chapter 4.0 evaluates the anticipated environmental consequences of the proposed project. Significant impacts are quantified, to the extent practical, to facilitate reviewers' assessment of anticipated project impacts. Feasible mitigation measures, which may reduce anticipated project impacts, are also identified.

### **1.4 METHODOLOGY**

A combination of quantitative and qualitative analyses were used in the preparation of this environmental assessment. These evaluations relied primarily upon available information from public agencies, and other private organizations. Available information was obtained through the use of existing technical reports and supplemented by informal discussions with selected representatives of public agencies and other private organizations.



An onsite reconnaissance of the Wailua-Kapaa area was made intermittently during the May 14-25, 1990 period by James Pedersen, Planning Consultant. Onsite observations and field notes were supplemented by a filming of the proposed sewer alignment and stream crossing areas using 8 mm camcorder equipment.

## 1.5 AGENCY AND PUBLIC CONSULTATION

Preparation of this environmental assessment involved consultation with the following public and private organizations:

### County of Kauai

- Department of Public Works
- Planning Department
- Transportation Office
- Department of Finance
- Office of Economic Development
- Office of Housing

### State of Hawaii

- Department of Land and Natural Resources
  - Division of Aquatic Resources
  - Division of Water and Land Development
- Department of Business and Economic Development
- Department of Transportation
  - Division of Highways
- Department of Health

### United States Government

- Army Corps of Engineers

### Private Organizations

- Portugal & Associates, Inc.
- Belt Collins & Associates, Inc.
- Park Engineering
- Aqua Engineers, Inc.

**1.6 RESPONSIBILITY FOR ENVIRONMENTAL ASSESSMENT PREPARATION**

Portugal and Associates, Inc., consulting engineers and land surveyors, is the prime consultant to the County of Kauai for the planning and design of the Kapaa Sewer Project, Phase I. A portion of the planning responsibilities for Portugal and Associates is the preparation of an environmental assessment for the Kapaa Sewer Project. James H. Pedersen, Planning Consultant, was retained by Portugal and Associates, Inc. to prepare the environmental assessment for this project.

Mr. Jim Pedersen, the principal of the firm, is a planning consultant with 20 years of professional experience associated with the evaluation and master planning of regional, community and site development projects throughout the Pacific Basin. These projects have involved his management and preparation of regional economic and infrastructure development plans; community development and redevelopment projects; economic and development feasibility studies, *site and facility plans for specific transportation, residential, commercial and industrial development projects*; and related environmental impact studies.

**CHAPTER TWO**  
**PROJECT ALTERNATIVES**



## **CHAPTER TWO PROJECT ALTERNATIVES**

### **2.1 SIGNIFICANT FACTORS INFLUENCING ALTERNATIVE SELECTION**

#### **2.1.1 General Planning Issues**

The management of wastewater from Kauai's Wailua-Kapaa area (Figure 1-1) has been under study since 1973. Past evaluations and related wastewater facility planning by the County of Kauai have considered various development options that have been aimed at 1) reducing the disposal of untreated domestic sewage; and 2) centralizing sewage treatment and effluent disposal.

Since 1973, the past planning objectives of the County of Kauai have essentially not changed. However, the selection of development options has varied and has been readjusted during the past 17 years to primarily accommodate changing program requirements of the U.S Environmental Protection Agency (USEPA). The changes in USEPA requirements were, for the most part, a reflection of major revisions to the federal Clean Water Act of 1972 which were made by the U.S. Congress during the 1972-1977 period.

The growth of Kauai County during the past 20 years has also influenced the planning of wastewater facilities in the Wailua-Kapaa area. Expanded land development and related increases in residential and visitor population are generating greater wastewater volumes and have prompted greater public and governmental agency concerns for groundwater quality and surface water quality along the shoreline and inshore waters. Public agency concerns for the Wailua-Kapaa area, and other statewide coastal areas, have resulted in the State Department of Health's implementation of recent and pending wastewater disposal regulations that will exclude the use of cesspools makai of the 100-foot elevation and within 1000-feet of any groundwater well.

The presence of a high water table in the Wailua-Kapaa area continues to affect the operational reliability of individual cesspools and private wastewater treatment and disposal systems. Greater enforcement actions by the State Department of Health have been imposed upon public and private facilities in the area. In addition, National Pollution Discharge Elimination Permits (NPDES) for one public housing project in Kapaa contain stipulations that this facility must connect to the proposed Kapaa Sewerage Project.

A managing engineer from a local water/wastewater operations company on Kauai indicates that managers of most public and private wastewater facilities would welcome the opportunity to connect their facilities to the proposed Kapaa Sewerage System (Kagimoto, 1990).

## **2.1.2 Population Growth and Increased Land Development**

### **2.1.2.1 Island of Kauai**

During the past two decades, the Island of Kauai has emerged from a sugar cane plantation community of roughly 29,800 residents to a community of approximately 51,000 persons in July, 1989 (State Department of Business and Economic Development, 1990) that is principally based upon the visitor industry. The shift in emphasis from sugar production to the visitor industry was marked by the gradual increase in visitor arrivals that grew from roughly 410,000 visitors in 1970 to 1,177,000 visitors in 1989 (State Department of Business and Economic Development, 1982 and 1989). This increase in visitor arrivals represented an average annual growth rate of 10 percent since 1970.

The growth of the visitor industry during the past decades has fueled additional private investments and the related construction of hotels, resort condominiums, commercial retail centers, as well as residential apartments and single family residential subdivisions.

By the year 2000, it is estimated that an additional 2,634 hotel, condominium, and apartment units (available as visitor accommodations) will be constructed on Kauai to supplement an existing inventory of 7,563 hotel, condominium, apartment-hotel, and cottage units (Kauai County Office of Economic Development, 1989). Roughly one-third of this development is expected to occur in the Wailua-Kapaa area.

The continued growth of the visitor industry and related secondary services in the local Kauai economy is expected to sustain continued growth in resident and visitor populations. The State Department of Business and Economic Development estimates that Kauai's future resident population will increase to roughly 61,100 persons in 1995 and approximately 68,200 persons by the year 2000. Westbound visitor arrivals during the same period are expected to increase to almost 1,473,000 in 1995 and to approximately 1,657,000 in 1998 (Kauai County Office of Economic Development, 1989).

### **2.1.2.2 Wailua-Kapaa Area**

Kauai's Wailua-Kapaa area has generally paralleled the growth of the rest of the Island during the past 20 years. The Wailua-Kapaa area is part of the larger Kawaihau district which includes the residential communities of Wailua, Waipouli, Kapaa and Anahola. Since 1980, the Kawaihau district has grown at the rate of roughly 3.8 percent per year, or almost double the average population growth rate of most American communities. In 1970, the resident population of Kawaihau district included 5,173 persons. By 1980, the district population increased to 5,846 residents. More recent estimates for the Kawaihau district indicate a resident population of roughly 13,700 persons in 1988 (Kauai County Office of Economic Development, 1989). The present resident population of the somewhat smaller Wailua-Kapaa area is believed to be about 12,500 persons.

Approximately 2,800 hotel, condominium, and apartment-hotel units are situated in the Wailua-Kapaa area (Table 2-1). By the year 2000, the existing number of hotel, condominium and apartment-hotel units in this area is expected to be approximately 3,723 units (Kauai County Office of Economic Development, 1989). Consequently, the Wailua-Kapaa will continue to be Kauai's primary location for visitor accommodations.

### **2.1.3 Increased Wastewater Flows in the Wailua-Kapaa Area**

#### **2.1.3.1 Existing Wastewater Flow Projections**

The most recent facility plan for the overall Kapaa sewerage system was prepared in 1984 by R.M. Towill Corporation. For the purposes of estimating future wastewater flows in the Wailua-Kapaa area, this plan segregated the area into five subareas (Figure 1-1):

- Kuhio Highway;
- Lower Kapaa Homestead;
- Upper Kapaa Homestead;
- Kapaa Heights; and
- Wailua Houselots.

In order to provide a basis for general design and satisfy planning requirements of the U.S. Environmental Protection Agency, R.M. Towill Corporation developed wastewater flow projections for the 1985-2025 period (Tables 2-2 through 2-4). These estimates suggest that, in the year 2005, average wastewater flows will be approximately 1.77 million gallons per day (mgd); peak flows (the sum of design maximum flow and infiltration) were forecasted to be 6.63 mgd (Table 2-3). However, the forecasts of future wastewater flows did not include wastewater generation from the existing Wailua Houselots area, but did include a proposed "Wailua Houselots subarea" that was previously identified for potential single family residential development.

With the absence of the Wailua Houselots area population from the earlier community facility plan, the wastewater flow projections developed by Towill Corporation reflect a somewhat incomplete picture of future wastewater flows in the Wailua-Kapaa area. In addition, significant population growth and land development during the 1980's, as well as anticipated growth to the year 2000, have also increased the potential volume of anticipated wastewater flows during, at least, the next decade.

#### **2.1.3.2 Anticipated Wastewater Flows to the Year 2000**

In recognition of the significant growth of the Wailua-Kapaa area since 1980 and the need to incorporate the Wailua Houselots into future wastewater flows to the Wailua Sewage Treatment Plant, the County of Kauai recently retained Barrett Consulting Group, Inc., (BCG) to update its current facility plan for the Kapaa Sewer System. A portion of this effort will soon involve BCG's calculation of anticipated wastewater flows to the year 2000 on the basis of more recent population forecasts and anticipated land development activity.

**TABLE 2-1**  
**HOTEL, CONDOMINIUM, AND APARTMENT-HOTEL UNITS**  
**WAILUA-KAPAA AREA**  
**1989**

<u>NAME OF PROPERTY</u>	<u>TYPE OF FACILITY</u>	<u>NUMBER OF UNITS</u>
Coco Palms	Hotel	390
Hotel Coral Reef	Hotel	26
Islander on the Beach	Condo	198
Kaha Lani	Condo	74
Kapaa Sands	Condo	24
Kapaa Shore	Condo	81
Kauai Beach Boy Hotel	Hotel	243
Kauai Hilton Hotel	Hotel	350
Kauai Beach Villas	Condo	134
Kauai Kai Lani Apartments	Apartment	57
Kauai Resort Hotel, Aston	Hotel	242
Kauai Sands Hotel	Hotel	212
Lae Nani	Condo	55
Lanikai	Condo	18
Plantation Hale	Condo	159
Pono Kai	Condo	217
Sheraton Coconut Beach	Hotel	308
Wailua Bay View Apartments	Apartment	N/A

**SUMMARY BY TYPE OF ACCOMMODATION**

<u>Type of Accommodation</u>	<u>Number of Units</u>
Hotel	1,771
Condo	960
Apartment-Hotel	57
Cottage	0
	2,788

Source: Kauai Office of Economic Development, October, 1989.

**TABLE 2-2**  
**PROJECTED WASTEWATER FLOW IN 1985**  
**KAPAA SEWER SYSTEM**  
**1984 COMMUNITY FACILITY PLAN FORECAST**

SUBAREAS	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9
	Resident Population Subarea To Be Sewered	Domestic Sewage Flow (MGD)	Business/Industrial Flow (MGD)	Tourist (Resort) Flow (MGD)	School/Institution Flow (MGD)	Design Average Flow (MGD)	Design Maximum Flow (MGD)	Weather Infiltration (MGD)	Design Peak Flow (MGD)
Kuhio Highway	1400	0.14	0.32	0.26	0.11	0.83	2.74	0.98	3.72
Lower Kapaa Homestead	1520	0.15	--	--	--	0.15	0.69	0.11	0.80
Upper Kapaa Homestead	1850	0.19	0.06	--	--	0.25	1.03	0.15	1.18
Kapaa Heights	400	0.04	--	--	--	0.04	0.20	0.06	0.26
Mauiua Houselots	0	0	--	--	--	0	0	0	0
<b>TOTAL FOR PLANNING AREA</b>	<b>5170</b>	<b>0.52</b>	<b>0.38</b>	<b>0.26</b>	<b>0.11</b>	<b>1.27</b>	<b>3.81</b>	<b>1.30</b>	<b>5.11</b>

**NOTES:**  
 COLUMN 6 - Design Average Flow is the sum of Columns 2 to 5 inclusive.  
 COLUMN 7 - Design Maximum Flow is the design average flow multiplied by the appropriate Babbitt factor.  
 COLUMN 8 - Infiltration is estimated as 1,250 gallons/acre/day for sewers above the groundwater table and as 2,750 gallons/acre/day for sewers below the groundwater table.  
 COLUMN 9 - Design Peak Flow is the sum of design maximum flow and infiltration.

Source: R. M. Towill Corporation, 1984.

**TABLE 2-3**  
**PROJECTED WASTEWATER FLOW IN 2005**  
**KAPAA SEWER SYSTEM**  
**1984 COMMUNITY FACILITY PLAN FORECAST**

SUBAREAS	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9
	Resident Population Subarea Total	Domestic Sewage Flow (MGD)	Business/Industrial Flow (MGD)	Tourist (Resort) Flow (MGD)	School/Institution Flow (MGD)	Design Average Flow (MGD)	Design Maximum Flow (MGD)	Weather Infiltration (MGD)	Design Peak Flow (MGD)
Kuhio Highway	1400	0.15	0.43	0.40	0.16	1.14	3.51	1.15	4.66
Lower Kapaa Homestead	2015	0.20	--	--	--	0.20	0.87	0.14	.99
Upper Kapaa Homestead	2380	0.24	0.06	--	--	0.30	1.18	0.18	1.36
Kapaa Heights	435	0.04	--	--	--	0.04	0.20	0.06	0.26
Maliua Houselots	940	0.09	--	--	--	0.09	0.45	0.06	0.51
<b>TOTAL FOR PLANNING AREA</b>	<b>7170</b>	<b>0.72</b>	<b>0.49</b>	<b>0.40</b>	<b>0.16</b>	<b>1.77</b>	<b>5.04</b>	<b>1.59</b>	<b>6.63</b>

**NOTES:**  
 COLUMN 6 - Design Average Flow is the sum of Columns 2 to 5 inclusive.  
 COLUMN 7 - Design Maximum Flow is the design average flow multiplied by the appropriate Babbitt factor.  
 COLUMN 8 - Infiltration is estimated as 250 gallons/acre/day for sewers above the groundwater table and as 2,750 gallons/acre/day for sewers below the groundwater table.  
 COLUMN 9 - Design Peak Flow is the sum of design maximum flow and infiltration.

Source: R. M. Towill Corporation, 1984.

**TABLE 2-4**  
**PROJECTED WASTEWATER FLOW IN 2025**  
**KAPAA SEWER SYSTEM**  
**1984 SMALL COMMUNITY FACILITY PLAN FORECAST**

SUBAREAS	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9
	Resident Population Subarea To Be Sewered Total	Domestic Sewage Flow (MGD)	Business/Industrial Flow (MGD)	Tourist (Resort) Flow (MGD)	School/Institution Flow (MGD)	Design Average Flow (MGD)	Design Maximum Flow (MGD)	Net Weather Infiltration (MGD)	Design Peak Flow (MGD)
Kuhio Highway	1520	0.15	0.55	0.54	0.22	1.46	4.31	1.30	5.61
Lower Kapaa Homestead	2820	0.28	--	--	--	0.28	1.11	0.20	1.31
Upper Kapaa Homestead	3340	0.33	0.06	--	--	0.39	1.40	0.25	1.65
Kapaa Heights	460	0.05	--	--	--	0.05	0.25	0.07	0.32
Ma'iiua Houselots	1680	0.17	--	--	--	0.17	0.73	0.10	0.83
<b>TOTAL FOR PLANNING AREA</b>	<b>9820</b>	<b>0.98</b>	<b>0.61</b>	<b>0.54</b>	<b>0.22</b>	<b>2.35</b>	<b>6.58</b>	<b>1.92</b>	<b>8.50</b>

**NOTES:**  
 COLUMN 6 - Design Average Flow is the sum of Columns 2 to 5 inclusive.  
 COLUMN 7 - Design Maximum Flow is the design average flow multiplied by the appropriate Babbitt factor.  
 COLUMN 8 - Infiltration is estimated as 1,250 gallons/acre/day for sewers above the groundwater table and as 2,750 gallons/acre/day for sewers below the groundwater table.  
 COLUMN 9 - Design Peak Flow is the sum of design maximum flow and infiltration.

Source: R. M. Towill Corporation, 1984.

In the absence of this information, an estimation was made of anticipated average wastewater flows via the calculation of anticipated flows from residential homes, visitor accommodation facilities, schools and institutions, and commercial/industrial facilities (Table 2-5). Waste generation rates were based upon those identified within the County of Kauai's sewer design standards.

During the next ten years, the State Department of Business and Economic Development expects an average annual growth rate of 2.6 percent in Kauai's resident population. Should the resident population growth of the Wailua-Kapaa area parallel the anticipated rate of growth for the Island of Kauai during the next ten years, the resident population of the Wailua-Kapaa area would be approximately 16,160 persons by the year 2000. Assuming a related wastewater flow of 100 gallons per capita per day (includes dry weather infiltration), the future resident population of the Wailua-Kapaa area is expected to generate wastewater flows of approximately 1.62 mgd by the year 2000.

Flows from hotels, condominium, and apartment-hotel units may increase significantly to roughly 0.60 mgd. This latter estimate assumes a unit occupancy of 77.7 percent by 1.8 persons, as well as a 15 percent non-visitor contribution (James Pedersen, Planning Consultant, 1990).

School flows were based upon school enrollment forecasts by the State Department of Education and a waste generation rate of 25 gallons per student. The forecast of future institutional flows, i.e. Mahelona Hospital, assumed that the existing bed count would not increase beyond existing levels until after the year 2000. Hospital flows of 2000 gallons per day were applied to the number of long term patients. Waste generation rates of 106 gallons and 11 gallons were used to calculate average flow for day-care patients and hospital employees. These calculations indicate an average Year 2000 flow of 0.114 mgd for school facilities and 0.016 mgd for the hospital.

Wastewater flows from general commercial and neighborhood commercial facilities were based upon the review of land use records for the Wailua-Kapaa area and the assumption that commercial development will grow at the rate of approximately 5 percent per year to the year 2000. Industrial land uses were estimated in the same manner except that the anticipated rate of growth was assumed to be one percent per year during the next decade. The average flow anticipated from general commercial, neighborhood commercial, and light industrial facilities is estimated to be approximately 0.44 mgd in the year 2000.

The cumulative average flow from the four primary sources of wastewater is expected to be about 2.79 mgd.



**TABLE 2-5  
 ANTICIPATED AVERAGE WASTEWATER FLOWS  
 WAILUA-KAPAA AREA  
 YEAR 2000**

<u>Source of Flow</u>	<u>Average Wastewater Flow (mgd)</u>
Domestic (residential)	1.62
Hotel, Condos, Apt.-Hotels	0.60
Schools/Institutions	0.13
Commercial/Industrial	0.44
<b>TOTAL AVERAGE COMMUNITY FLOW</b>	<b>2.79</b>

Source: James H. Pedersen, Planning Consultant, 1990; County of Kauai Sewer Design Standards; Metcalf & Eddy, Inc., 1979.

#### 2.1.4 Water Quality of Local Streams and Inshore Waters

Sporadic water quality monitoring programs focusing on bacteriological, nutrient and dissolved oxygen characteristics have been conducted within streams and the inshore waters in the Wailua-Kapaa area during the past 20 years. The sporadic nature of data collection efforts has limited the long-term use of this information. However, when applied to specific events, e.g. discharge of raw sewage from private treatment plant, past data have occasionally provided useful information to confirm or deny short-term impacts upon the local aquatic and marine environments.

While no long-term Coliform data is available for the Wailua-Kapaa area, a survey of 413 residents and business establishments in 1984 indicated a 21 percent failure rate for cesspools in the Wailua-Kapaa area (R. M. Towill, 1984). The failure of a cesspool was considered to be any cesspool that overflowed, or was pumped, at least once during the past 10 years. The greatest number of cesspool failures occurred in the Kuhio Highway, Kapaa Heights, and Lower Kapaa Homestead subareas (Figure 1-1). While no long-term health risks have been identified by consistent, higher levels of Coliform in local streams and the inshore waters, a potential long-term contaminant remains in the local environment via cesspool failures and a higher water table level.

Higher water table levels in Kapaa area have also caused problems associated with the ultimate disposal of treated wastewater effluent from smaller private treatment plants. The failure of these systems has been, in some cases, compounded by inappropriate system design and/or inadequate facility operation and maintenance (Takekuma, 1989). While private treatment facilities are routinely monitored by private wastewater operators and the State Department of Health via the NPDES permit process, system failures occasionally generate increased nutrient loading and Coliform levels in the streams and/or inshore waters of the Wailua-Kapaa area. The concurrent review of effluent quality records and stipulations of the individual NPDES permits ensures that most system failures occur only over a short duration.

After a decade of regular observations of the streams and inshore waters of the Wailua-Kapaa area, State aquatic biologist Don Heacock concludes that the most significant water quality issue is the regular, periodic discharge of sediment-laden waters into the area's three streams - Moikeha Canal, Waikaea Canal, and Uhelekawana Stream (Waipouli Canal). Turbid waters and sediment gradually travel downstream and eventually reduce the amount of light and photosynthesis into the inshore waters. These natural processes influence the growth and abundance of coral communities situated in the inshore waters near the mouth and south of Waikaea Canal, as well as north of Moikeha Canal to the intersection of Kawaihau Road and Kuhio Highway (R.M. Towill, 1974). At the same time, each of the streams serve as feeding area for various juvenile fish (Heacock, 1990).

## 2.2 METHOD OF ALTERNATIVE EVALUATION

Three project alternatives are presented in Sections 2.3 through 2.5. Each alternative is identified in terms of general project scope, location, and significant project consequences. Subsequently, each development option is further evaluated on a comparative basis.

Arbitrary statistical ratings and related comparisons were also made to determine the desirability and undesirability of those potential impacts which 1) may be significant and/or 2) are of concern to public agencies consulted during the preparation of the environmental assessment. Project evaluation criteria used for the comparison of alternatives included a combination of both short-term, long-term and cumulative impacts. Those issues considered in the evaluation included the following:

- Conserves aquatic resources and water quality of Wailua River, Uhelekawana Stream, Waikaea Canal, and Moikeha Canal;
- Conserves inshore water quality of the Wailua-Kapaa area;
- Improves the level of service of vehicular traffic along the Kuhio Highway corridor;
- Centralizes the treatment and disposal of wastewater effluent in the Wailua-Kapaa area;
- Improves the maintenance of safe and desirable noise levels in the Wailua-Kapaa area.
- Provides a more cost-effective approach to the development and operation and maintenance of wastewater treatment and disposal in the Wailua-Kapaa area.

The statistical rating of alternatives was made by assigning weighted values to each of the evaluation criteria and subsequently rating the potential impact of each alternative on each of the established evaluation criteria.

Weighted values ranged from 0.1 to 1.0. Higher weighted values indicated issues (evaluation criteria) believed to be of greater importance to public agencies and the general public. The rating of individual criteria for each alternative involved the determination of numerical scores ranging from 1 to 10. Lower scores, e.g. 0 to 3, indicated a potential adverse impact which will not benefit the community or the local resource. A score of 5 or 6 suggests that the implementation of the given alternative will not influence, or significantly affect, the criteria in question. Scores ranging from 7 to 10 represent potential impacts which are expected to benefit the community and/or general public. The alternative receiving the highest cumulative score represents the most desirable overall alternative.

While subjective and arbitrary, this method of comparison, combined with other analyses in Chapter two, is useful in providing the reviewer of this environmental assessment with the information needed to identify and evaluate the rationale used for alternative selection.

### 2.3 PROJECT ALTERNATIVE A: THE NO PROJECT OPTION

Alternative A would be to continue the present method of wastewater disposal for the Wailua-Kapaa area via cesspools and smaller private wastewater treatment plants for private resort complexes, condominiums, public housing areas, commercial/industrial facilities, and local institutions. The prohibition of cesspools within a 1000-foot radius of any existing or proposed drinking water sources would remain. The use of injection wells would continue to be permitted only in areas makai of the established underground injection control line (Figure 3-7) in the Wailua-Kapaa (Takekuma, 1990).

However, as the State Department of Health's recent policies concerning wastewater disposal are implemented, the future construction of cesspools within soon-to-be established "critical waste disposal areas" would gradually be eliminated below the 100-foot elevation in the Wailua-Kapaa area.

### 2.4 PROJECT ALTERNATIVE B: CONSTRUCT A PUBLIC SEWER TRANSMISSION SYSTEM IN THE WAILUA-KAPAA AREA AND DIRECT FLOWS TO THE EXISTING WAILUA WASTEWATER TREATMENT PLANT

Project Alternative B is the most recent plan developed by the County of Kauai for centralization of wastewater flows in the Wailua-Kapaa area. This option involves the construction of a sewer main in the Wailua-Kapaa area that will transport flows to the existing Wailua Treatment Plant. This approach was initially recommended in the 1984 Kapaa Sewerage System Small Community Facility Plan, prepared by R.M. Towill Corporation for the County of Kauai.

As envisioned, the initial phase of development would permit connection of only a portion of wastewater flows within the Kuhio Highway corridor (Figure 1-1). The sewer transmission system will consist of new and existing sewerage, consisting of pump stations and force mains, that are required to transport pressurized flows to the Wailua WWTP. A later second phase expansion would construct additional sewer collection lines in order to transport additional flows, both mauka and makai of Kuhio Highway, to the Wailua WWTP.

Phase I of the Kapaa Sewer Project (including existing flows) will generate a total flow of approximately 1.18 mgd. A future second Phase II will add an additional 0.21 mgd of flow. Consequently, the proposed Phase I and future second phase can be accommodated by the existing Wailua Wastewater Treatment Plant which has a treatment capacity of 1.5 mgd.

**2.5 PROJECT ALTERNATIVE C: CONSTRUCT A PUBLIC SEWER TRANSMISSION SYSTEM AND WASTEWATER TREATMENT PLANT IN KAPAA**

The original wastewater management strategy, adopted by the County of Kauai for the Wailua-Kapaa area, was to establish separate collection, treatment and disposal wastewater systems for both Wailua and Kapaa. The construction of the Wailua Wastewater Treatment Plant and a nearby sewer transmission system represented the first major step toward that objective. Following construction of the Wailua Wastewater Treatment Plant, the County of Kauai and R. M. Towill Corporation prepared a plan involving the construction of a public sewer transmission system and wastewater treatment plant in Kapaa (Project Alternative C). This plan was outlined in the 1975 Preliminary Engineering Report (Facilities Plan) for Kapaa Wastewater Facilities.

Under this plan, proposed wastewater facilities would generally include the initial construction of a transmission system in Kapaa Town, pump stations, force mains, a secondary treatment plant west of Waikaea Canal, and a 6,000 foot-long ocean outfall makai of Waikaea Canal for the disposal of secondary wastewater effluent. The first phase of system development would service the Kapaa Town commercial center area, Mahelona Hospital and Kapaa High and Intermediate School. The second phase of system development would include the development of sewerage that would service Kapaa Homestead, Upper Kapaa Homestead, and Kapaa Heights areas. The proposed third phase of development would provide sewerage for the Wailua Houselots area.

**2.6 COMPARISON OF PROJECT ALTERNATIVES**

**2.6.1 Conservation of Inshore Water Quality and Stream Biota**

One of Kauai County's wastewater management objectives is to conserve the quality of local streams and aquatic life. The discharge of untreated wastewater flows from existing cesspools (Alternative A) presently transports Coliform bacteria and added nutrients to existing streams within the Wailua-Kapaa area. The significance of this bacteriological and nutrient contribution to local stream resources is not known without the performance of an intensive, long-term study of the aquatic resources in the streams. However, as stated earlier, it is reasonable to assume that the long-term transport of additional bacteria and nutrients is not a beneficial contribution to local stream biota and related stream water quality.

Increased nutrient levels in fresh-water canals and streams frequently result in greater long-term algal growth. While aquatic plant life can be a desirable component to the stream environment, excessive growths can significantly affect water quality and the habitat of resident fishes and other biota. For example, potential algal blooms during the nighttime hours could gradually deplete the oxygen supply of local streams and canals as algal species take in oxygen. Respiration by these plants during the daytime hours will add greater

amounts of oxygen which can lead to super-saturated conditions in the stream waters. This change in water quality can generate a change in the composition of stream biota as more tolerant species, e.g. tilapia, replace existing resident juvenile fish such as aholehole and mullet (Timbol, 1990; Federal Water Pollution Control Administration, 1972).

The collection and treatment of a portion of the domestic wastewater flows in the Kuhio Highway corridor, via a centralized public system (Project Alternatives B and C), is believed to represent a more desirable development option. This approach enables Kauai County to 1) significantly reduce the volume of future domestic flows in the local substrata; and 2) effectively manage and treat future wastewater flows, as well as monitor impacts upon local water resources. The effective management of wastewater flows in the Wailua-Kapaa area continues to grow in importance as the Wailua-Kapaa area resident and visitor population increases and expands its use of the Wailua-Kapaa shoreline for recreational purposes.

From a water quality perspective, it is believed that the water quality of the inshore waters can be best conserved through the transmission of wastewater flows from the Kuhio Highway corridor to the existing Wailua Wastewater Treatment Plant (Project Alternative B). A second treatment plant near Waikaea Canal (Alternative C) would require construction of a second point-source discharge along the Wailua-Kapaa shoreline which would increase the potential risk of adverse impacts upon inshore coral reef communities. Alternative B eliminates the County's need to construct, operate and maintain a second treatment plant outfall along the Wailua-Kapaa shoreline during, at least, the next 10 years.

Project Alternatives B and C would each require instream excavation to install required force mains unless the State of Department of Transportation, Highways Division, permitted the hanging of force main lines from existing bridge crossings. State Highways Division representatives indicate that existing bridges are incapable of supporting the additional weight of larger force mains.

Since the in-stream installation of force main lines is not expected to generate any significant impact upon the water quality and aquatic life of these streams, Alternatives B and C are clearly worth the short-term disruption of the local stream environments because these development options will significantly reduce the transport of bacteria and nutrients into the local substrata. A significant reduction in the flow of bacteria and nutrients will reduce the potential degradation of stream water quality which otherwise might lead to a change the composition of aquatic life.

#### **2.6.2 Temporary Construction-Related Impacts**

In contrast to Alternative A, construction activities associated with the development of sewerage facilities along the Kuhio-Highway corridor (Alternatives B or C) would generate temporary impacts upon the level of service along Kuhio Highway. In addition, temporary noise impacts would also be generated through the operation of heavy equipment and general construction activities.

The in-stream installation of force mains at Moikeha Canal, Waikaea Canal, and Uhelekawana stream via Alternatives B and C would generate short-term changes in stream water quality makai of Kuhio Highway. Changes in water quality would consist of increased turbidity and some sedimentation during the installation of force mains. These changes are viewed as insignificant in light of the influence of periodic stormwater flows into these canals which frequently generate short-term discharges of sediments and turbid water.

### **2.6.3 The Cost of Improved Wastewater Management**

Alternative A is the least costly project option because it involves no action by public agencies. However, this option does generate both short and long-term costs to residential homeowners in the Wailua-Kapaa area who, without connection to a centralized wastewater system, will have to install septic tanks to comply with State Department of Health wastewater disposal regulations. Given the cost of new septic tank installation, the average expenditures by individual homeowners may range from \$5,000 to \$7,000 in 1990 dollars.

Alternatives B and C vary considerably in terms of overall project cost. The cost of constructing a transmission system for each of these alternatives would be comparable. However, construction of a second public wastewater treatment plant and ocean outfall facility, which would be required to accomplish Alternative C, results in a total construction cost that is roughly three times greater than Alternative B. In contrast, the cost of implementing Alternative B would be roughly \$8 million, or one-third of the development cost associated with Alternative C.

### **2.6.4 Statistical Comparison Results**

The statistical rating and comparison of project alternatives (Tables 2-6 and 2-7), as described in Section 2.2, indicate the following preference in order of statistical "desirability":

- Alternative B - CONSTRUCT A PUBLIC SEWER TRANSMISSION SYSTEM IN THE WAILUA-KAPAA AREA AND DIRECT FLOWS TO THE EXISTING WAILUA WASTEWATER TREATMENT PLANT
- Alternative A - THE NO PROJECT OPTION
- Alternative C - CONSTRUCT A PUBLIC SEWER TRANSMISSION SYSTEM, WASTEWATER TREATMENT PLANT, AND OCEAN OUTFALL IN KAPAA

**TABLE 2-6  
COMPARATIVE SCORING OF PROJECT ALTERNATIVES  
KAPAA SEWER SYSTEM PROJECT**

Evaluation Criteria	Value	Raw Score Comparison (Scoring Range 0 - 10)		
		A	B	C
1. Conserves water quality of Wailua River, Uhelekawana Stream, Waikaea Canal, and Moikeha Canal.	1.00	2	7	7
2. Conserves aquatic resources of Wailua River, Uhelekawana Stream, Waikaea Canal, and Moikeha Canal.	1.00	2	7	7
3. Conserves inshore water quality of the Wailua-Kapaa area.	1.00	3	6	4
4. Improves the level of service of vehicular traffic along the Kuhio Highway corridor.	0.65	5	0	0
5. Centralizes the treatment and disposal of wastewater effluent in the Wailua-Kapaa area.	1.00	5	10	7
6. Improves the maintenance of safe and desirable noise levels in the Wailua-Kapaa area.	0.50	5	3	3
7. Provides a more cost-effective approach to the development and operation and maintenance of wastewater treatment and disposal in the Wailua-Kapaa area.	0.75	5	6	2

Note: Section 2.2 of the report summarizes the significance of weighted values and scoring range used in this matrix evaluation technique.

Source: James H. Pedersen, Planning Consultant, 1990.



**TABLE 2-7  
COMPARISON OF THREE PROJECT ALTERNATIVES  
KAPAA SEWER SYSTEM PROJECT  
TOTAL WEIGHTED ALTERNATIVE SCORES**

Evaluation Criteria	Weighted Value	A	B	C
1. Conserves water quality of Wailua River, Uhelekawana Stream, Waikaea Canal, and Moikeha Canal.	1.00	2.00	7.00	7.00
2. Conserves aquatic resources of Wailua River, Uhelekawana Stream, Waikaea Canal, and Moikeha Canal.	1.00	2.00	7.00	7.00
3. Conserves inshore water quality of the Wailua-Kapaa area.	1.00	3.00	6.00	4.00
4. Improves the level of service of vehicular traffic along the Kuhio Highway corridor.	0.65	3.25	0.00	0.00
5. Centralizes the treatment and disposal of wastewater effluent in the Kuhio Highway corridor.	1.00	5.00	10.00	7.00
6. Improves the maintenance of safe and desirable noise levels in the Wailua-Kapaa area.	0.50	2.50	01.50	01.50
7. Provides a more cost-effective approach to the development and operation and maintenance of wastewater treatment and disposal in the Wailua-Kapaa area.	0.75	3.75	04.50	01.50
<b>TOTAL SCORES</b>		<b>21.50</b>	<b>36.00</b>	<b>28.00</b>

Notes: Total weighted score for each criteria was calculated by multiplying the comparative raw scores summarized in Table 2-6 by the weighted value for each criteria.

Source: James H. Pedersen, Planning Consultant, 1990.

Alternative B was rated the most desirable project option despite its anticipated impact upon vehicular level of service along Kuhio Highway during construction. This alternative represents the most desirable approach for the centralization of wastewater flows in the Kuhio Highway corridor, the conservation of inshore water quality, and the more cost-effective approach for the management of wastewater flows.

Alternative C generally paralleled the ratings of the selected Alternative B except for two important considerations. The construction of a second treatment plant and ocean outfall helps centralize wastewater flows; this option creates significantly higher project development, operation and maintenance costs. In addition, it creates an unnecessary point discharge into the inshore waters.

Alternative A was clearly rated higher, or more desirable, for its non-impact during construction. However, "no-action" scope of this alternative resulted in lower scores for the conservation of inshore water quality and the aquatic resources of local streams. In general, this alternative was rated somewhat lower than the selected option because, if implemented, this approach would avoid, rather than address, potential water quality and waste management issues. This option assumes that recent State wastewater disposal policies would adequately address the potential impact of untreated, or inadequately treated, wastewater flows on the water quality and resources of local streams and the inshore waters. The uncertainty of the potential impact resulting from this approach was not believed to be worth the potential impact and risk of leaving a growing volume of untreated sewage disposal unmanaged.

## **2.7 PROJECT DESCRIPTION OF SELECTED PROJECT ALTERNATIVE B**

### **2.7.1 Project Objectives**

The objective of the County of Kauai is to: 1) centralize wastewater flows in the Kuhio Highway corridor; and 2) improve overall waste management practices and conserve the water quality and resources of the inshore waters and local streams.

### **2.7.2 General Project Scope and Location**

Phase I of the Kapaa Sewerage System Project generally involves the construction of a new main transmission system from the north end of Kapaa Town to the Kuhio Highway/Leho Drive intersection near (adjacent to the Ashton Kauai Resort). From the Kuhio Highway/Leho Drive intersection, wastewater flows will be transported to the existing Wailua Wastewater Treatment Plant via an existing 15-inch transmission line.

Construction of the main transmission system will also include the related development of three new sewage pump stations, the renovation of an existing pump station near Coco Palms Hotel complex, and the construction of 29 sewer manholes. The initial phase of the project will provide service for an average wastewater flow of approximately 1.181 mgd (Belt Collins and Associates, 1990).

*"Anticipated peak design flows developed for the gravity sewer system were used to determine the capacity of the new pump stations. The new pump stations will have two pumps (one primary and one standby). Each pump will be capable of handling peak flow"* (Belt Collins and Associates, 1990). Each pump station will also have stand-by electrical power supply that may be used through the operation of a small diesel-engine generator. The generator will be housed and muffled to mitigate potential noise impacts to surrounding community land uses.

The primary criteria for the size of force mains was velocity. The desirable range for force mains is three to five feet per second. Minimal velocities of 1.7 feet per second are required to ensure that minimal solids deposition will occur (Belt Collins and Associates, 1990).

The new transmission system will generally be located along the Kuhio Highway corridor. More specific locations of the sewer transmission alignment, pump stations and manholes are depicted in Figures 2-1 through 2-4. The areas shown in these illustrations also reflect the service areas flowing to each of the four pump stations. Figure 2-1, for example, includes the northern end of Kapaa Town where cumulative flows will initially be transported towards Wailua via sewage pump station 4 N (SPS #4N). More detailed descriptions of the proposed project are presented in the following paragraphs for each of the four areas along the Kuhio Highway corridor.

#### **2.7.2.1 Northern Kapaa Town**

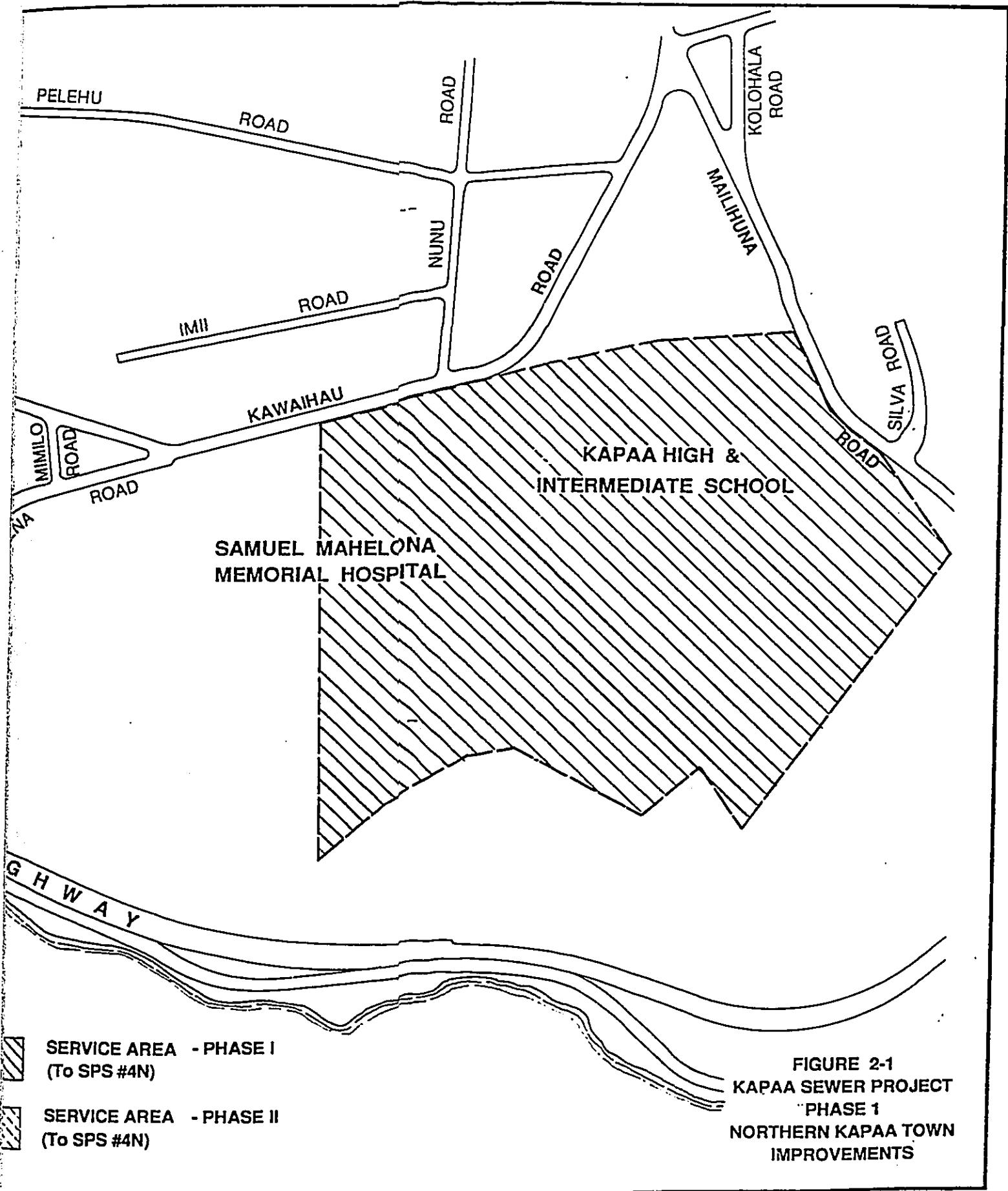
Approximately 13 acres of northern Kapaa Town (Figure 2-1), as well as the nearby treatment plant at Mahelona Hospital-Kapaa High and Intermediate School (115 acres), will generate an average wastewater flow of approximately 0.150 mgd. An existing 24-inch force main along Kuhio Highway will be connected to a new sewage pump station #4 (SPS #4) wet well.

SPS #4 will be located on the north side of Moikeha Canal. The pump station will be situated in a landscaped area which is part of a relatively new warehouse-shopping complex owned by Aloha Lumber Company. Flows from the pump station will cross Moikeha Canal transversely via a new 10-inch force main that will be installed in-stream approximately two feet below the stream bottom (Figure 2-5). The force main will be contained within a concrete jacket. The stream excavation will be backfilled by the replacement of all excavated material.

#### **2.7.2.2 Central and South Kapaa Town**

Roughly 163 acres of south and central Kapaa Town (Figure 2-2), consisting of commercial retail, single family residential, apartments, churches and light industrial uses, will be served by Phase I of the Kapaa Sewerage Project. Central and south Kapaa Town will generate an estimated average daily flow of 0.442 mgd from the mauka and makai sides of the Highway corridor. Cumulative wastewater flows at SPS #3 will be approximately 0.298 mgd; downstream at SPS #2, cumulative flows will increase to about 0.592 mgd.







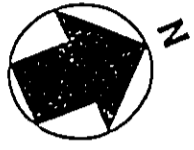
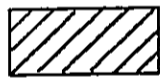
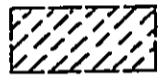
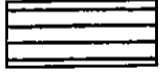
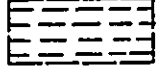
 SERVICE AREA - PHASE I  
 (To SPS #4N)  
 SERVICE AREA - PHASE II  
 (To SPS #4N)

FIGURE 2-1  
 KAPAA SEWER PROJECT  
 PHASE 1  
 NORTHERN KAPAA TOWN  
 IMPROVEMENTS

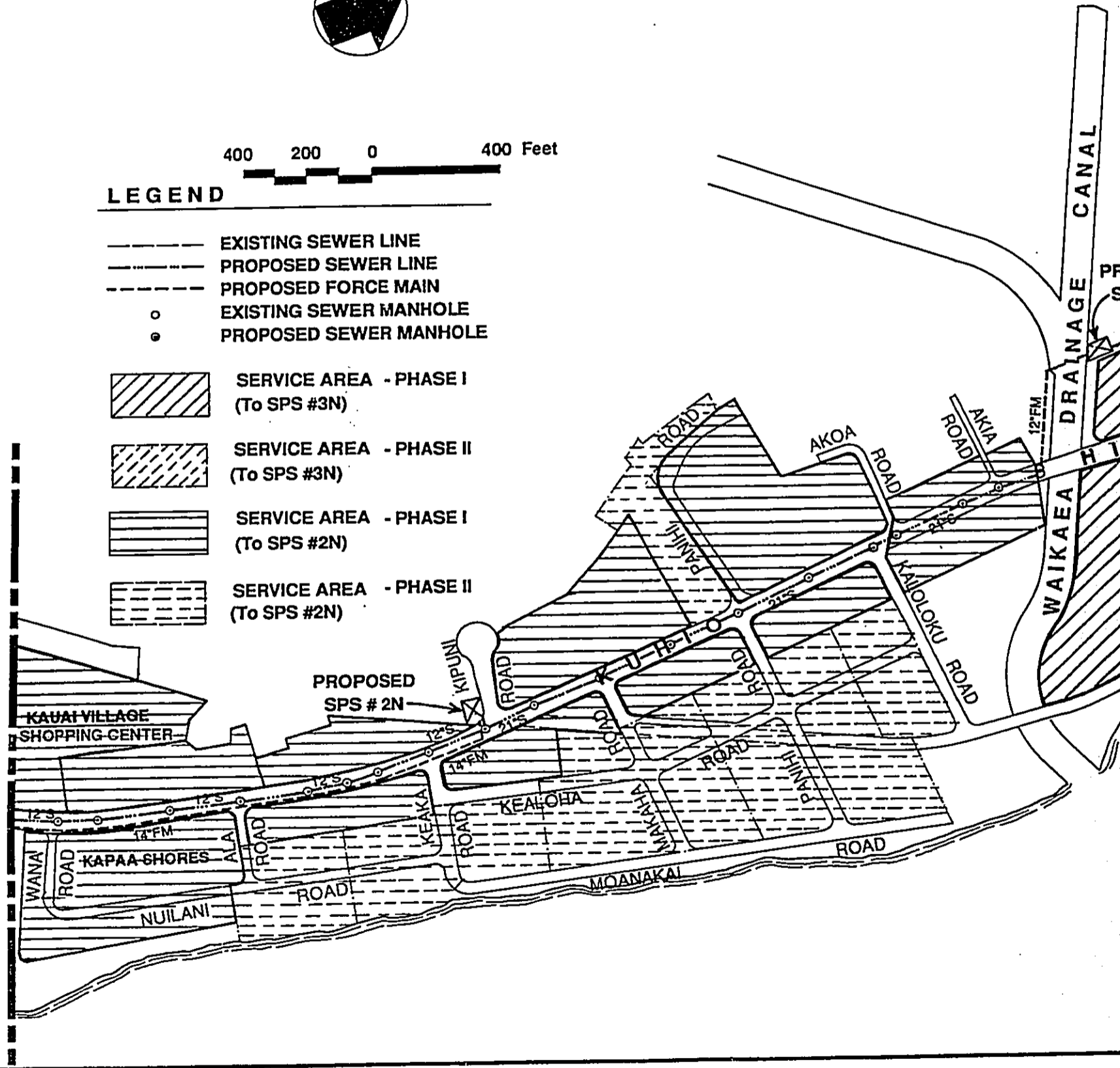


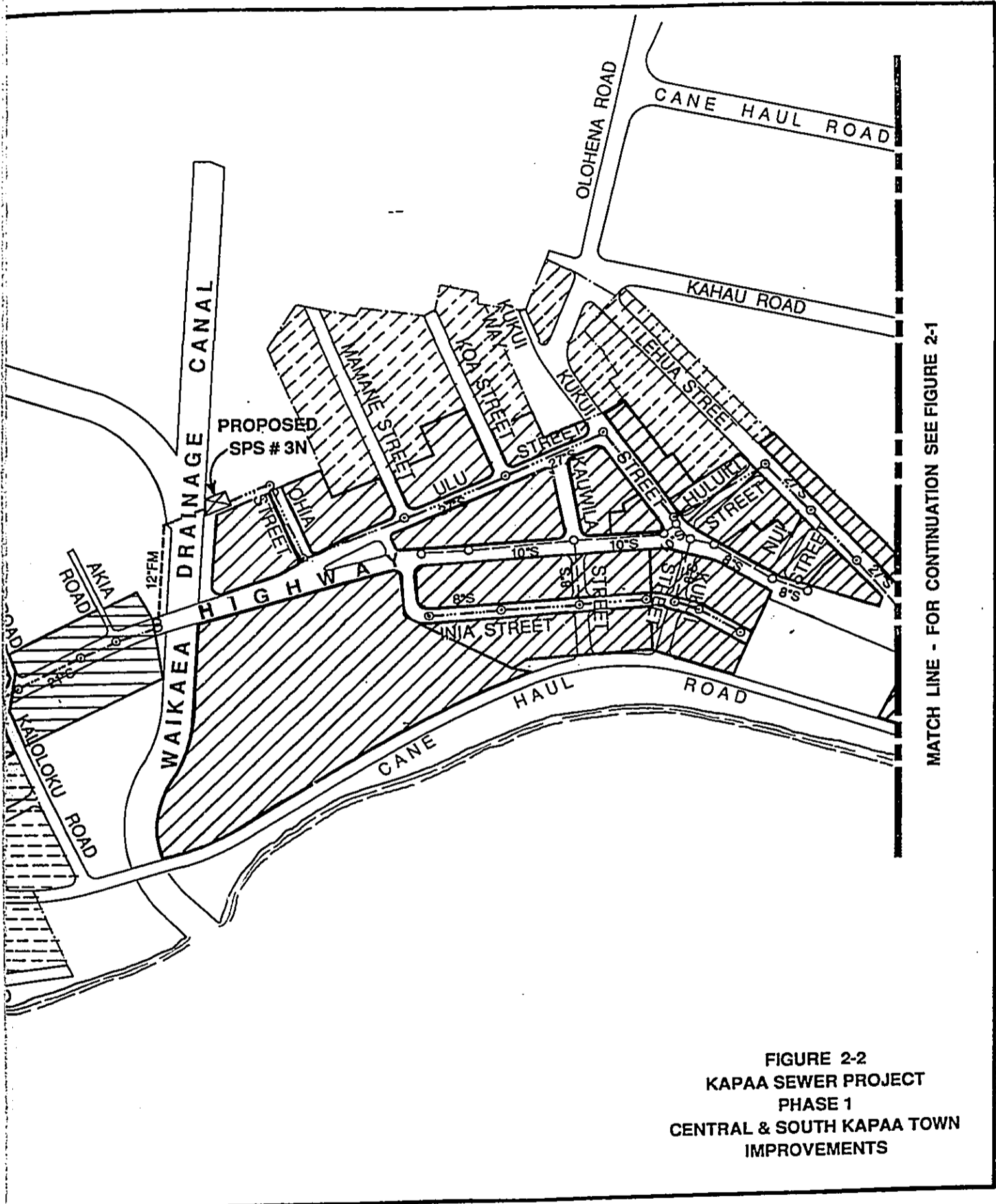
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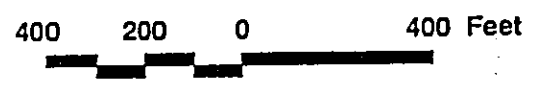
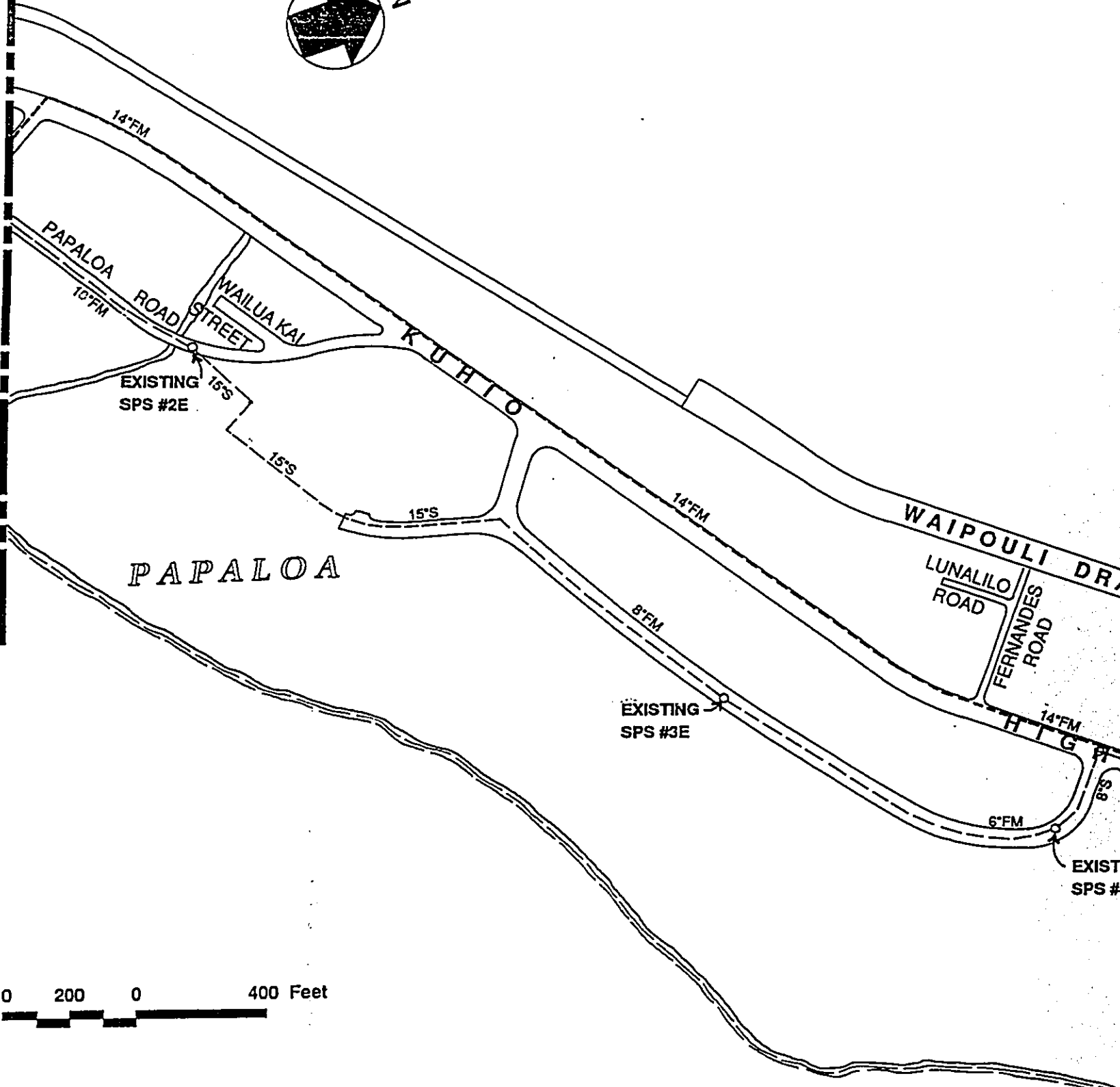
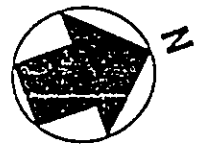
- EXISTING SEWER LINE
- - - PROPOSED SEWER LINE
- - - PROPOSED FORCE MAIN
- o EXISTING SEWER MANHOLE
- PROPOSED SEWER MANHOLE
  
-  SERVICE AREA - PHASE I  
(To SPS #3N)
-  SERVICE AREA - PHASE II  
(To SPS #3N)
-  SERVICE AREA - PHASE I  
(To SPS #2N)
-  SERVICE AREA - PHASE II  
(To SPS #2N)

MATCH LINE - FOR CONTINUATION SEE FIGURE 2-3




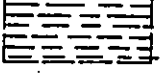


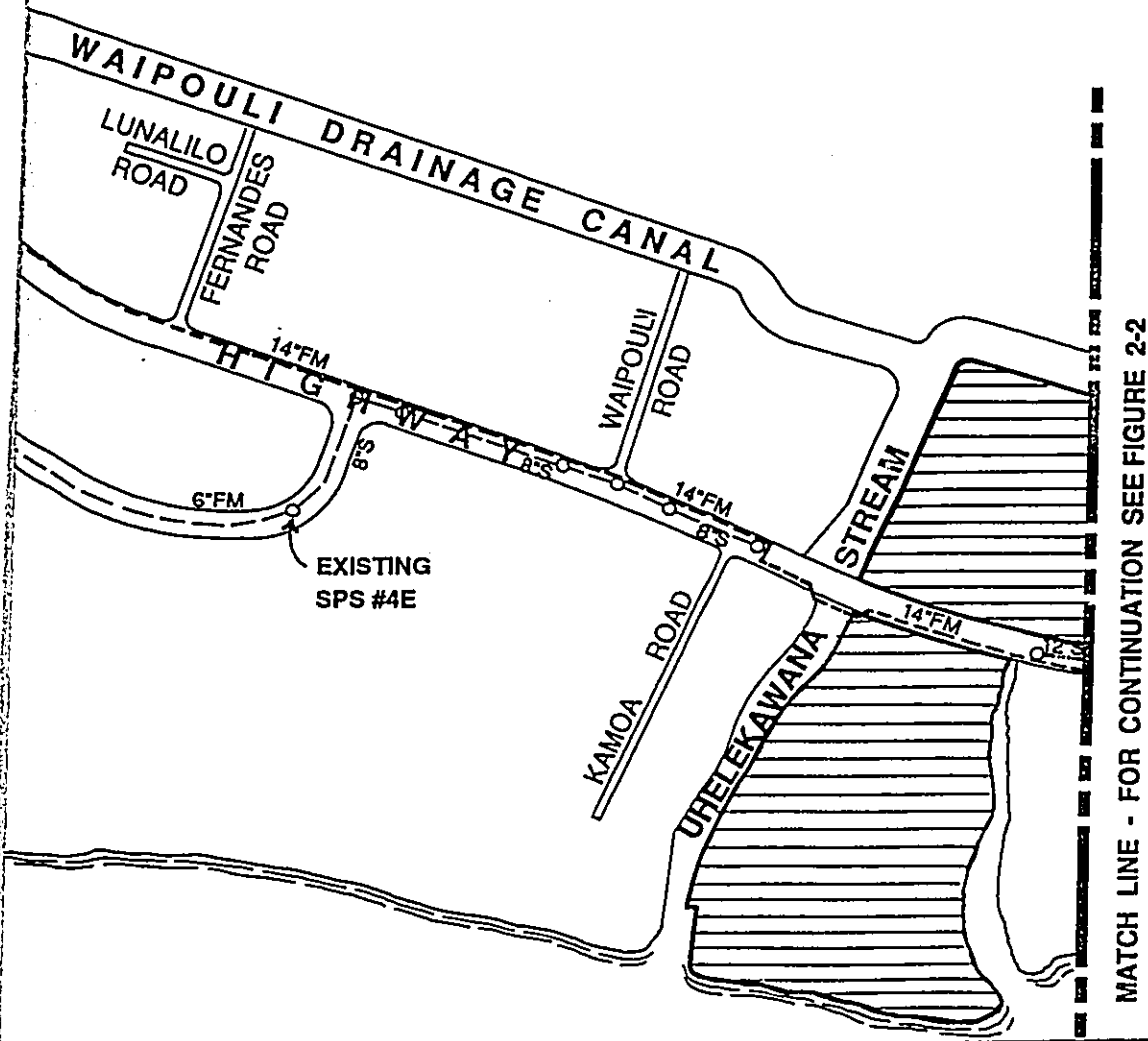
MATCH LINE - FOR CONTINUATION SEE FIGURE 2-4





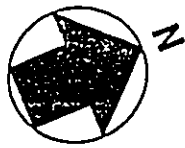
**LEGEND**

- EXISTING SEWER LINE
- - - - PROPOSED SEWER LINE
- - - - PROPOSED FORCE MAIN
- EXISTING SEWER MANHOLE
- ⊙ PROPOSED SEWER MANHOLE
-  SERVICE AREA - PHASE I  
(To SPS #2N)
-  SERVICE AREA - PHASE II  
(To SPS #2N)

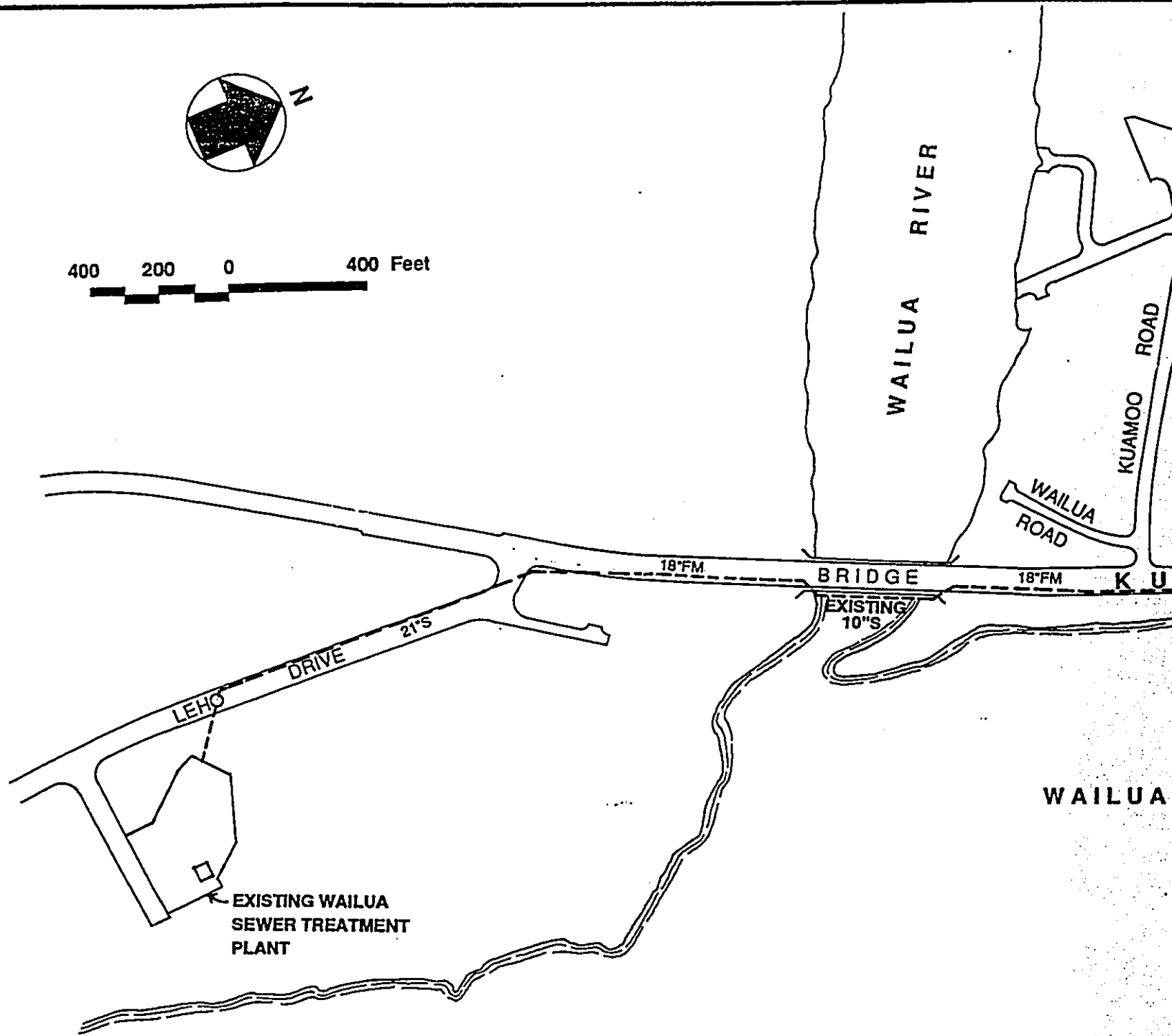


MATCH LINE - FOR CONTINUATION SEE FIGURE 2-2

**FIGURE 2-3  
KAPAA SEWER PROJECT  
PHASE 1  
WAIPOULI AREA  
IMPROVEMENTS**



400 200 0 400 Feet



**LEGEND**

- EXISTING SEWER LINE
- PROPOSED SEWER LINE
- PROPOSED FORCE MAIN
- o EXISTING SEWER MANHOLE
- o PROPOSED SEWER MANHOLE

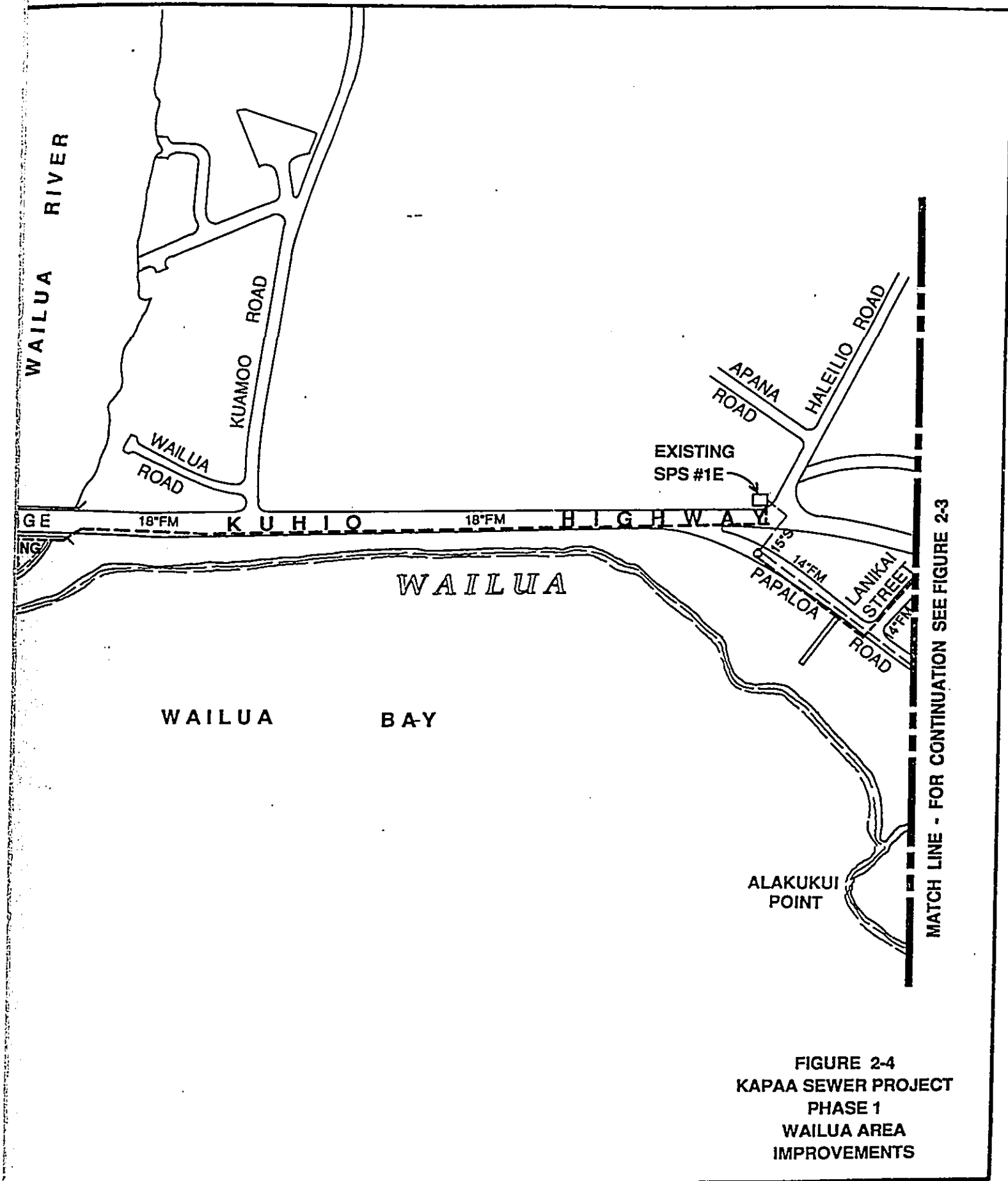
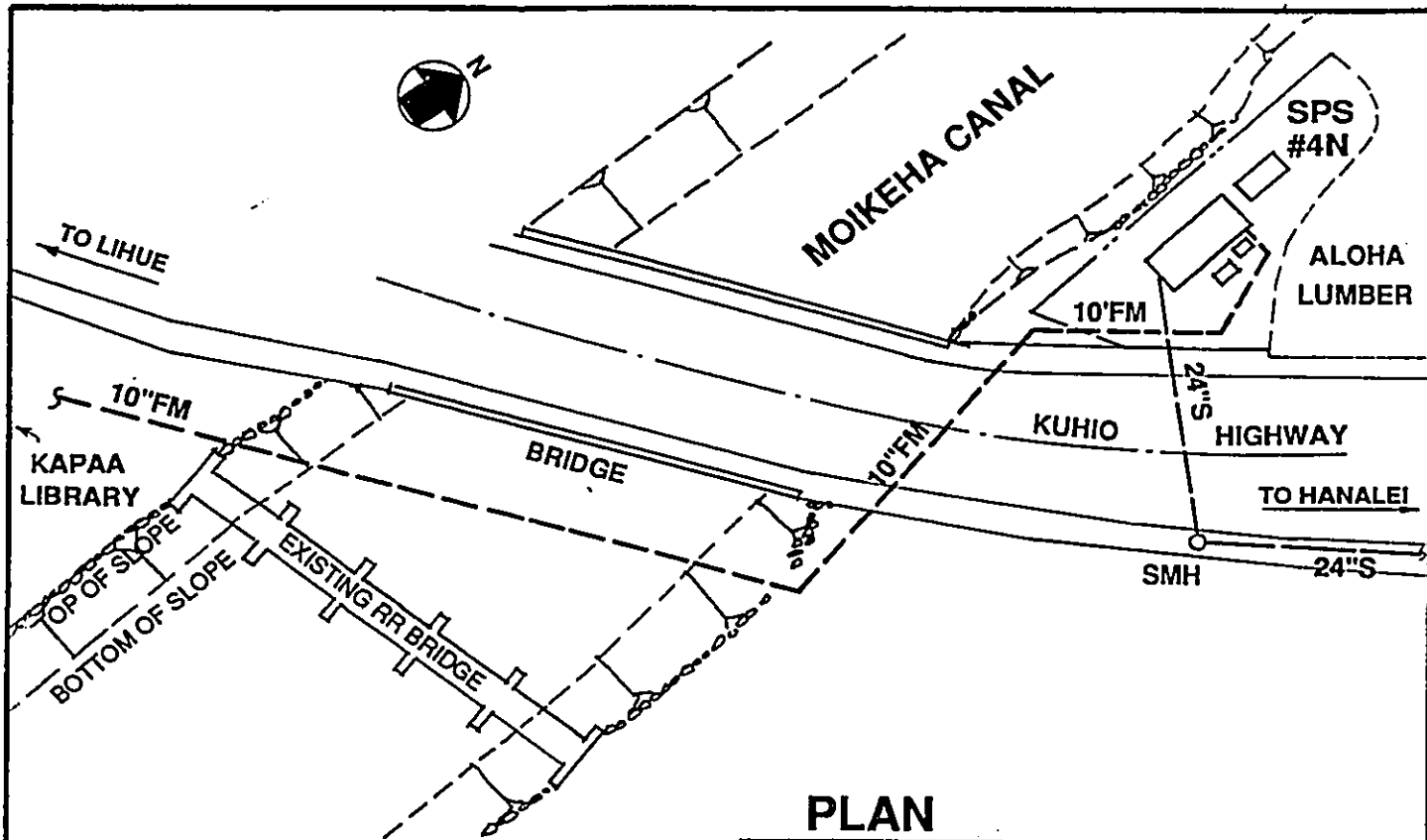
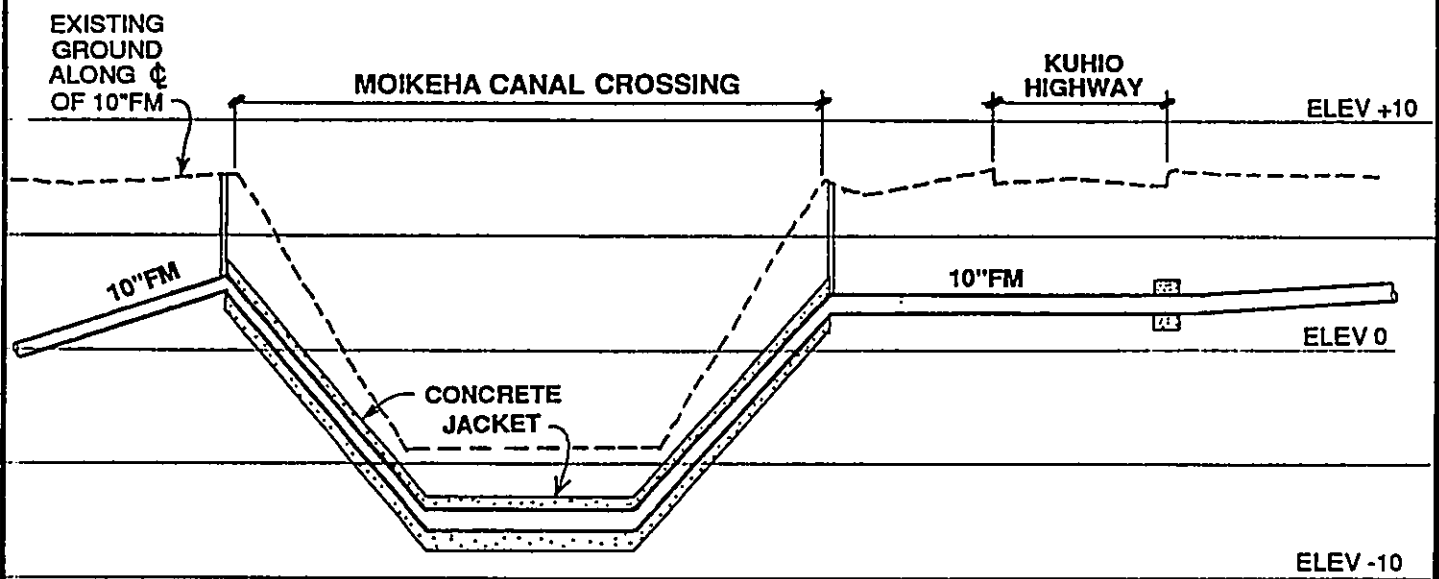


FIGURE 2-4  
 KAPAA SEWER PROJECT  
 PHASE 1  
 WAILUA AREA  
 IMPROVEMENTS



**PLAN**

Scale: 1" = 40'



**PROFILE**

Scale: Horiz: 1" = 40'

Vert: 1" = 8'

FIGURE 2-5  
MOIKEHA CANAL CROSSING  
PLAN AND PROFILE

The new 10-inch force main crossing Moikeha Canal will connect to an existing 16-inch force main that connects to an existing 27-inch sewer line along Lehua Street. Along Lehua Street, the existing 27-inch sewer main will connect with a new 21-inch sewer main which will continue south to Hulili Street, north on Kukui Street, west along Ulu Street, and ultimately west on Ohia Street. Wastewater flows makai of Kuhio Highway, along Inia Street, will also be transported to SPS #3 via a new 8-inch sewer main that will merge with the new 21-inch sewer main along Kukui Street.

South of Ohia Street, the new 21-inch sewer main will connect to the wet well of new SPS #3 which will be located at the southeast corner of an existing Kauai County baseyard. Approximately 150-200 feet upstream of the Waikaea Canal bridge, the new 12-inch sewer main from SPS #3 will be installed in-stream approximately two feet below the stream bottom (Figure 2-6). The sewer main will be contained within a concrete jacket. The stream excavation will be backfilled through the replacement of all excavated material.

Waipouli Complex and Waipouli Plaza are commercial shopping centers along the west side of Kuhio Highway in south Kapaa Town. These commercial centers, and adjoining light industrial areas, will be served by phase I of the Kapaa Sewer Project. Along the makai side of Kuhio Highway, existing single family residential and apartment buildings, fronting the Highway, will also be connected.

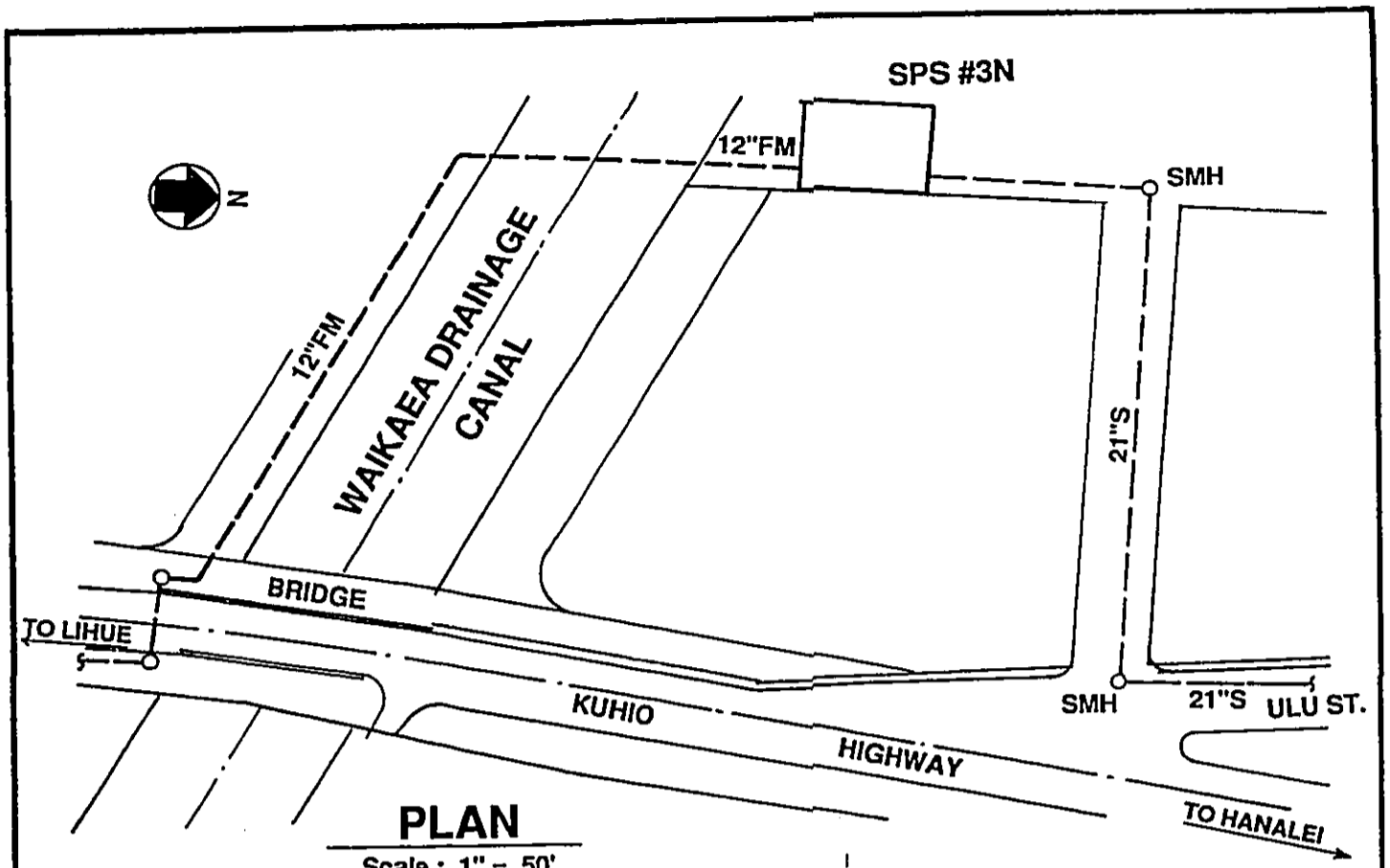
The new 21-inch sewer main will continue along the makai side of Kuhio Highway within the existing road right-of-way. Crossing laterals will be installed to provide service to commercial facilities on the mauka side of the Highway. The 21-inch sewer line will continue until the Kipuni Place intersection with Kuhio Highway where the sewer line connects to the wet well of sewage pump station #2 (SPS #2).

At this point, a new 14-inch force main and a 12-inch sewer line will continue along the makai side of the Highway in parallel. The 12-inch sewer line, between the Kipuni intersection to the south end of the Kuhio Highway/Wana Road intersection, will transport wastewater flows from single family and apartment buildings in the reverse direction (south to north) along the mauka and makai side of the Highway. In contrast, the new 14-inch force main will transport flows south toward Wailua.

### **2.7.2.3 Waipouli Area**

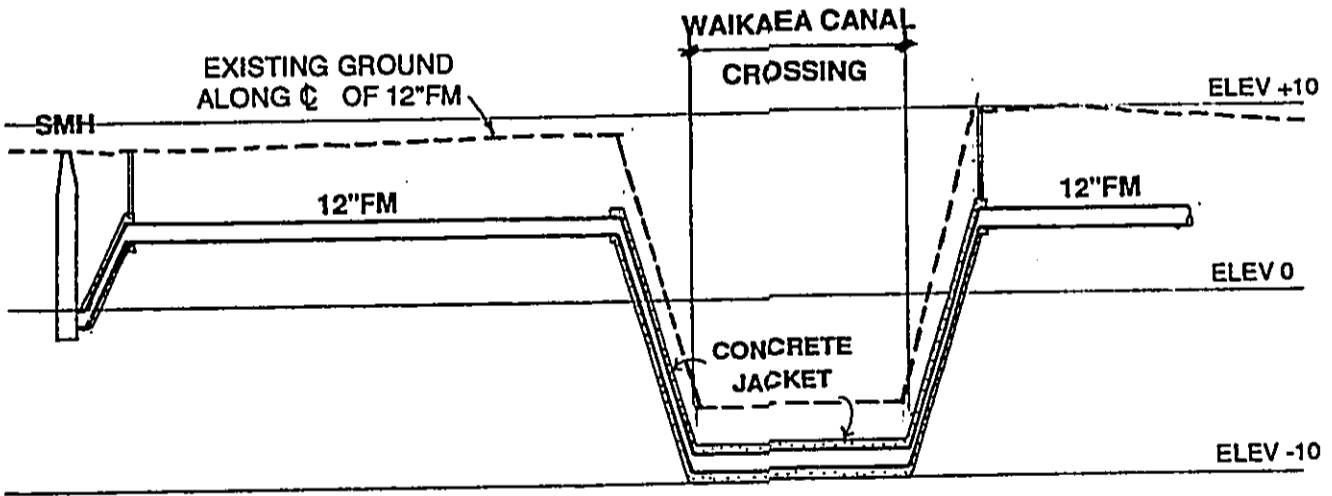
In the Waipouli area (Figure 2-3), Kauai Village Shopping Center along the mauka side of Kuhio Highway, as well as Kapaa Shores condominium along the makai side of the Highway, will be served by Phase One of the Kapaa Sewer Project. The Waipouli area will contribute an additional average wastewater flow of 0.123 mgd. However, no additional service area, south of Uhelekawana Stream (Waipouli Canal) to Wailua River, will be served by Phase One of the Kapaa Sewer Project.

The 14-inch force main will continue southward along Kuhio Highway, and cross Uhelekawana Stream (Waipouli Canal) which is roughly 620 feet south of the Kuhio



**PLAN**

Scale : 1" = 50'



**PROFILE**

Scale: Horiz: 1" = 50'  
Vert: 1" = 20'

FIGURE 2-6  
WAIKAEA CANAL CROSSING  
PLAN AND PROFILE

Highway/Wana Road intersection. Soon after its crossing at Waipouli Canal, the 14-inch force main will cross to the mauka side of the Highway as flows move southward. Within Waipouli Canal, the force main will be installed about one foot below the stream bottom (Figure 2-7). The force main will be contained within a concrete jacket. All excavated material will be backfilled through the replacement of the excavated material.

#### **2.7.2.4 Wailua Area**

Condominiums, residences and commercial facilities in the Wailua area, which are already connected to the existing public wastewater transmission system, will contribute an additional 0.589 mgd of flow to Phase I of the Kapaa Sewer Project. However, no additional service areas in the Wailua area will be incorporated into the Kapaa Sewer Project (Figures 2-3 and 2-4).

The 14-inch force main alignment will continue along the makai side of the Highway until Lanikai Street intersection. At Lanikai Street, the 14-inch force main heads east and connects with an existing 15-inch sewer main which proceeds along the makai side of Kuhio Highway to existing sewage pump station #1.

The existing SPS #1, which is situated adjacent to Coco Palms Hotel complex, will be receiving a cumulative flow of 1.18 mgd from Phase I of the Kapaa Sewer Project.

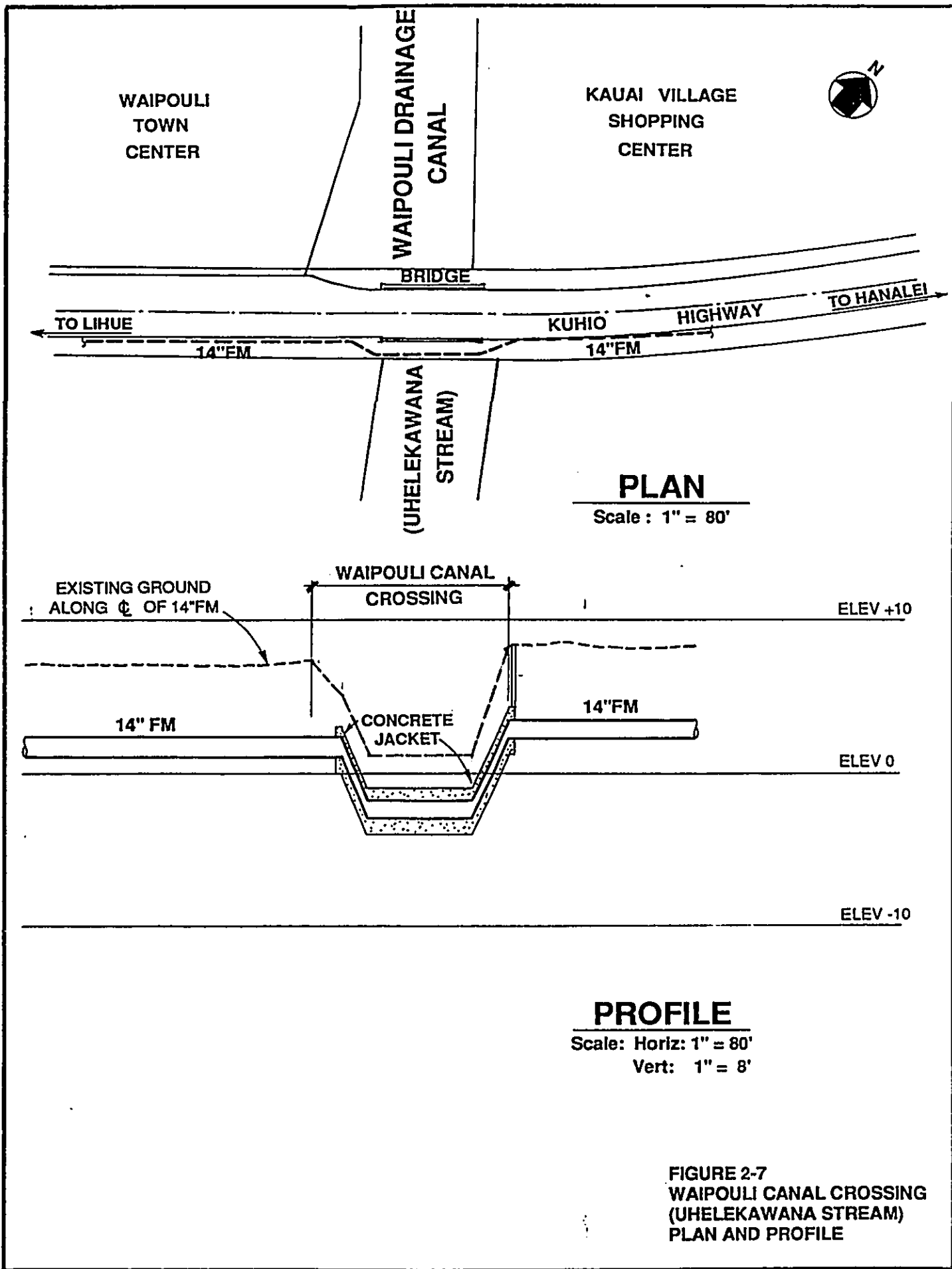
From SPS #1, the 18-inch force main, replacing the existing 10-inch force main, will be installed along the makai side of the road until Wailua River bridge. At this point, the new force 18-inch force main will connect with an existing 10-inch sewer line that is attached to the existing bridge structure (Figure 2-8). On the south side of the bridge, the existing 10-inch sewer line will connect to a new 18-inch force main along the makai side of the Highway, and will continue to the Kuhio Highway/Leho Drive intersection. At the intersection, the 18-inch force main will connect to an existing 15-inch sewer line along Leho Drive which ultimately will transport flows to the Wailua Wastewater Treatment Plant. Consequently, no in-stream crossing occurs at Wailua River.

#### **2.7.3 Use of Public Funds**

The Kapaa Sewer Project will be funded through the use of federal, State of Hawaii, and County of Kauai monies. In fulfilling its commitments associated with a federal Wailua Sewage Treatment Plant grant, the County of Kauai must commit \$4.7 million that is to be used exclusively for fulfilling the County's obligations under the requirements of its grant agreement with the U.S. Environmental Protection Agency.

#### **2.7.4 Construction Schedule**

Under its agreement with the U.S. Environmental Protection Agency, the County of Kauai is scheduled to begin construction of Phase I of the Kapaa Sewer Project in February, 1991 and complete the project by late February, 1993.



**FIGURE 2-7**  
**WAIPOULI CANAL CROSSING**  
**(UHELEKAWANA STREAM)**  
**PLAN AND PROFILE**



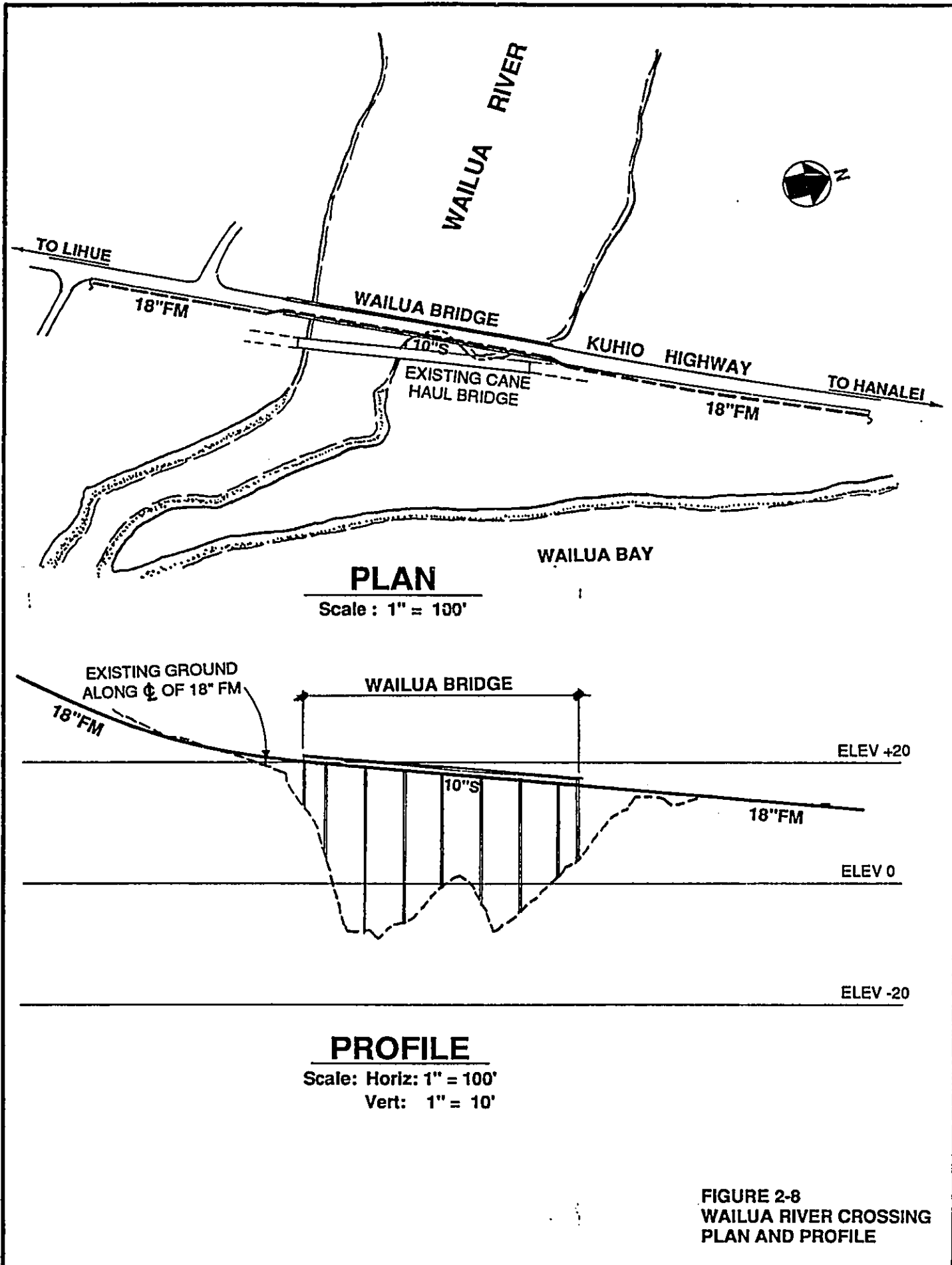


FIGURE 2-8  
WAILUA RIVER CROSSING  
PLAN AND PROFILE

## **SECTION THREE ENVIRONMENTAL SETTING**

### **3.1 PHYSICAL ENVIRONMENT**

#### **3.1.1 Geology and Soils**

The geology of the eastern side of Kauai is dominated by volcanic rock from the Koloa series. Rock from the Koloa series is believed to be younger than rock from the west side of Kauai. The structure of the rock is considerably more complex because of its variable composition of basalts, cinder and ash bed layers that are frequently interspersed with permeable and fractured gravel materials (R. M. Towill Corporation, 1984).

Soils in the Wailua-Kapaa area, along the Kuhio Highway corridor, have been generally classified as the Mokuleia Series by the U.S. Soil Conservation Service. Mokuleia fine sandy loam, is the primary soil type identified by the Soil Conservation Service along Kuhio Highway. This soil is characterized by:

1. a poorly-drained soil that has a sandy surface layer approximately 16 inches thick; and
2. a sublayer, ranging from 34 to 48 inches thick, that is a dark-brown and light gray loamy sand.

Onsite geotechnical investigations made for the Kapaa Sewer Project by Geolabs-Hawaii in September, 1989 generally confirm these soil characteristics. Field explorations included the drilling and sampling of nine borings to depths that varied from 15 to 36 feet below existing ground elevations. In general, these investigations identified the following general soil characteristics below Kuhio Highway pavement:

1. Fill material up to 5.5 feet thick consisting of medium stiff to very stiff clayey silt and with gravels;
2. beach deposits up to 9.5 feet deep consisting of medium to dense tannish, brown, fine sand; and
3. marine deposits, beneath fill and beach deposit materials, extending to the maximum depth of borings (36 feet) that was comprised of soils ranging from dense coarse sand, loose clayey/silty sand, and soft sandy silt (Geolabs Hawaii, 1989).

#### **3.1.2 Topography of the Kuhio Highway Corridor**

A review of existing topography along the proposed sewer transmission alignment indicates that elevations along the Kuhio Highway corridor range from 0 to 48 feet above mean sea level. Higher elevations, ranging from 12 to 48 feet, are present in the vicinity of Wailua

River and the Coco Palms resort complex. North of this area, elevations generally range from 4 to 10 feet above mean sea level and typically average about +8 feet MSL (Portugal and Associates, 1990).

### 3.1.3 Climate

The climate of east Kauai is generally warm throughout the year as ambient temperatures range from 70 to almost 80 degrees Fahrenheit. The consistent temperatures generally suggest the presence of no seasonal weather changes. However, varying amounts of rainfall (Table 3-1) do occur in the Wailua-Kapaa area which clearly suggest a 5-month summer season and a 7-month "winter season". The summer season, from May through September, is a higher sun period that reflects both warmer temperatures and more steady tradewind conditions. The winter season is characterized by somewhat cooler temperatures, greater storm-generated rainfall, and less frequent tradewinds (Giambelluca, Nullet, and Schroeder, 1986).

**TABLE 3-1  
SEASONAL MEDIAN RAINFALL PATTERN  
WAILUA-KAPAA AREA  
(MILLIMETERS)**

January	150
February	100
March	100
April	100
May	75
June	50
July	75
August	50
September	50
October	100
November	150
December	150

### 3.1.4 Hydrology

The geotechnical investigations, conducted by Geolabs Hawaii in September, 1989 indicate that ground water in the Wailua-Kapaa area occurs at elevations ranging from 1.5 to 3.0 feet above mean sea level. Consequently, ground water occurs as little as 5.5 feet below ground elevation along much of the Kuhio Highway corridor in the Wailua-Kapaa area. Local ground water can generate a continuing discharge of pollutants from cesspools, leach fields, and other near-surface disposal facilities which pose a continuing potential risk to local water quality. In addition, ground water provides a potential source of fresh-water infiltration to any public wastewater collection system.

**CHAPTER THREE**  
**ENVIRONMENTAL SETTING**

The other primary hydrological features of the area include two drainage canals: Waikaea and Moikeha. These canals serve as flood control channels for runoff originating from the Kapaa watershed and a network of smaller inland streams. Similarly, Uhelekawana Stream (Waipouli Canal) serves as an interceptor of sheet flow from sugarcane fields mauka of the Kuhio Highway corridor, as well as surface flows from the adjoining Kauai Village Shopping Center (U.S. Department of the Army, Corps of Engineers, 1973; James H. Pedersen, Planning Consultant, 1990).

### 3.1.5 Floods and Tsunamis

The Wailua-Kapaa area has historically been inundated by numerous storm water flows and tsunami. Storm water flows originate intense rainfall and higher surface flows within the Wailua and Kapaa Watersheds, and infrequent tsunamis generated by seismic activity within the Pacific Basin.

Since 1914, the most severe storm affecting the Wailua area occurred during November, 1955. This storm generated a discharge of about 85,000 cfs near the Wailua River mouth. The Wailua flood plain was inundated with storm water up to 5 feet in depth. These flows were evidenced by flood marks in the dining room of Coco Palms Hotel which were measured at slightly more than five feet above floor elevation (U.S. Department of the Army, Corps of Engineers, 1973).

Since 1962, available records indicate that the Kapaa Watershed experienced its greatest storm runoff during a storm in December, 1968 which produced an estimated peak flow of about 12,800 cubic feet per second (cfs). The storm generating these flows inundated more than 100 acres in the watershed where standing water averaged seven feet deep. Other areas such as Keapana Crossing were washed out with surface water over 15 feet deep (U.S. Department of the Army, Corps of Engineers, 1973).

The most damaging tsunami inundating the Wailua-Kapaa area occurred in April, 1946. Originating from an earthquake in Alaska's eastern Aleutian Islands (Iida, Cox and Pararas-Carayannis, 1967), local tsunami waves inundated lands in the Wailua-Kapaa area to about the 12-foot elevation. An inundation level of one-foot flooded the Kapaa Beach Park area to about 300 yards inland. The Coco Palms Hotel site was inundated in approximately two to three feet of standing water (U.S. Department of the Army, Corps of Engineers, 1973).

In recognition of past tsunami inundation, potential tsunami inundation areas extend approximately 3,000 feet inland at Wailua Golf Course and Kapaa Town. In Wailua, the potential tsunami inundation area extends roughly 4,000 feet inland.

## **3.2 BIOLOGICAL RESOURCES**

### **3.2.1 Aquatic Resources of Local Canals and Streams**

The aquatic resources of Moikeha Canal, Waikaea Canal, Uhelekawana Stream (Waipouli Canal) were generally assessed through a general reconnaissance of the fresh-water areas (excluding Wailua River) by Mr. Don Heacock of the State Division of Aquatic Resources and James Pedersen, Planning Consultant, on May 9, 1990. Each of the stream areas were visually observed from the stream mouths to Kuhio Highway. Informal field observations were filmed on 8mm tape to facilitate the documentation and review of field notes and onsite observations.

These general observations were supplemented through a cursory review of available literature and discussions with other State Aquatics Division representatives who are familiar with the biota of Wailua River and other local streams.

As stated earlier, the three canals were initially constructed to discharge the drainage of storm water flows from the Wailua and Kapaa watersheds, as well as the surface flow from mauka sugarcane fields. In contrast, the Wailua River represents a recreational access point for residents fishing upriver and visitors taking boat tours to the upstream fern grotto area. It should be noted, however, that a boat ramp along the south side of Waikaea Canal is an important boat launching access for local boaters fishing at various offshore destinations.

Moikeha, Waikaea and Waipouli Canals each show noticeable influences from the downstream discharge of silt-laden fresh-water discharges from upland streams and sugar cane fields as considerable sediment and detritus material were observed along the stream bottoms. Each stream mouth has sand accumulation that results from onshore wave action and the apparent influence of rubble-mound jetties constructed adjacent to the stream mouths. The stream mouths at Moikeha and Waikaea represent popular shoreline fishing areas for local residents (Heacock, 1990).

Despite these influences and the generally insignificant habitat characteristics of the canals, each of the canals provide a nursery and feeding ground for several species of juvenile fish. Dominant fish species such as aholehole and mullet tend to spawn in habitat found along nearby inshore coral reef areas.

#### **3.2.1.1 Moikeha Canal**

General onsite observations indicate that the predominant juvenile fish using this area are mullet and aholehole which were present in schools ranging from 10 to 200 fish. Secondly, lesser populations of manini, kupipi, and mamo, and akule were also present. One needle fish and a few barracuda were also observed. The juvenile fish population generally feeds upon filamentous algae and other detritus material, as well as samoan crabs.

#### 3.2.1.2 Waikaea Canal

Onsite observations and past observations of the State Division of Aquatic Resources indicate that mullet, manini and aholehole comprise roughly 99 percent of the entire stream biomass (Heacock, 1990). Papio are also regularly harvested by shoreline fishermen at the stream mouth.

Similar to Moikeha, the juvenile fish population generally feeds upon filamentous algae and other detritus material, as well as samoan crabs.

#### 3.2.1.3 Waipouli Canal

Field observations indicate that a weir across the width of the stream is present which somewhat restricts the movement of some juvenile fish further upstream. While five manual openings can permit additional water flow and fish movement through the weir, a significant accumulation of silt is located underneath the Kuhio Highway bridge. This stream is also affected by some limited surface flows from Kauai Village Shopping Center and the Bull Shed vehicular parking area, as well as the presence of wind-blown trash and solid waste material from the Kauai Village Shopping Center.

Juvenile mullet, tilapia and aholehole were all abundant during the informal field survey. Smaller populations of moi and guppies were also observed. Mosquito fish and swordtails, which would typically favor this type of aquatic environment, were not seen during the survey.

Despite the presence of the weir that poses a barrier to some fish attempting to swim upstream, larger sizes of tilapia were observed mauka of the Kuhio Highway bridge.

Waters within the western or mauka end of the canal, which parallels Kuhio Highway, have, in recent years, been overtaken by the over-abundant growth of hyacinths. Hyacinths are well-known for their ability to absorb nutrients; consequently, this aquatic plant growth acts as a significant filtering system for surface waters discharging into Waipouli Canal (Heacock, 1990).

#### 3.2.1.4 Wailua River

No field investigations were made of the Wailua River area. However, Mr. Wade Ishikawa of the State Aquatics Division indicates that the river is similar to the composition of the other canals and streams in the Wailua-Kapaa area in terms of specie composition. From his personal observations, he has observed larger populations of mullet, tilapia, and aholehole. Lesser populations of papio and ulua, an occasional shark, have also been observed within the River.

### 3.2.2 Terrestrial Ecology

The Kuhio Highway corridor contains little to no significant vegetation within the proposed sewer transmission alignment because the alignment is, for the most part, contained within the Highway right-of-way. Adjacent to the Highway right-of-way are various types of exotic shrubs and trees in the front of adjoining properties containing homes, apartments, condominiums, as well as commercial and light industrial areas.

Past ornithological observations at two wetland areas (Kapaa Marsh and Wailua River/Opaekaa River Valley) west of the Kuhio Highway corridor, have included sightings of various waterbirds (Shallenberger, 1977). While waterbirds may exist in the east Kauai region, the urbanized nature of the Kuhio Highway corridor is not believed to represent any significant habitat for any native or endemic waterbird species.

## 3.3 CULTURAL RESOURCES

### 3.3.1 Archaeological and Historical Resources

The Lydgate area of Wailua River State Recreation Area is located south of the Wailua River mouth.

*"...located at the mouth of the river in the Lydgate area is Hikinaakala Heiau and Hauola (Place of Refuge). This heiau is part of the larger Wailua Heiau Complex which is listed on both the Hawaii and National Register of Historical Places.....The significance of this complex is based on the concentration of religious sites and their association with the chiefly residence at Wailua during the prehistoric and early historic period" (Yent, 1987).*

### 3.3.2 Socio-Economic Trends

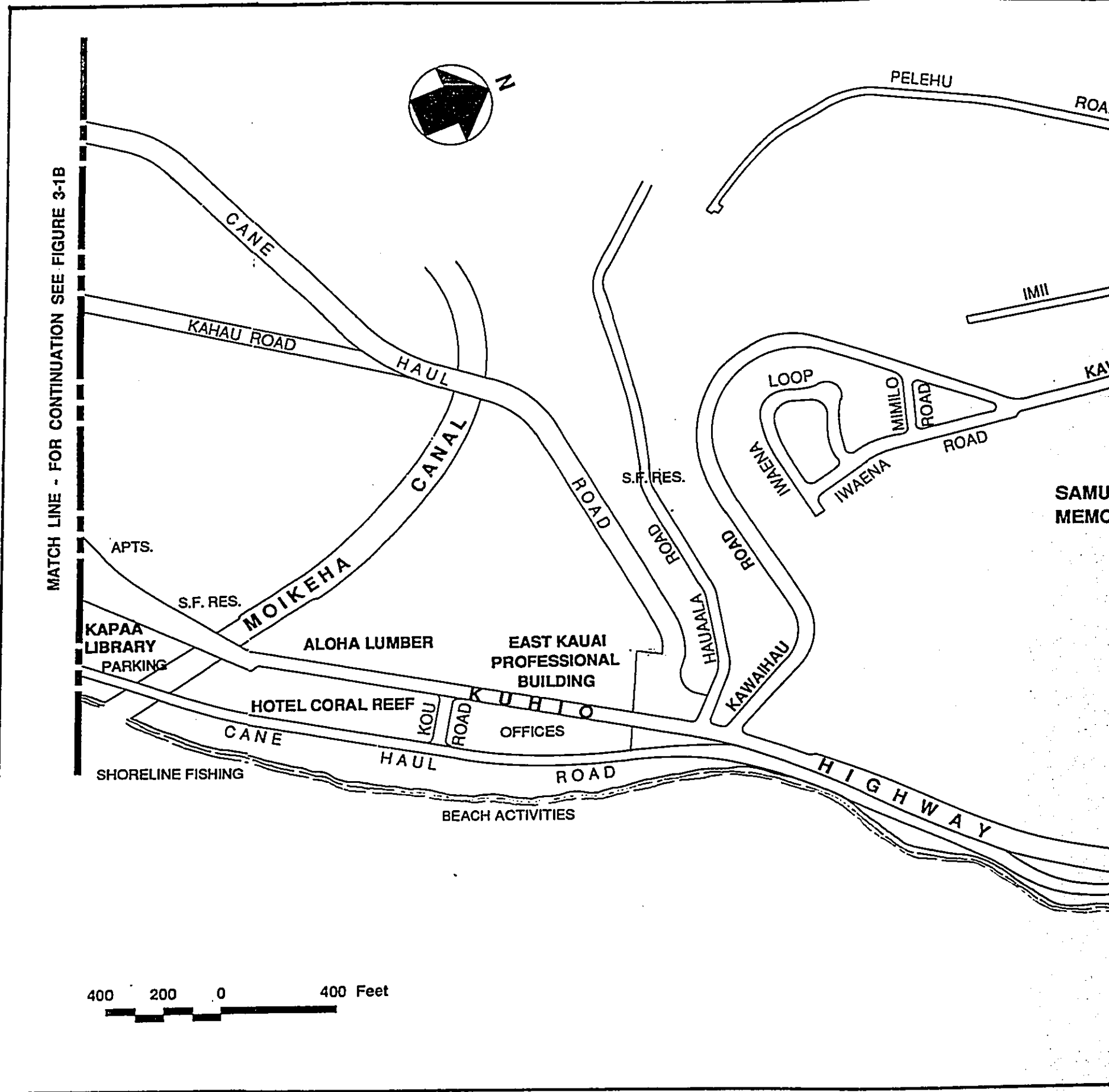
Section 2.1.2 of this report outlines the general scope of anticipated population growth and increased land development on Kauai, and the Wailua-Kapaa area during the next ten years.

## 3.4 BUILT ENVIRONMENT

### 3.4.1 Existing Land Uses

Existing land uses along the proposed sewer alignment include single family residential, apartments and condominiums, hotels, commercial shopping centers and neighborhood commercial facilities, and light industrial areas. These uses are located more specifically on Figures 3-1A through 3-1D.





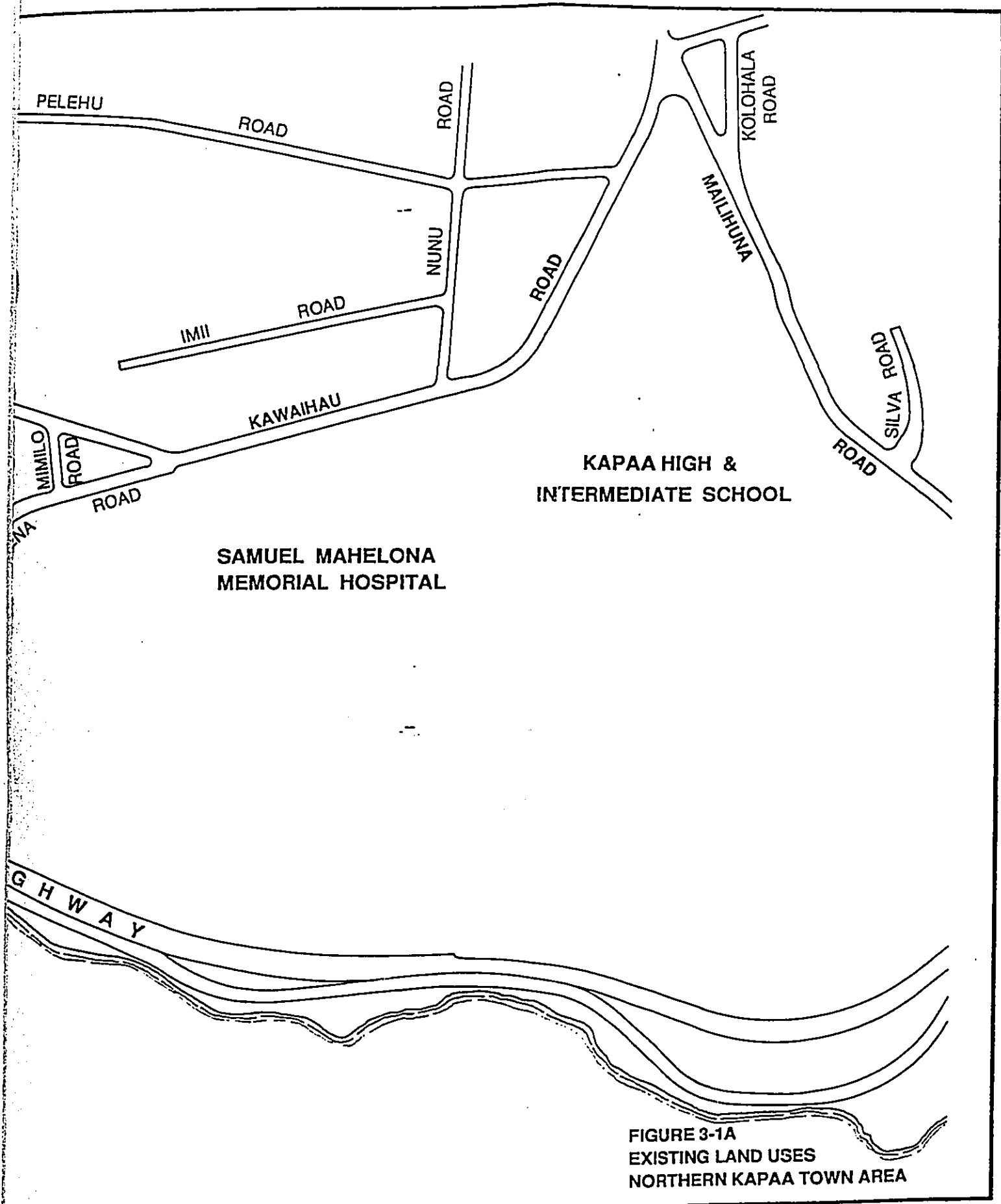
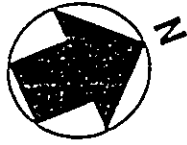
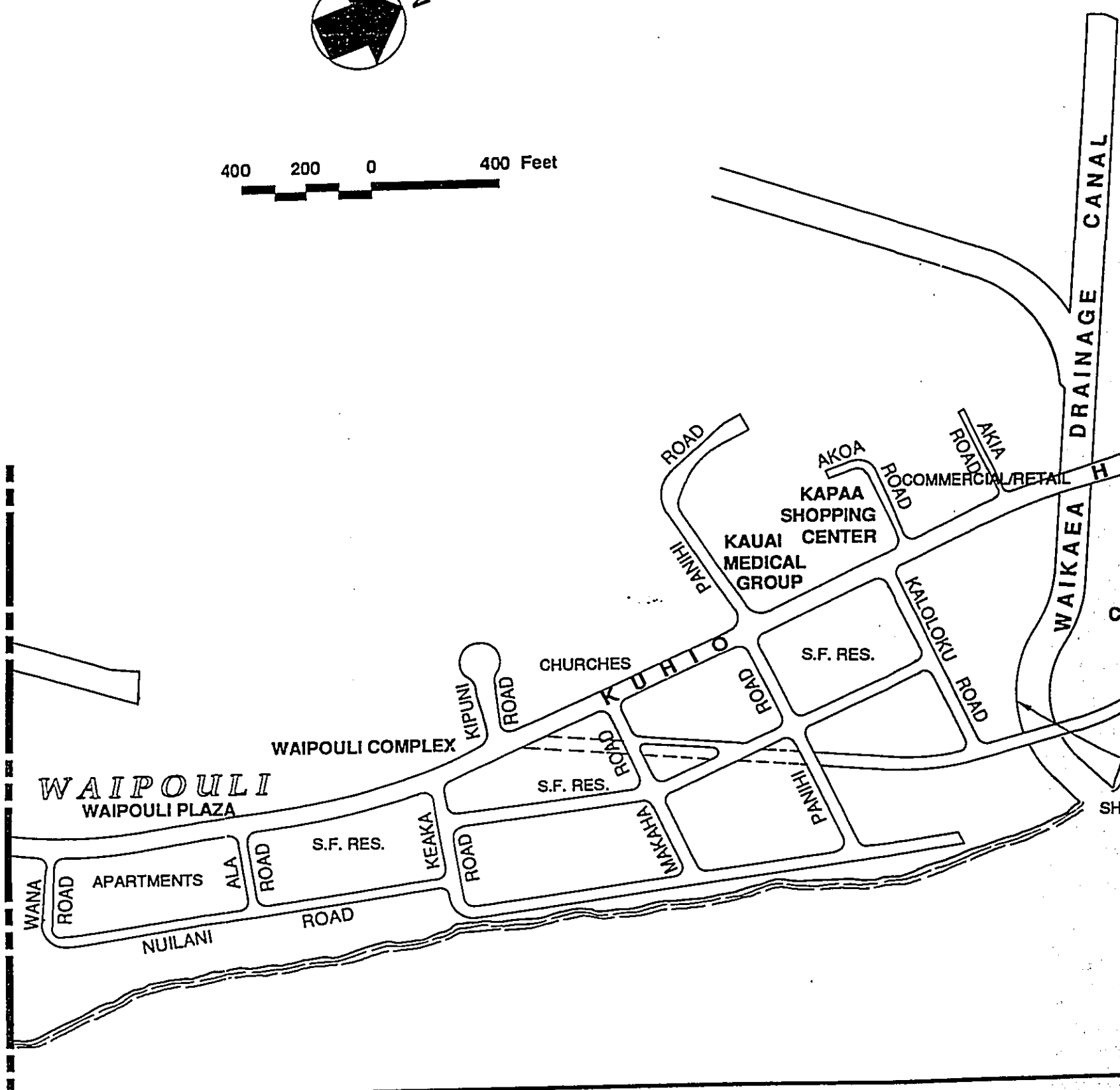


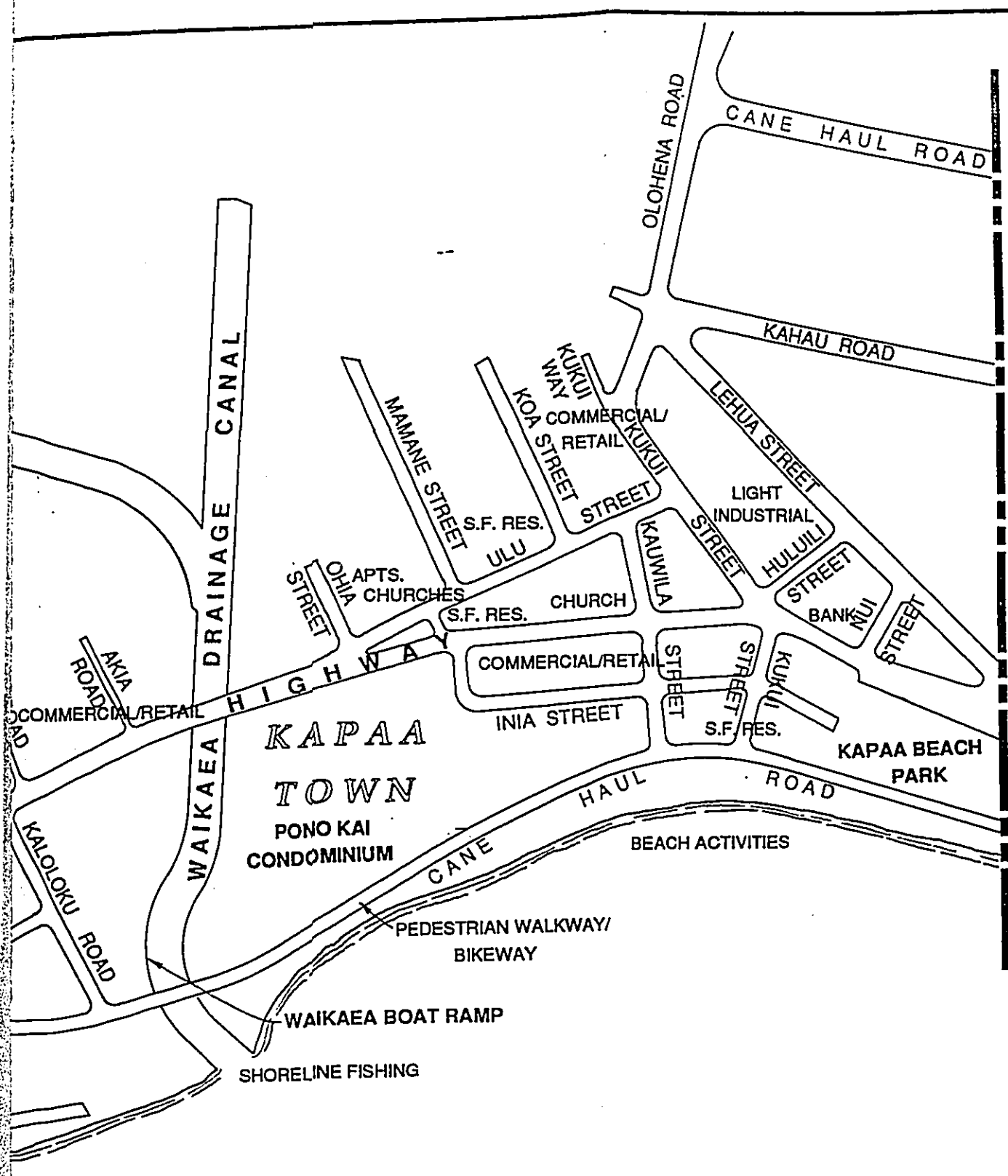
FIGURE 3-1A  
EXISTING LAND USES  
NORTHERN KAPAA TOWN AREA



400 200 0 400 Feet

MATCH LINE - FOR CONTINUATION SEE FIGURE 3-1C

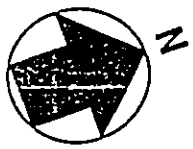




MATCH LINE - FOR CONTINUATION SEE FIGURE 3-1A

FIGURE 3-1B  
 EXISTING LAND USES  
 CENTRAL & SOUTH KAPAA AREA

MATCH LINE - FOR CONTINUATION SEE FIGURE 3-1D



UNDEVELOPED  
LAND

PAPALOA ROAD  
LAE NANI

S.F. RES.  
WAILUA KAI  
STREET

KAUAI SANDS  
HOTEL

COCONUT GROVE  
MARKETPLACE

UNDEVELOPED  
LAND

ISLANDER  
ON THE BEACH

KAUAI BEACH BOY  
CONDOMINIUMS

COCONUT  
GROVE

PLANTATION

WAIPOULI DRIVE

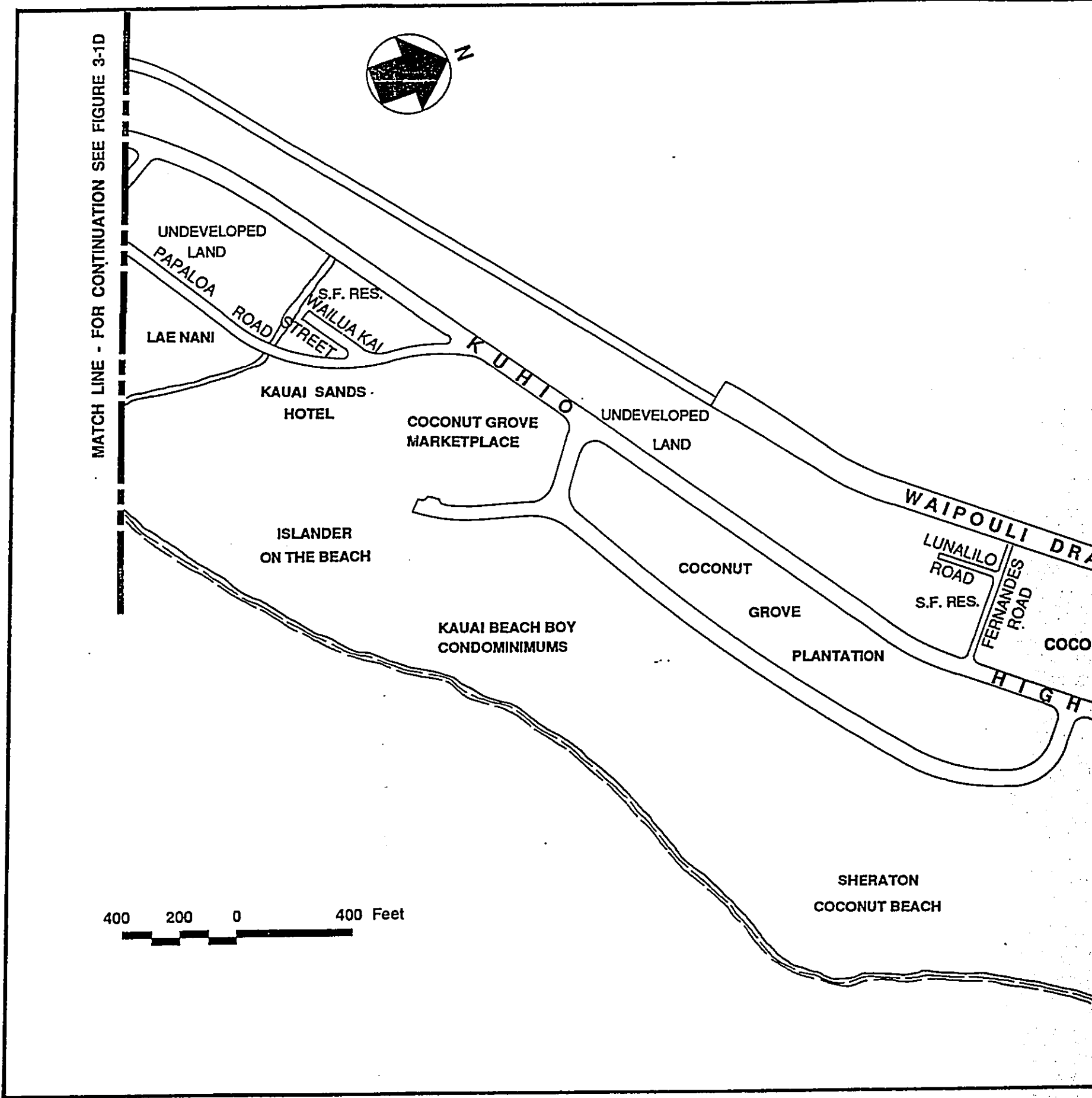
LUNALILO  
ROAD  
S.F. RES.

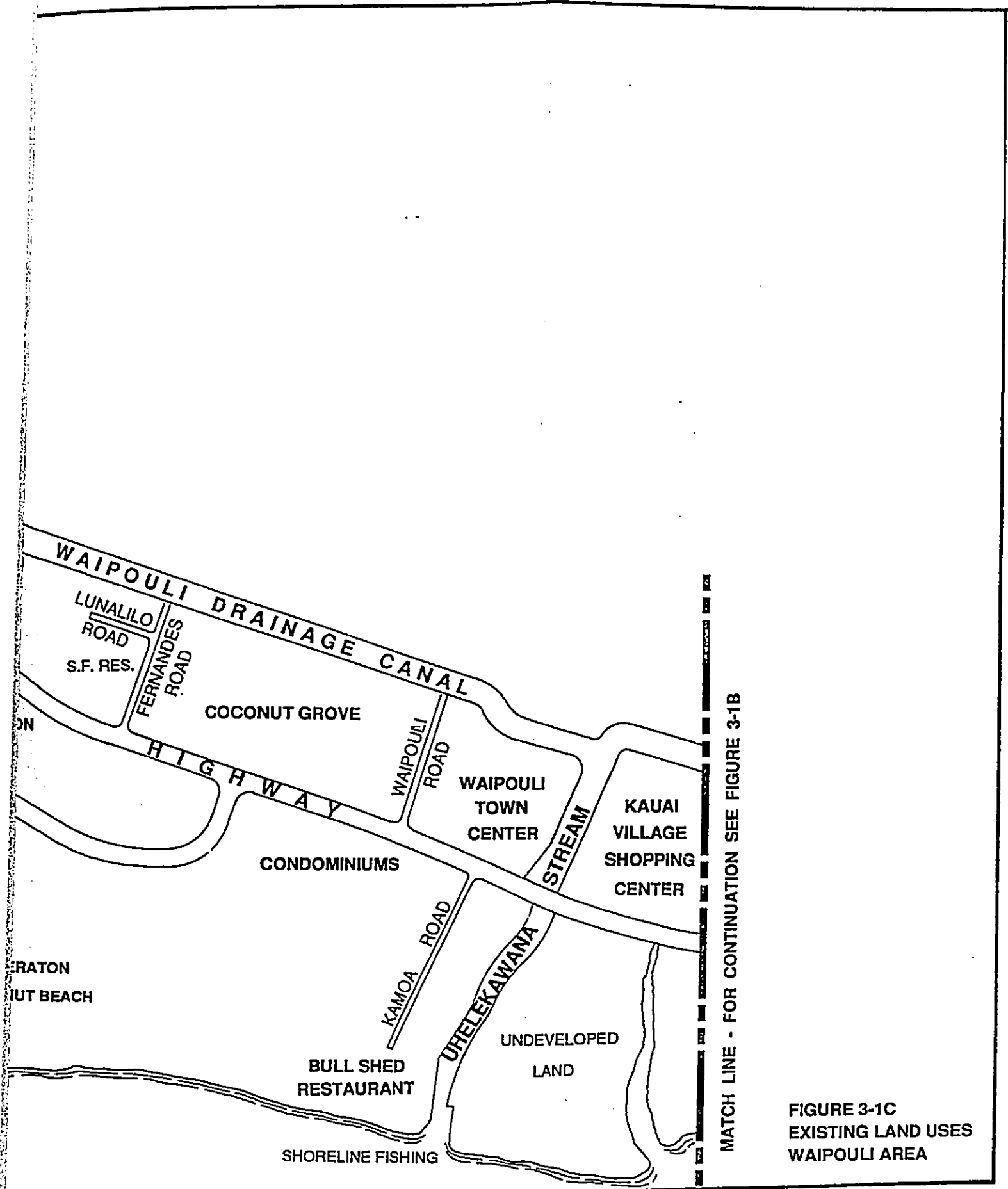
FERNANDES  
ROAD

COCO

HIGH

SHERATON  
COCONUT BEACH

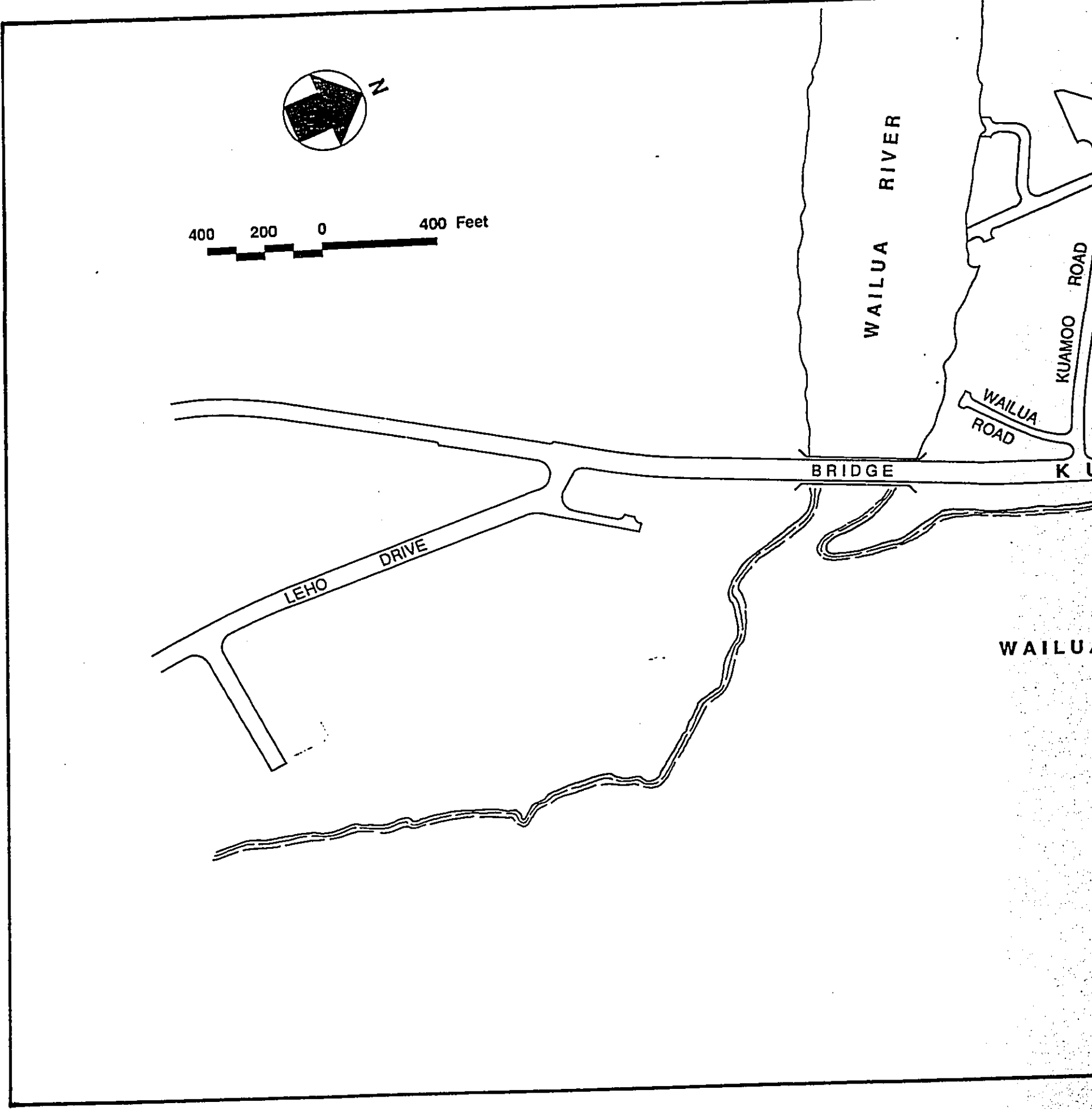


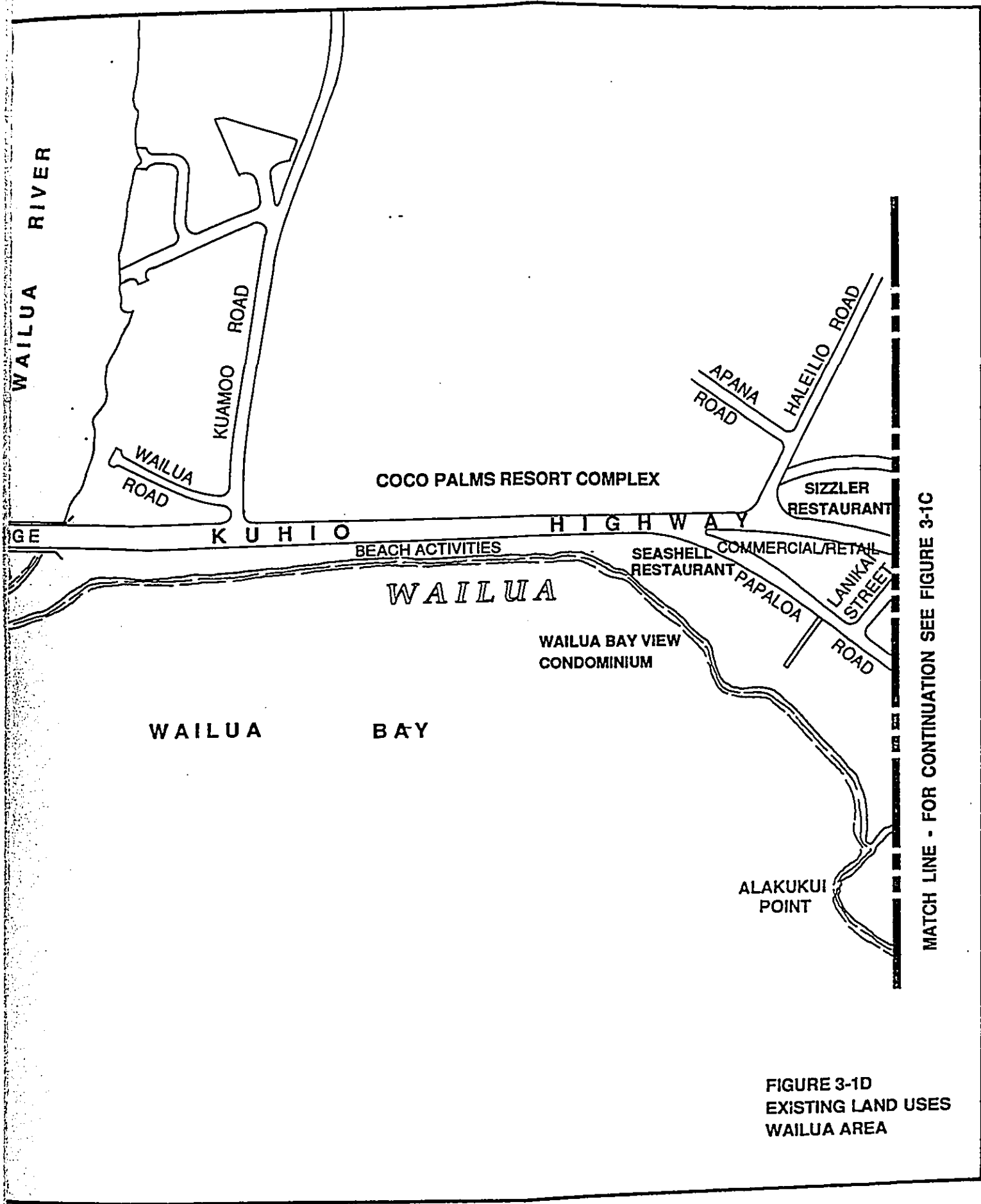


MATCH LINE - FOR CONTINUATION SEE FIGURE 3-1B

FIGURE 3-1C  
EXISTING LAND USES  
WAIPOULI AREA

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





MATCH LINE - FOR CONTINUATION SEE FIGURE 3-1C

FIGURE 3-1D  
EXISTING LAND USES  
WAILUA AREA



### **3.4.2 Existing Wastewater System in the Wailua-Kapaa Area**

#### **3.4.2.1 Kauai County System**

Kauai County's existing wastewater system in the Wailua-Kapaa area presently serves the Coconut Plantation Resort and Marketplace area, as well as other adjacent resort/commercial facilities in Papaloa. Other land uses connected to the system include the Coco Palms Hotel, the Kauai Resort Hotel and other nearby condominiums.

Flows from the Waipouli area are transported to the Wailua Wastewater Treatment Plant via an existing 8-inch sewer main along Kuhio Highway. The sewer main begins at Waipouli Town Center and continues through Coconut Plantation and the Coconut Plantation Marketplace via existing force mains and sewer line. The pressurized flow to the treatment plant is made possible by the County's use of four force mains (Figures 2-3 and 2-4) within the Coconut Plantation and Marketplace area, and along Papaloa Road and Kuhio Highway (near Coco Palms Hotel).

The existing wastewater treatment plant is situated makai of Kuhio Highway and Kauai Resort Hotel, and south of Lydgate Park (Figure 2-4). This facility is a secondary treatment plant that uses the activated sludge process for waste treatment. The total plant capacity is estimated to be 1.5 mgd. The average flow rate at the plant presently ranges between 0.5 and 0.7 mgd (Funamura, 1990). Consequently, the treatment plant is presently operating at roughly 40 percent of its original design capacity.

#### **3.4.2.2 Other Wastewater Systems**

Several private and two State-owned wastewater treatment plants have been constructed at various condominiums, resorts, shopping centers, and public housing areas within the Wailua-Kapaa area (Table 3-2). It is estimated that these facilities generate an average wastewater flow of, at least, 0.144 mgd.

The 208 Water Quality Management Plan for the County of Hawaii indicates that there are, at least, 2000 cesspools in the Wailua-Kapaa area (R.M. Towill Corporation, 1984). A Kauai County survey made of cesspool owners indicates that roughly 20 percent of the owners have experienced "cesspool failure". This condition was defined as a cesspool that needed to be pumped, or overflowed, at least once during the past 10 years.

### **3.4.3 Vehicular Traffic Along the Kuhio Highway Corridor**

A draft Kauai County Highway Planning Study was recently completed by Kaku Associates for the State Department of Transportation and the County of Kauai. This study examined existing and anticipated vehicular traffic volumes during the next 20 years, as well as identified various recommended strategies for the improvement of vehicular capacity and level of service.

**TABLE 3-2**  
**ESTIMATED AVERAGE WASTEWATER FLOW (MGD)**  
**OTHER PRIVATE AND PUBLIC WASTEWATER TREATMENT SYSTEMS**

<u>NAME OF PROPERTY</u>	<u>WASTEWATER GENERATION (mgd)</u>
Hotel Coral Reef	0.004
Hawaii Housing Authority *	0.025
Kauai Hilton	0.056
Kauai Beach Villas	0.022
Pono Kai Condominium *	0.067
Kapaa Shore *	0.012
Kauai Kailani Apartments	0.009
Waipouli Plaza	0.008
Mahelona Hospital/Kapaa High & Int. *	0.016
Bernice Hee Apartments	0.001
Hee Fat Building	0.006
TOTAL:	0.226

Note: \* Facility proposed for connection to Phase I of the Kapaa Sewer Project.

Source: James Pedersen, Planning Consultant, 1990; County of Kauai Sewer Standards.

Within the Wailua-Kapaa area, Kaku Associates examined six intersections along Kuhio Highway in July, 1988. The results of these studies indicate, at least, the following regarding the Wailua-Kapaa area:

1. Existing traffic volumes along Kuhio Highway (Figure 3-2) have reached, and in some locations, have surpassed existing roadway capacities (Table 3-3). Only the northern end of Kuhio Highway, and less-used secondary roadways in the Kapaa area, indicate any surplus capacity.
2. Average vehicular speeds for southbound traffic are slower during the morning peak period while afternoon speeds are slower for northbound vehicular traffic (Figure 3-3). This confirms the dominance of commuter-related traffic along Kuhio Highway to and from Lihue and south shore employment areas, as well as visitor traffic between Lihue Airport and resort facilities in the Wailua-Kapaa area.
3. The present level of service along Kuhio Highway is causing long traffic delays in the early morning and late afternoon periods (Table 3-4). This condition is more than apparent to residents of and visitors to the Wailua-Kapaa area.

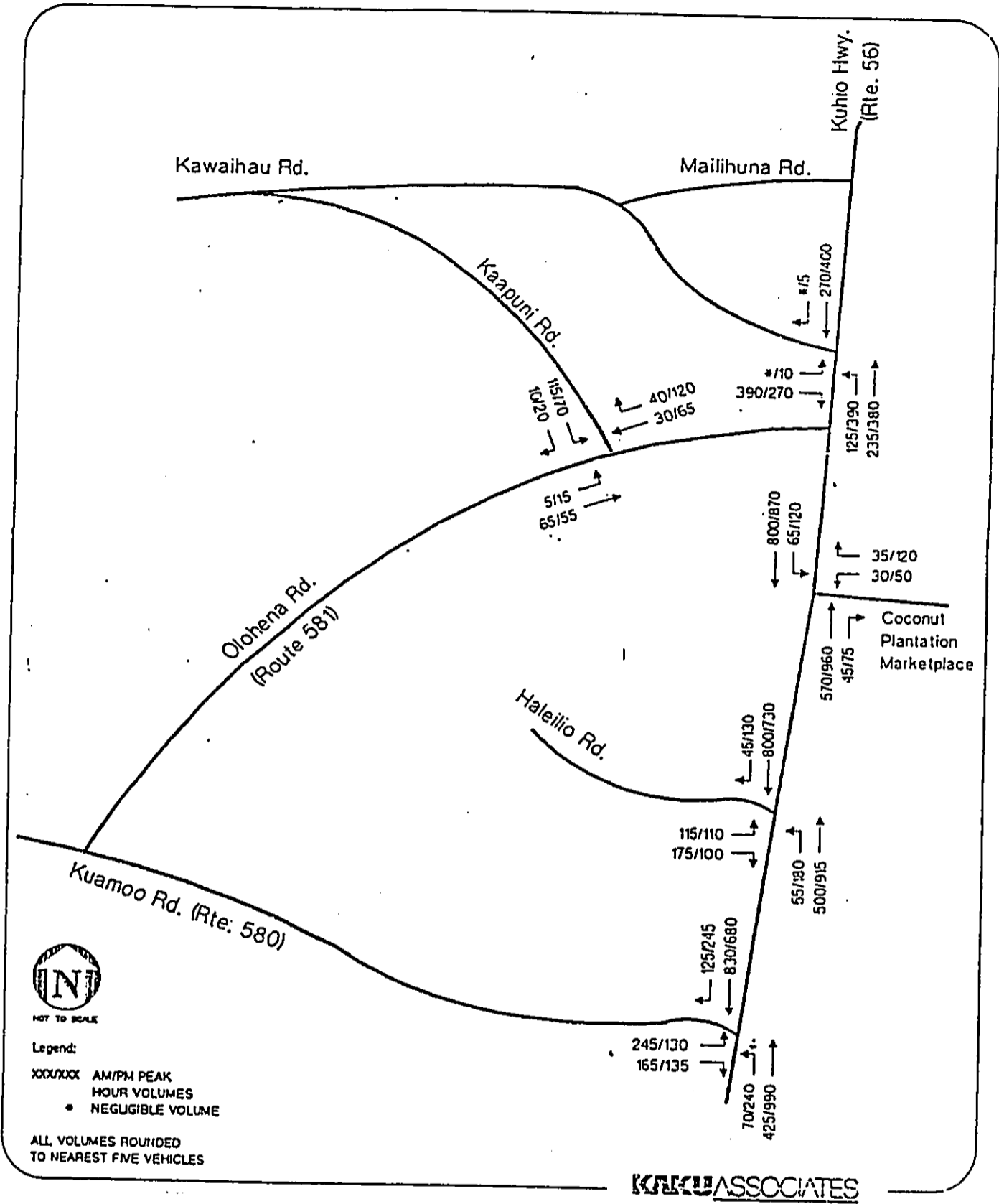
During the next 20 years, existing traffic volumes may triple on selected segments along the Kuhio Highway corridor. Recognizing this possibility and the anticipated growth in population and land development, Kaku and Associates recommended, in part: 1) the widening of Kuhio Highway to provide two more traffic lanes between Lihue and Kawaihau Road; and 2) the construction of a bypass highway mauka of the Kuhio Highway corridor.

In the short-term, the State Department of Transportation will soon begin to re-stripe and resurface portions of the Kuhio Highway to create three moving lanes of vehicular traffic which will be contra-flowed during peak morning and afternoon traffic. This project is scheduled to begin in September, 1990 and be completed by July, 1991. The project will affect Kuhio Highway between its intersections at Kapule Highway and the Haleilio Road.

A related second phase of State highway improvements will include the widening of existing canal bridges north of Wailua River. This project is scheduled to begin January, 1992 and be completed sometime in 1993.

#### **3.4.4 Recreation**

Recreational opportunities are extensive within the Wailua-Kapaa area, particularly those that occur along the shoreline. Both residents and visitors make considerable use of Wailua Bay, Waipouli Bay and Kapaa Beach Park for swimming, sunbathing and other shoreline recreation. Wailua Bay is also a popular destination for bodysurfers of intermediate ability (State Division of Parks, Outdoor Recreation and Historic Sites, 1987). As stated earlier, shoreline fishing is popular at the mouths of both Moikeha and Waikaea canals, and to a lesser extent, at Uhelekawana Stream (Heacock, 1990). Boaters also make considerable use of Waikaea boat ramp for access to offshore fishing locations.



**FIGURE 3-2**  
**PEAK HOUR TRAFFIC VOLUMES IN WAILUA-KAPAA AREA**  
**JULY, 1988**

Source: Kaku Associates, 1990.

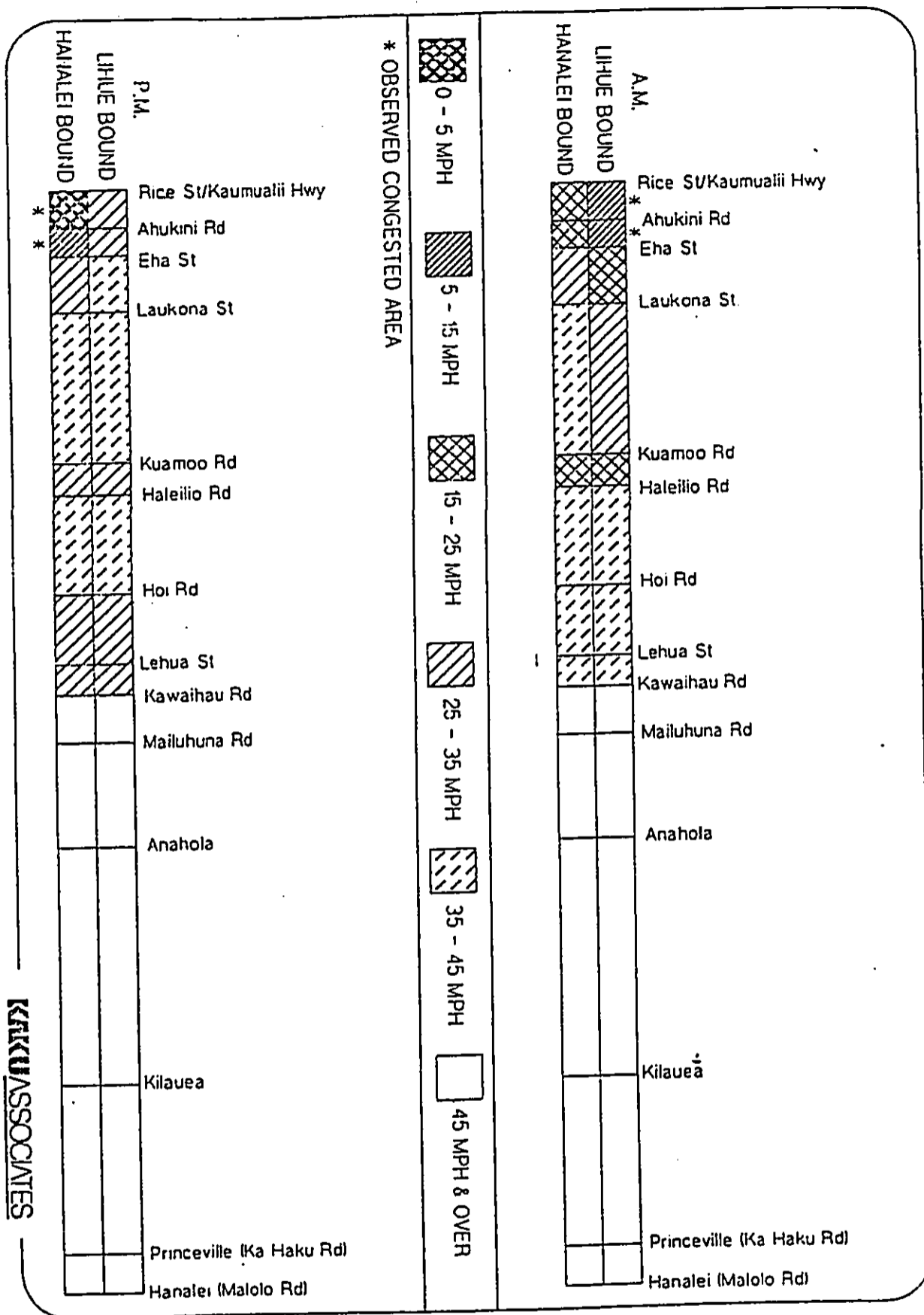
**TABLE 3-3  
EXISTING PEAK HOUR LEVELS OF SERVICE  
SELECTED TRAFFIC INTERSECTIONS  
IN WAILUA-KAPAA AREA**

<u>Intersection</u>	<u>AM PEAK HOUR</u>		<u>PM PEAK HOUR</u>	
	<u>V/C or Reserve Capacity</u>	<u>LOS</u>	<u>V/C or Reserve Capacity</u>	<u>LOS</u>
1. Kuhio Highway & Kawaihau Road	a + 257	C	a + 44	E
2. Kaapuni Road & Olohena Road	a + 688	A	a + 651	A
3. Kuhio Highway & Coconut Plantation Driveway	a + 30	E	a - 20	F
4. Kuhio Highway & Haleilio Road	a + 11	E	a - 53	F
5. Kuhio Highway & Kuamoo Road	b 0.85	D	b 0.86	D
6. Kuhio Highway & Kapaa Shopping Center Driveway	a - 1	F	a - 37	F

Notes:

- a) Indicates available reserve capacity (not V/C ratio) and level of service for turning movements from minor street approach, representing the most-constrained movements at the intersection (intersection controlled by stop-signs on minor street approach).
- b) Indicates volume/capacity ratio and level of service for intersection as a whole (intersection controlled by traffic signal).

Source: Kaku Associates, 1990.



Source: Kaku Associates, 1990.

**FIGURE 3-3**  
**AVERAGE VEHICULAR SPEED (BY DIRECTION)**  
**ALONG KUHIO HIGHWAY,**  
**MORNING AND EVENING TRAFFIC, JULY, 1988**

**TABLE 3-4  
LEVEL OF SERVICE DEFINITIONS FOR  
TWO-WAY STOP-CONTROLLED INTERSECTIONS**

<u>Available Reserve Capacity</u>	<u>Level of Service</u>	<u>Expected Delay to Minor Street Traffic</u>
400 or more	A	Little or no delay.
300 to 399	B	Short traffic delays.
200 to 299	C	Average traffic delays.
100 to 199	D	Long traffic delays.
0 to 99	E	Very long traffic delays.
Less than 0	F	Failure - extreme congestion.
(Any value)	F	Intersection blocked by external causes.

Source: Transportation Research Board, Highway Capacity Manual, Special Report 209, 1985.

### **3.5 PLANS, POLICIES AND CONTROLS**

#### **3.5.1 Hawaii State Plan, Hawaii Revised Statutes, Chapter 226**

The Hawaii State Plan provides a guide for the short and long-term development of Hawaii. These guidelines are presented in the context of regional goals, objectives, policies, and priorities concerning Hawaii's population, economy, environment, and man-made resources (Office of the Governor, Office of State Planning, 1988). In the following paragraphs, the guidelines considered relevant to the Kapaa Sewer Project are identified:

##### **Facility Systems - Solid and Liquid Wastes: Section 226-15**

Subsection A of Section 226-15 refers to the maintenance of public health and sanitation standards. The development of the sewer transmission line from Kapaa to Wailua clearly addresses this objective. The establishment of an expanded sewer system will significantly reduce the volume of untreated sewage being discharged via cesspool into the local substrata. The substrata contains a high water table. In addition, the Wailua-Kapaa area has suffered a large amount of cesspool failures. The potential risk upon inshore water quality and local stream quality are increased without the implementation of this project.

Subsection B of this section indicates that the policy of the State will be to encourage the development of adequate sewerage facilities that will complement planned growth. Both private and public plans point to the development of the Wailua-Kapaa area as a future focus for increased commercial and resort development. The proposed Kapaa Sewer Project will primarily service existing land uses along the Kuhio Highway corridor.

#### **3.5.2 State Land Use Designations**

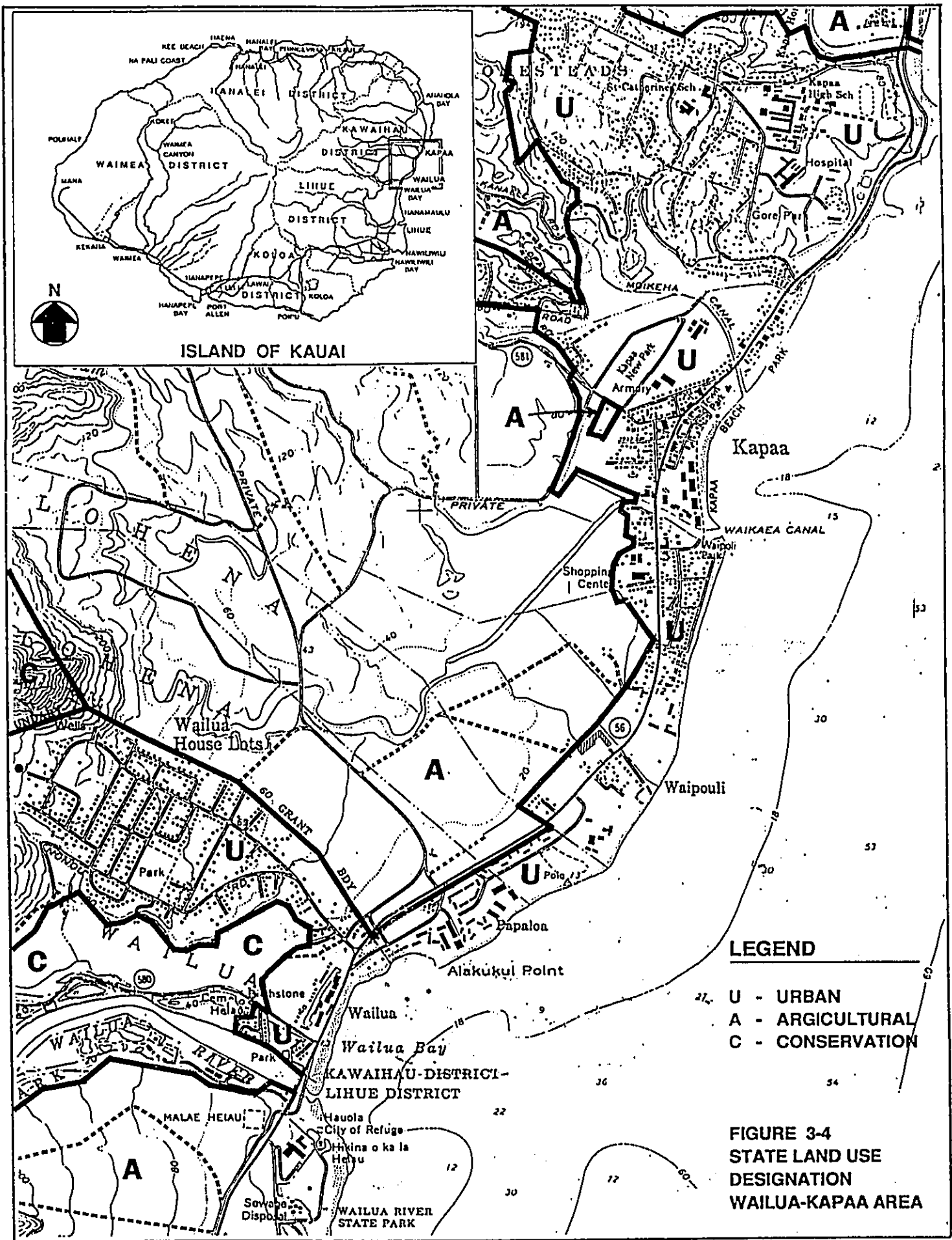
The entire project area and Kuhio Highway corridor is situated with an designated for "urban" uses such as commercial, residential, and industrial activities (Figure 3-4).

Land designated for urban use in Kauai County are administered by the Kauai county Planning Commission and the Kauai County Planning Department.

#### **3.5.3 Kauai County Special Management Area (SMA) Designations**

Chapter 205A, Hawaii Revised Statutes, provided the County of Kauai with the authority to establish special management area boundaries, as well as rules and regulations, that permit the County to manage the use of these land and coastal areas. In essence, this process enables the County to more closely review development projects that are situated in more sensitive development areas. The special management boundaries determined for the Wailua-Kapaa area are illustrated in Figure 3-5.





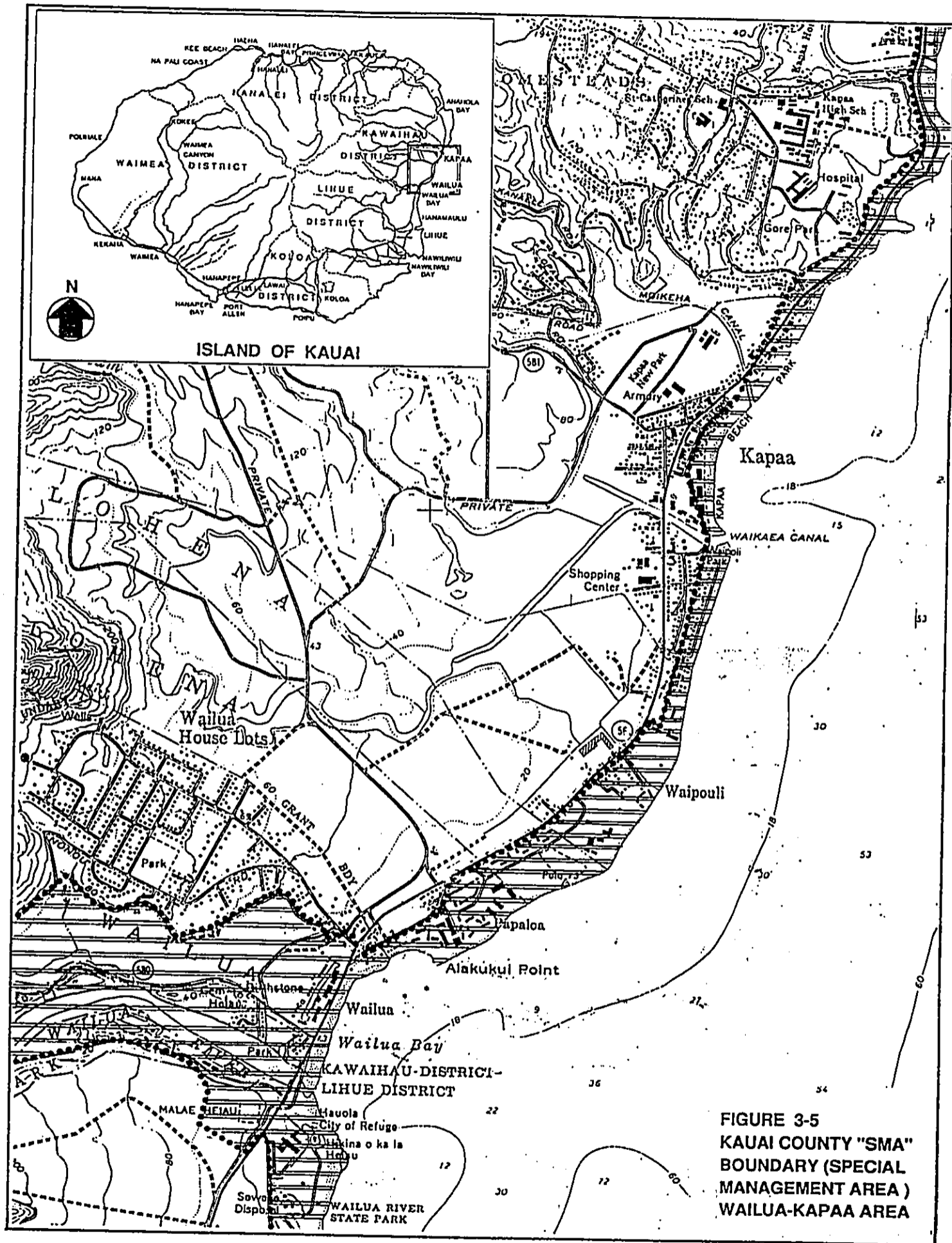


FIGURE 3-5  
 KAUAI COUNTY "SMA"  
 BOUNDARY (SPECIAL  
 MANAGEMENT AREA)  
 WAILUA-KAPAA AREA

Since the construction value of the Kapaa Sewer Project will exceed \$65,000, the County Department of Public Works is required to obtain a Special Management Area Permit for this project. The SMA permit documentation for this project is provided in Appendix A of this environmental assessment.

#### **3.5.4 Kauai County Zoning Designations**

Existing zoning designations in the Kuhio Highway corridor replicate much of the present development pattern in this area, as well as potential areas for future development (Figures 3-6A through 3-6D).

#### **3.5.5 Hawaii Administrative Rules, Title 11, Chapter 62, Wastewater Systems**

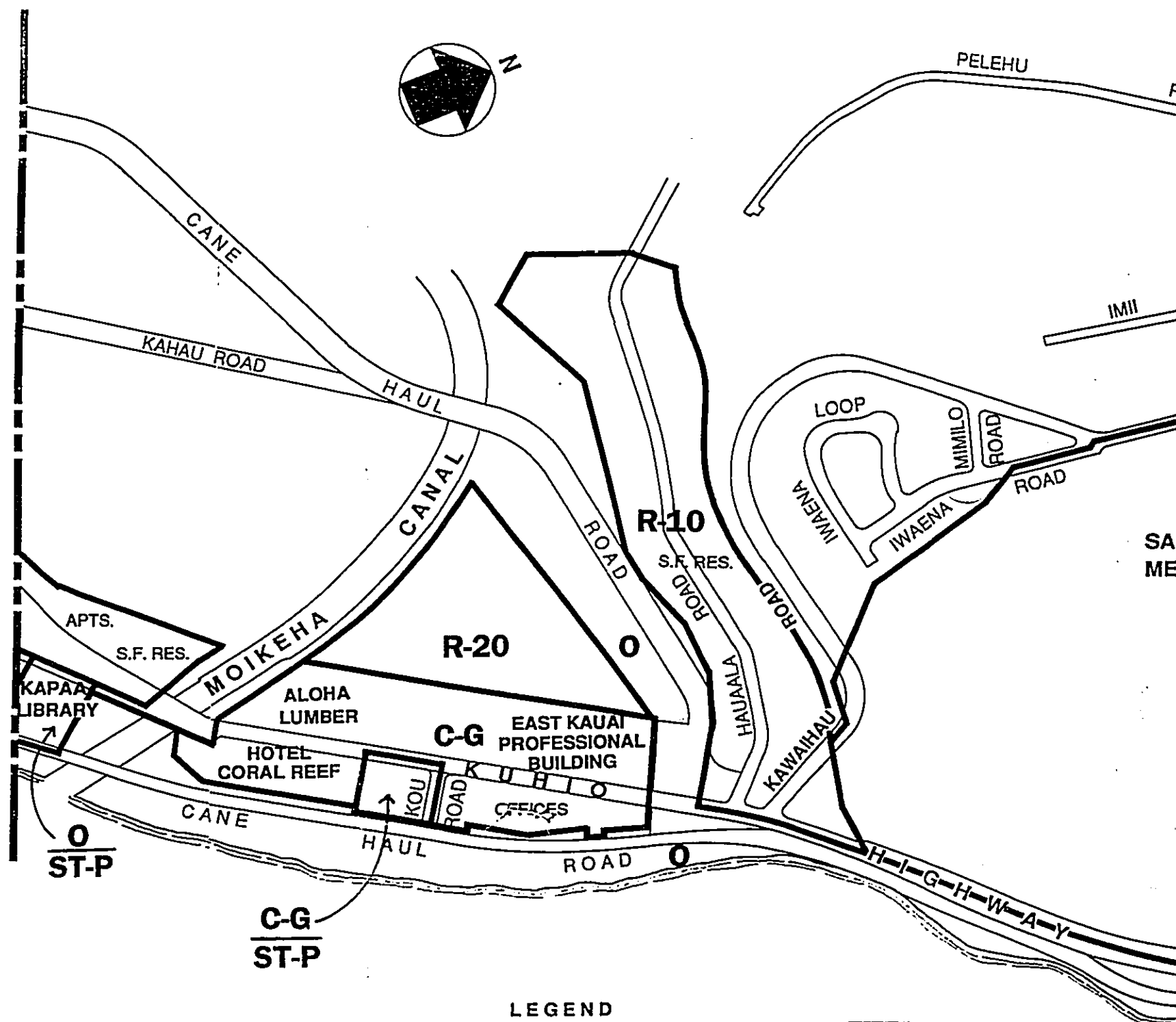
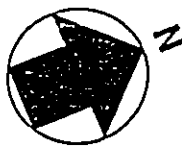
Chapter 62 gives authority to the director of the State Department of Health to establish "critical waste disposal areas" in Hawaii's four counties. Within the Wailua-Kapaa area, State Department of Health representatives indicate that it will soon exclude the use of cesspools makai of the 100-foot elevation. This proposed policy stems from the Department's objective to eliminate the construction of cesspools by the year 2000, and centralize regional sewage collection, treatment and disposal systems. Chapter 62 also stipulates that new publicly owned buildings must use a method of sewage disposal other than cesspools.

The Department of Health already restricts the development of any cesspool within a 1,000-foot radius of any ground water source or well as a result of policies already established by the Kauai County Water Department.

#### **3.5.6 Hawaii Administrative Rules, Title 11, Chapter 23, Underground Injection Control**

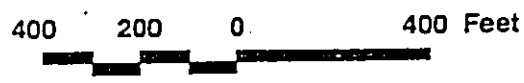
Chapter 23 provides the State Department of Health with the authority to establish underground injection control maps which indicate exempted aquifers and potable ground water sources, as well as a permit process related to the construction of most injection wells, e.g. sewage injection wells. In general, the policy of the State Department of Health is to restrict the construction of injection wells makai of existing "underground injection control" boundaries (Figure 3-7) in order to protect the State's potable ground water sources.

MATCH LINE - FOR CONTINUATION SEE FIGURE 3-6B



**LEGEND**

- R-1 RESIDENTIAL - 1 UNIT/ACRE
- R-4 RESIDENTIAL - 4 UNITS/ACRE
- R-10 RESIDENTIAL - 10 UNITS/ACRE
- R-20 RESIDENTIAL - 20 UNITS/ACRE
- RR-20 RESORT - 20 UNITS/ACRE, 40 HOTEL ROOMS/ACRE
- C-G COMMERCIAL - GENERAL
- C-N COMMERCIAL - NEIGHBORHOOD
- O OPEN
- ST-P SPECIAL TREATMENT DISTRICT - PUBLIC



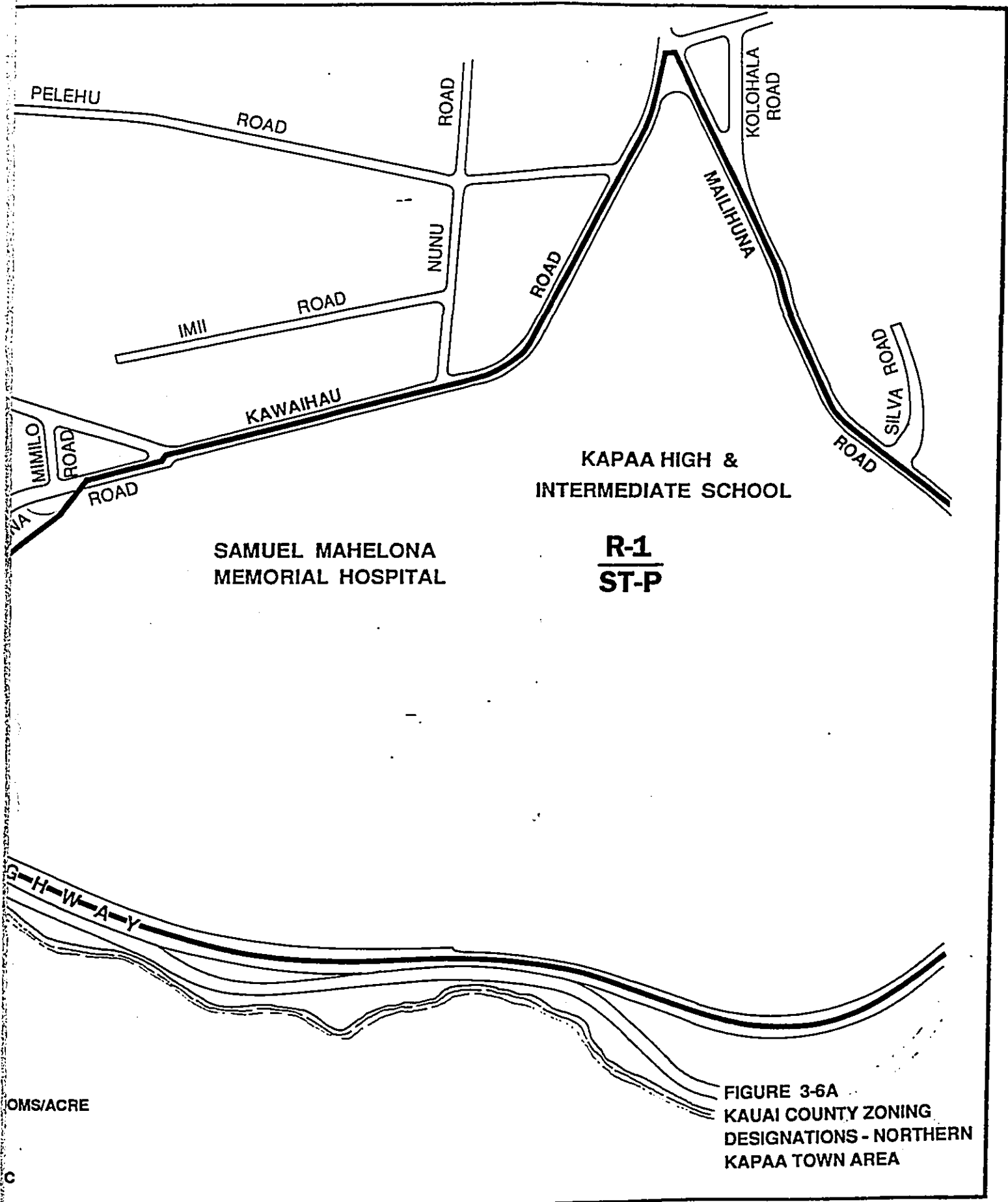
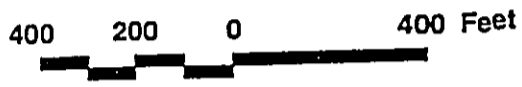


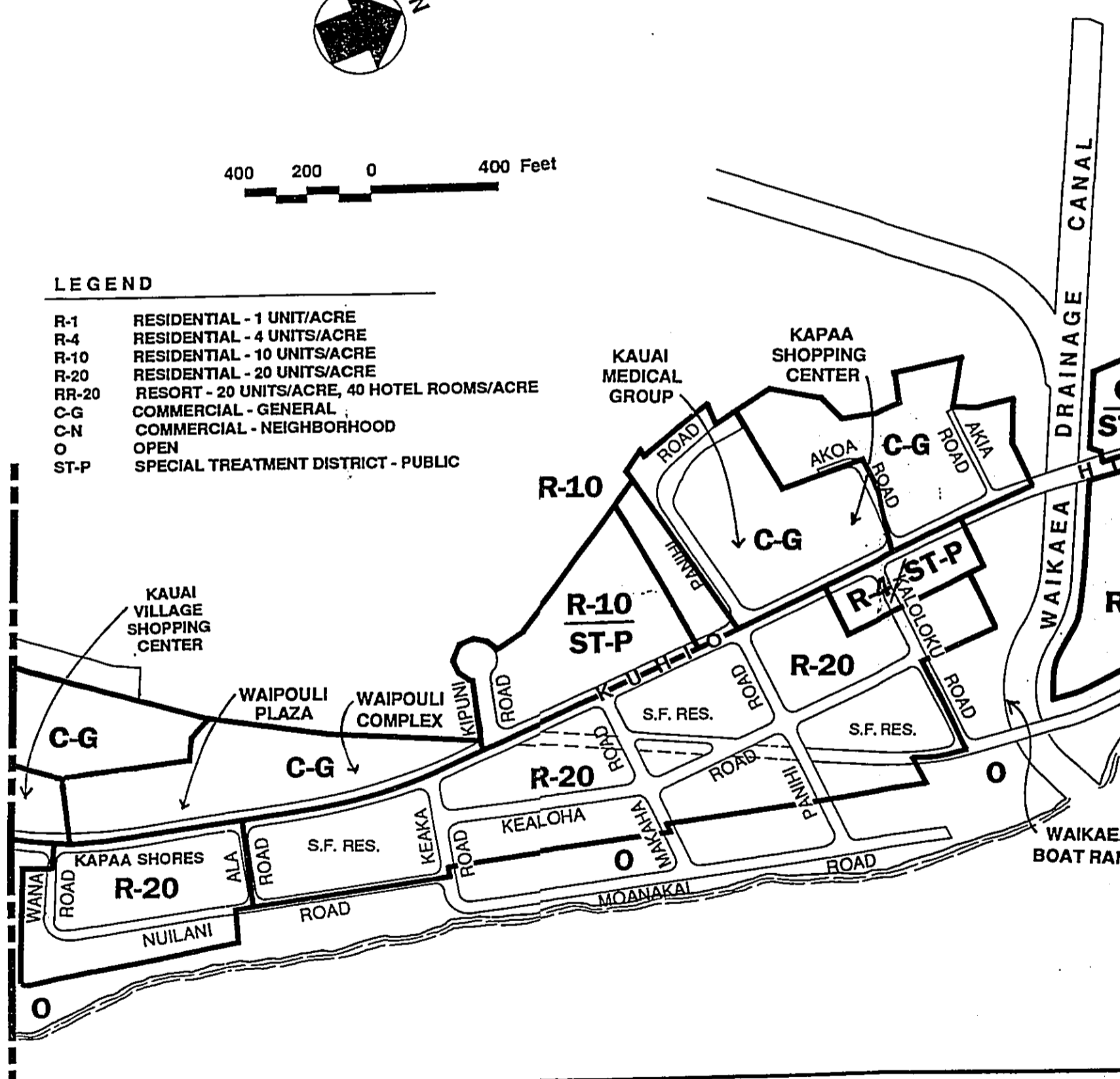
FIGURE 3-6A  
KAUAI COUNTY ZONING  
DESIGNATIONS - NORTHERN  
KAPAA TOWN AREA

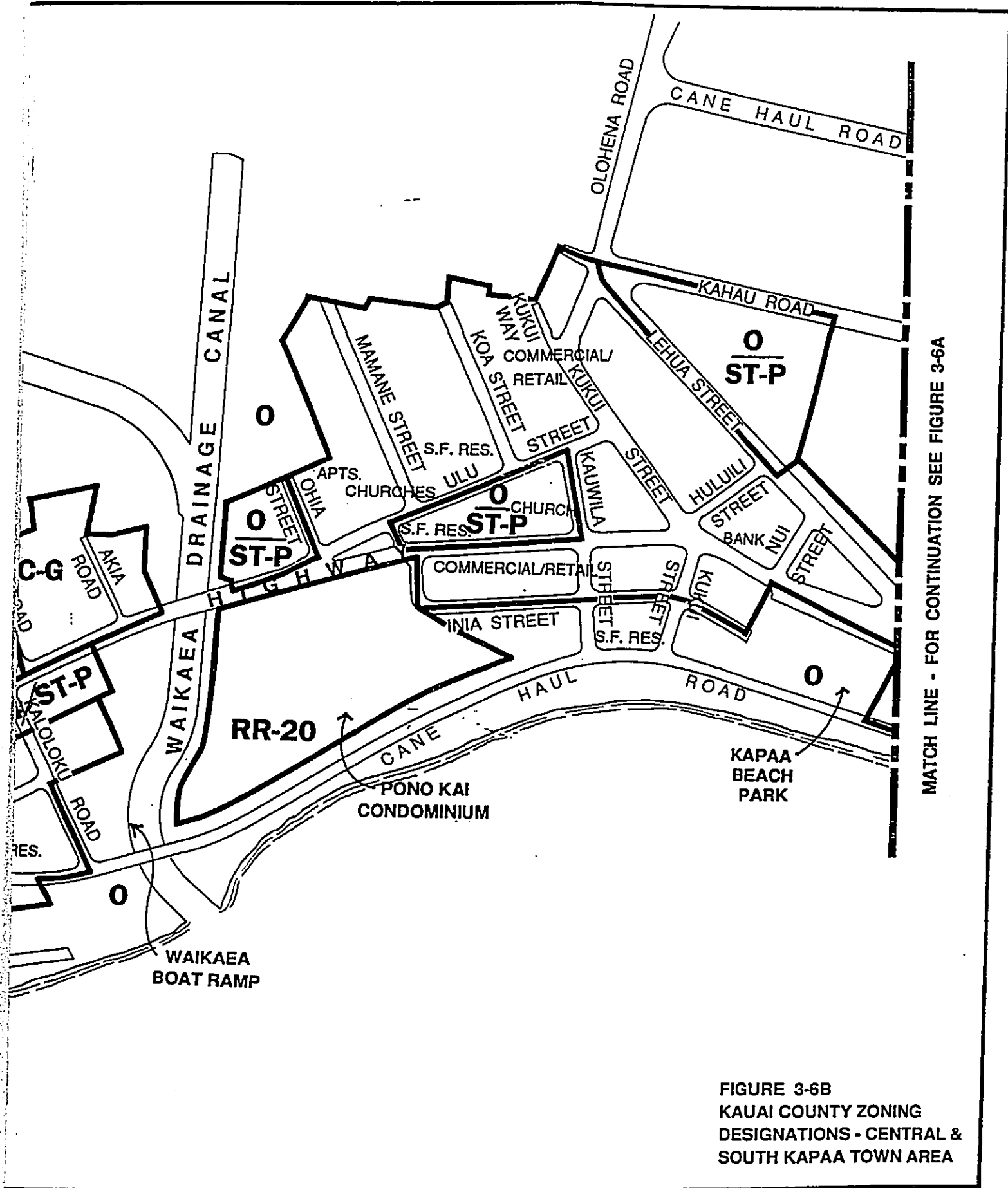


**LEGEND**

- R-1 RESIDENTIAL - 1 UNIT/ACRE
- R-4 RESIDENTIAL - 4 UNITS/ACRE
- R-10 RESIDENTIAL - 10 UNITS/ACRE
- R-20 RESIDENTIAL - 20 UNITS/ACRE
- RR-20 RESORT - 20 UNITS/ACRE, 40 HOTEL ROOMS/ACRE
- C-G COMMERCIAL - GENERAL
- C-N COMMERCIAL - NEIGHBORHOOD
- O OPEN
- ST-P SPECIAL TREATMENT DISTRICT - PUBLIC

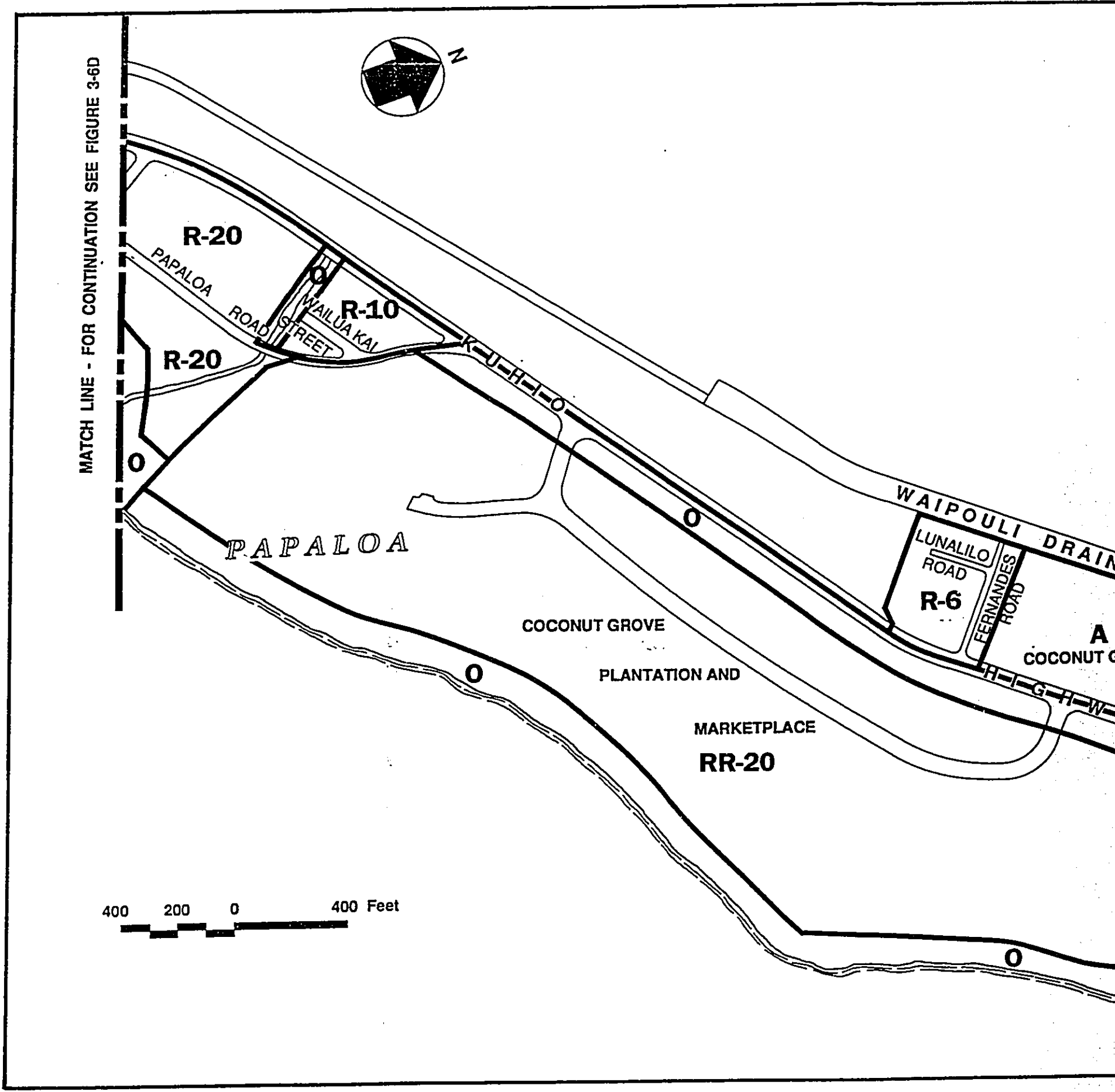
MATCH LINE - FOR CONTINUATION SEE FIGURE 3-6C





MATCH LINE - FOR CONTINUATION SEE FIGURE 3-6A

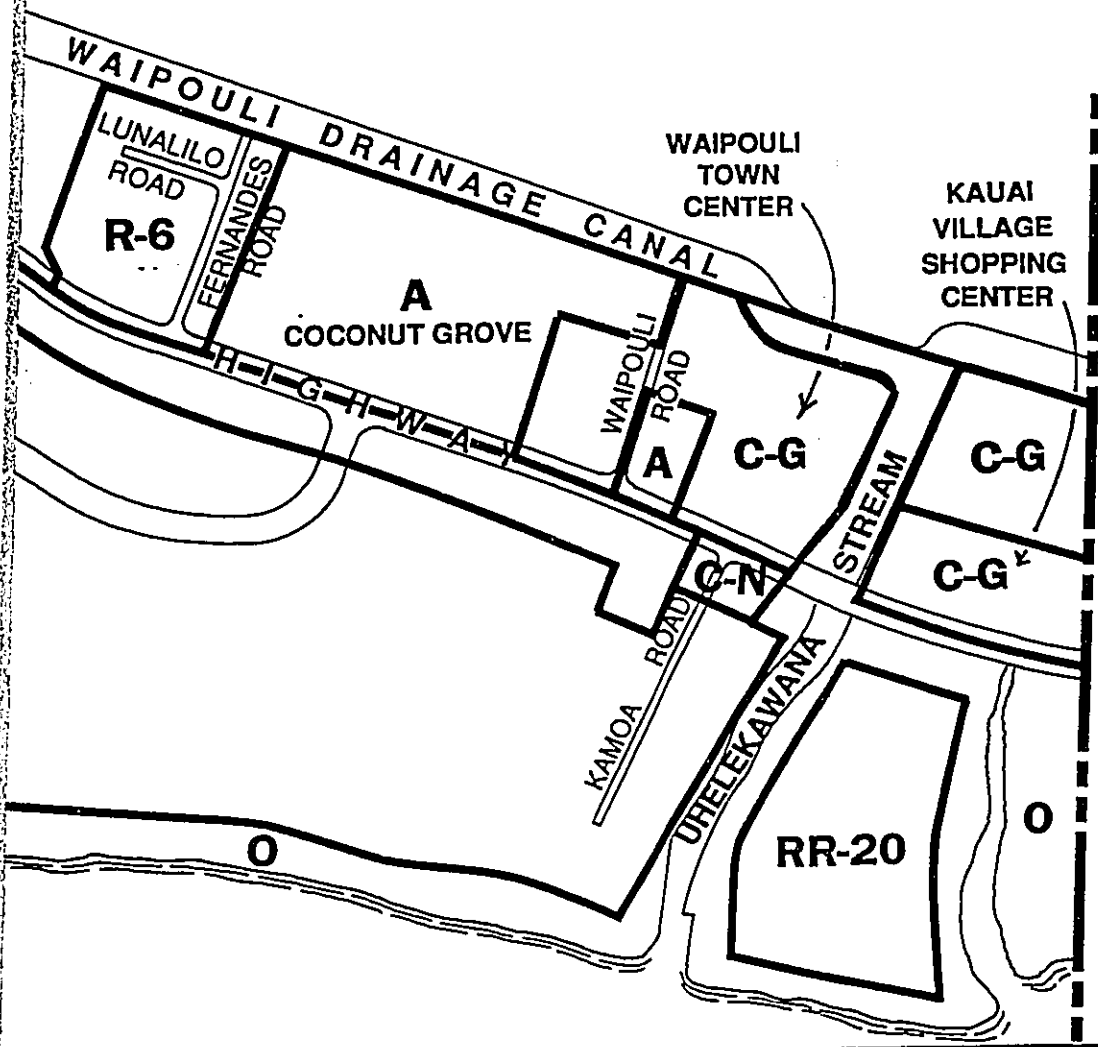
FIGURE 3-6B  
 KAUAI COUNTY ZONING  
 DESIGNATIONS - CENTRAL &  
 SOUTH KAPAA TOWN AREA





**LEGEND**

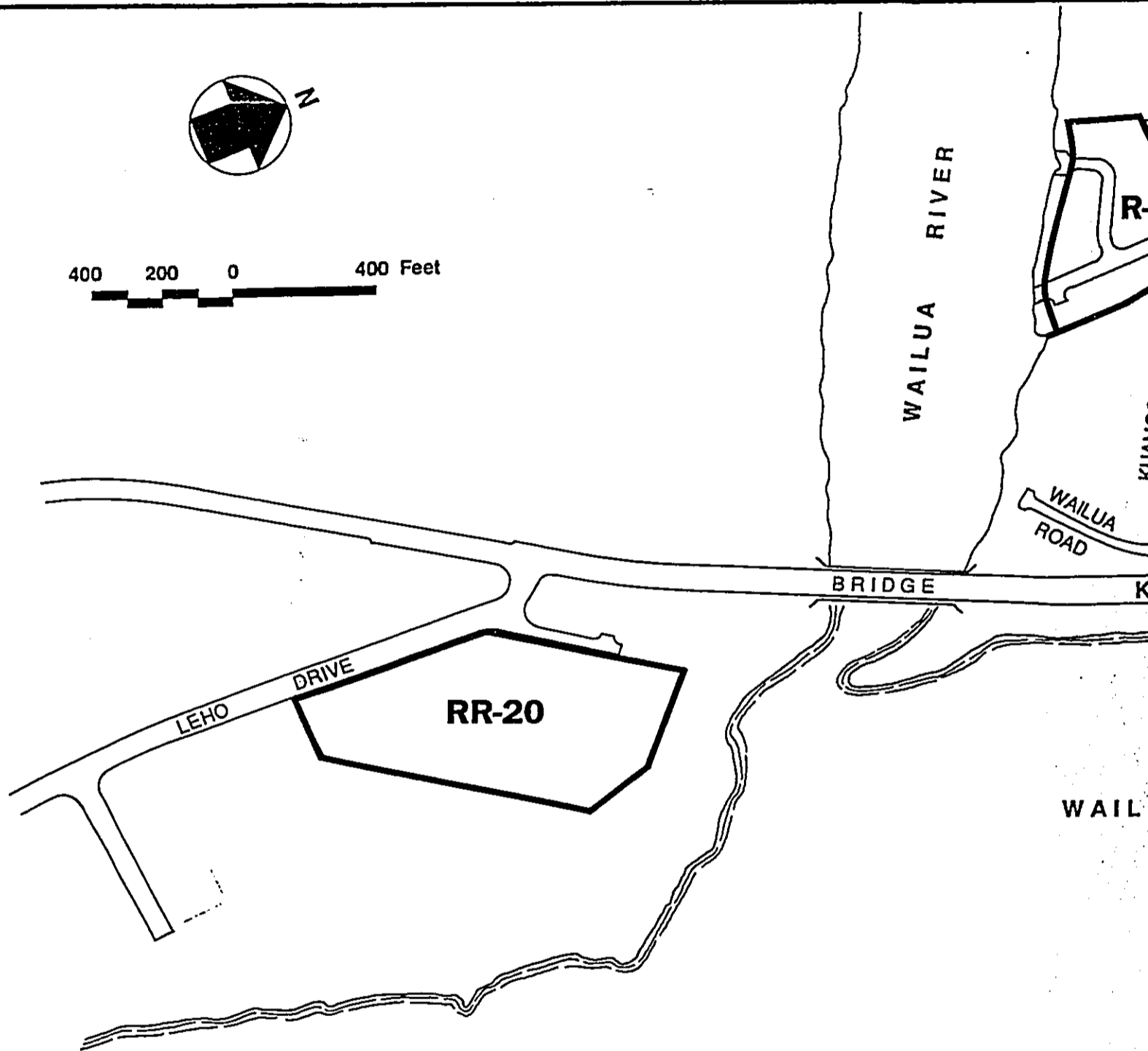
R-1	RESIDENTIAL - 1 UNIT/ACRE
R-4	RESIDENTIAL - 4 UNITS/ACRE
R-10	RESIDENTIAL - 10 UNITS/ACRE
R-20	RESIDENTIAL - 20 UNITS/ACRE
RR-20	RESORT - 20 UNITS/ACRE, 40 HOTEL ROOMS/ACRE
C-G	COMMERCIAL - GENERAL
C-N	COMMERCIAL - NEIGHBORHOOD
O	OPEN
ST-P	SPECIAL TREATMENT DISTRICT - PUBLIC



**FIGURE 3-6C  
KAUAI COUNTY ZONING  
DESIGNATIONS -  
WAIPOULI AREA**



400 200 0 400 Feet



**LEGEND**

- |       |   |
|-------|---|
| R-1   | RESIDENTIAL - 1 UNIT/ACRE                   |
| R-4   | RESIDENTIAL - 4 UNITS/ACRE                  |
| R-10  | RESIDENTIAL - 10 UNITS/ACRE                 |
| R-20  | RESIDENTIAL - 20 UNITS/ACRE                 |
| RR-20 | RESORT - 20 UNITS/ACRE, 40 HOTEL ROOMS/ACRE |
| C-G   | COMMERCIAL - GENERAL                        |
| C-N   | COMMERCIAL - NEIGHBORHOOD                   |
| O     | OPEN  |
| ST-P  | SPECIAL TREATMENT DISTRICT - PUBLIC         |

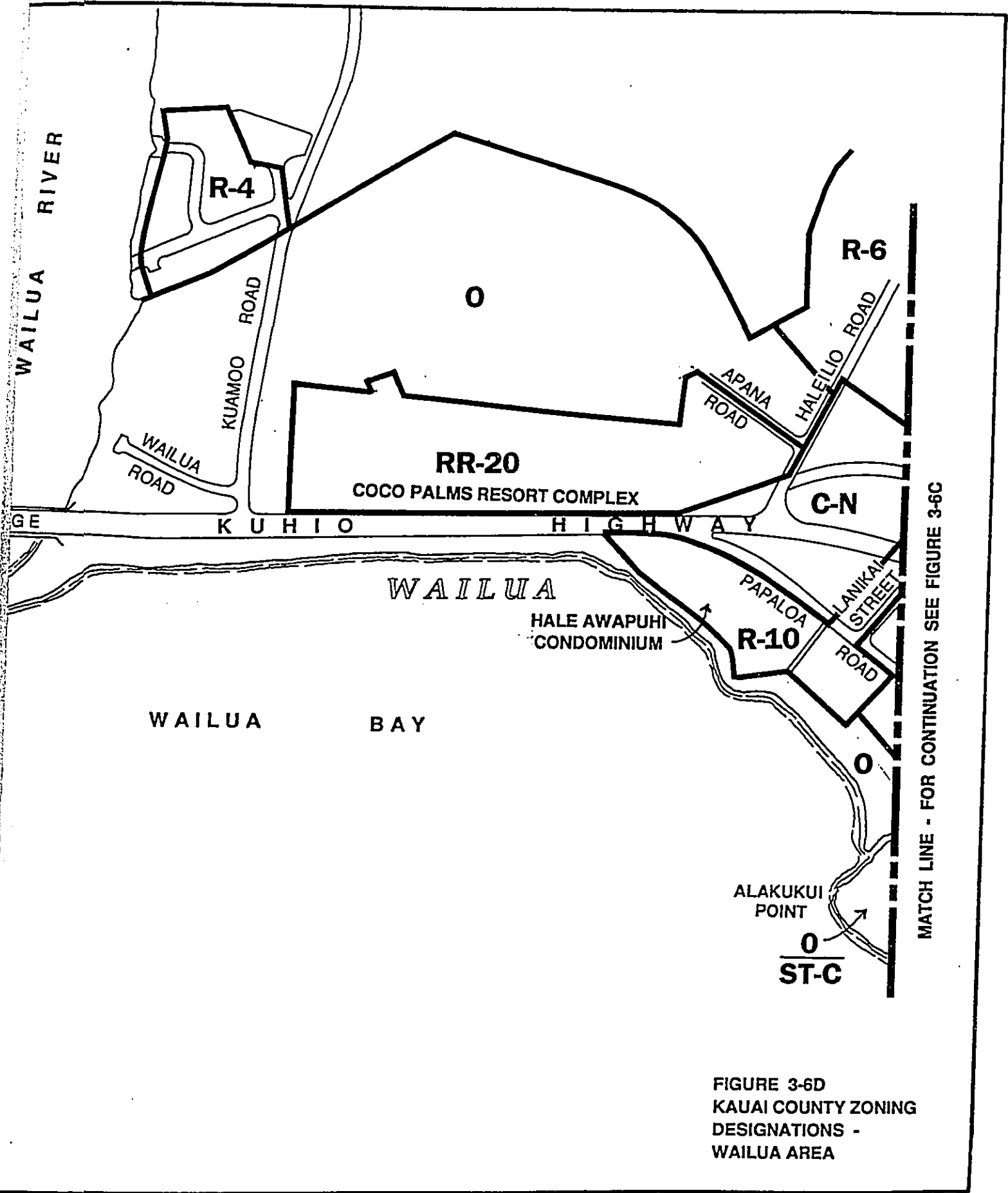
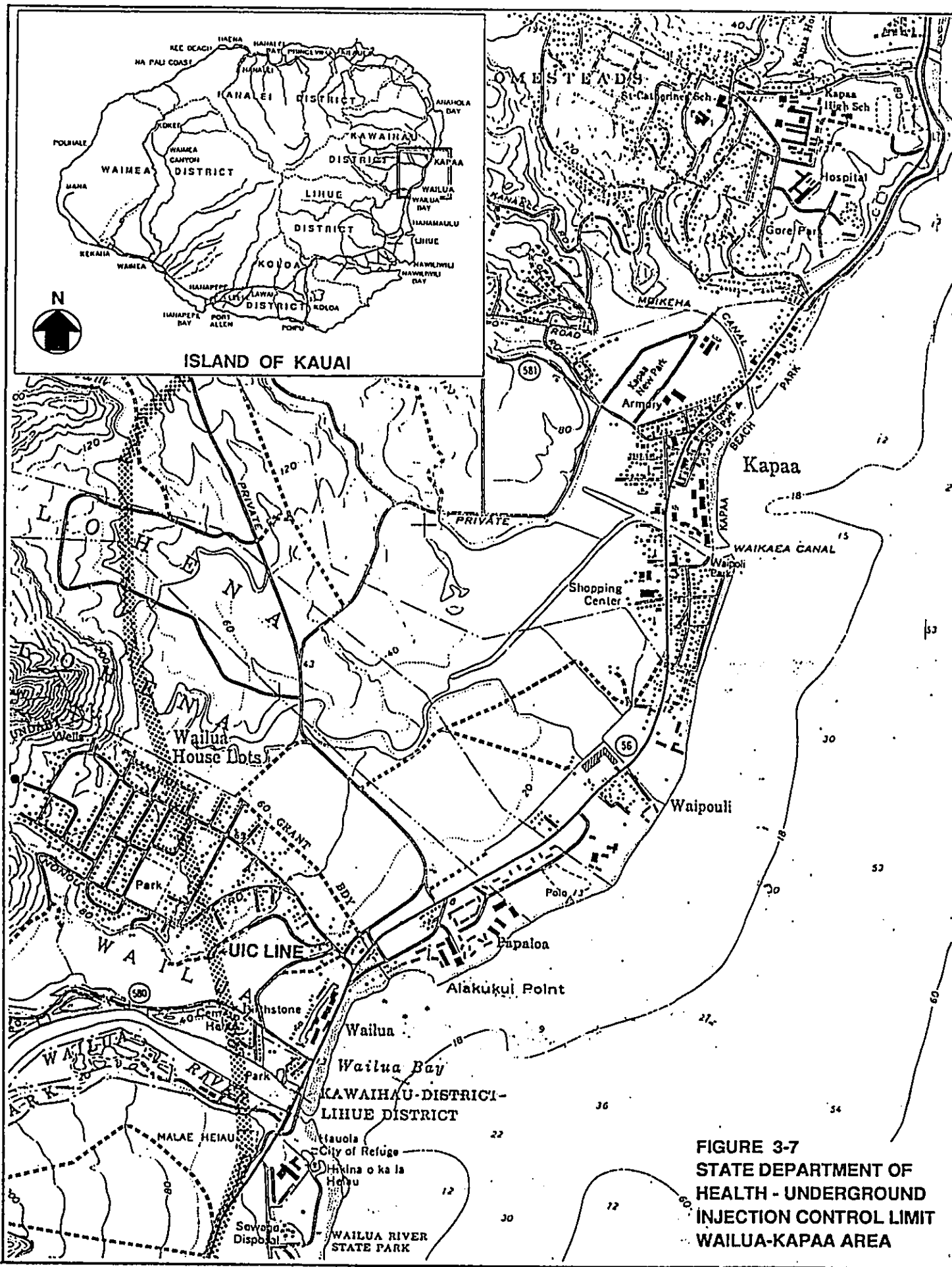


FIGURE 3-6D  
 KAUAI COUNTY ZONING  
 DESIGNATIONS -  
 WAILUA AREA



**FIGURE 3-7**  
**STATE DEPARTMENT OF**  
**HEALTH - UNDERGROUND**  
**INJECTION CONTROL LIMIT**  
**WAILUA-KAPAA AREA**

JOANN A. YUKIMURA  
MAYOR



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DEP. COUNTY ENGINEER  
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MAILING ADDRESS:  
4444 RICE STREET, RM. 230  
LIHUE, HI 96766

June 20, 1990

District Engineer (PODCO-O)  
U. S. Army Corps of Engineers  
Building 230  
Fort Shafter, Hawaii 96858

Subject: General Permit for Utility Lines in Navigable Waters  
Kapaa Sewer Project, Phase I  
Installation of Sewer Force Main Within Moikeha Canal,  
Waikaea Canal, and Uhelekawana Stream  
Wailua-Kapaa, Kauai

This letter is submitted to satisfy the procedures for work authorization associated with the Corps' general permit for utility lines in navigable waters.

The enclosed environmental assessment outlines the scope and method of proposed excavation for the Kapaa Sewer Project, as well as the schedule for commencement and completion of the project.

The County of Kauai has not yet selected a contractor for this project. I will advise your office of this information as it becomes available.

I certify that I am familiar with the information contained in this request, and to the best of my knowledge and belief such information is true, complete and accurate. I have read and understand General Permit PODCO-O 77-1E and hereby accept and agree to comply with its terms and conditions.

Kiyoji Masaki  
Acting County Engineer

Enclosure: Environmental Assessment - Kapaa Sewer Project, Phase I

**CHAPTER FOUR**

**ANTICIPATED ENVIRONMENTAL CONSEQUENCES  
AND PROPOSED MITIGATIVE MEASURES**



## **CHAPTER FOUR**

### **ANTICIPATED ENVIRONMENTAL CONSEQUENCES AND PROPOSED MITIGATIVE MEASURES**

#### **4.1 PHYSICAL IMPACTS**

##### **4.1.1 Trench Excavations**

Trenches will be temporarily excavated within the right-of-way of Kuhio Highway and various County streets in order to permit the installation of new gravity sewer line, new force main, and related connections to existing sewer mains. Potential collapses of trench walls are not anticipated since the contractor will be required to construct trench wall supports to reduce lateral movement of the adjacent ground into the trench excavation. This safeguard will reduce potential accidental injuries among workers, as well as potential damage to ongoing new construction.

The presence of a high water table along the northern half of Kuhio Highway, between Wailua and Kapaa, may occasionally generate intrusions of fresh water inside the excavated trench areas. However, this is not expected to adversely impact construction activities because the contractor will also be responsible for maintaining a dewatering system during the installation, testing and backfilling of the sewer line and force main trenches. Following installation of a given segment of the proposed transmission line, excavated trench areas will be backfilled with, at least, three feet of ground cover.

##### **4.1.2 Site Preparation of Pump Station Sites**

Limited topsoil removal and related grading activity will also occur on the relatively level sites where three new pump stations and related emergency generator buildings will be constructed (Figures 2-1 through 2-4). One exception will be sewer pump station #4 where the emergency generator building (22 x 18-feet) will be situated across Kuhio Highway on an enclosed 3,500 square-foot site adjacent to Kapaa Library and Kuhio Highway. All pump station and generator building sites will be fenced for security and safety purposes.

Such work will not destroy unique or endemic plants. Each of the pump station sites will be located on urbanized sites that have been significantly disturbed by past land uses and development.



#### 4.13 Force Main Installations in Local Streams and Canals

The force main alignment will cross four canal/stream locations: Moikeha Canal, Waikaea Canal, Uhelekawana Stream, and Wailua River (Figures 2-5, 2-6 and 2-7). With the exception of Wailua River, installation of force main in these locations will require instream excavation and backfilling of sandy, clay material and/or beach deposits approximately four feet below the bottom elevation of each canal or stream. The sizes of force mains to be installed at the three streams, requiring in-stream excavation, are as follows:

<u>Location</u>	<u>Size of Force Main</u>
Moikeha Canal	10-inch
Waikaea Canal	12-inch
Uhelekawana Stream	14-inch

The concrete jackets surrounding the force mains will be installed, at least, two feet below the bottom of each canal or stream. During construction, required construction activities will not alter the amount of water flowing in each of the three streams as no stream diversions are required to accomplish the excavation and installation of the sewer main pipe. Following installation of the pipe and related backfilling, the force main lines will not obstruct stream water flows or the movement of fish and other biota within the stream environments.

Stream excavation and backfilling activities could potentially generate significant sedimentation without the performance of proper mitigation efforts. For this reason, the County of Kauai is committed to requiring its contractor to implement the following construction efforts that will clearly reduce the significance of all in-stream excavation and backfilling activities.

1. Excavation work within the streams will be performed by the contractor only during low-flow stream and tidal conditions to reduce potential sedimentation within the stream/canals and downstream inshore waters. Excavation within the streams will be carried out only between the months of May through September.
2. Excavated soil and/or rock material will be stockpiled by excavation equipment adjacent to the stream or canal areas, but not within the stream prior to backfilling of excavated material.
3. Stockpiled soil and/or rock material will be temporarily covered prior to backfilling to ensure that stockpiled material does not "wash-out or run off" into the streams prior to the completion of backfilling activities.
4. No vehicles carrying or supporting excavation equipment will be permitted within the stream or canals during the course of the project.

The preceding mitigation measures will be incorporated into the design notes for the project. The contractor's performance of these measures will be further required in the construction contract documents. As a result, the impact of in-stream excavation activities will be the generation of short-term turbid flows and sedimentation downstream of Kuhio Highway.

## **4.2 BIOLOGICAL AND WATER QUALITY IMPACTS**

### **4.2.1 Temporary Relocation of Stream Biota During In-Stream Excavation**

Because of the precautions that will be exercised by the contractor during stream excavations and subsequent backfilling operations, the impact of stream excavation and backfilling will be limited to intermittent, turbid stream discharges (makai of Kuhio Highway) for approximately one week at each stream crossing. This anticipated construction period assumes the presence of low-flow stream and tidal conditions which would be required for work performance.

Intermittent discharges of turbid waters will force juvenile fish to temporarily relocate in the inshore waters where they will forage for food such as samoan crab and filamentous algae. This is not an uncommon occurrence for these fish since these streams are already influenced by periodic, turbid flows and downstream sedimentation resulting from heavier rainfall in the Kapaa watershed.

## **4.3 CULTURAL IMPACTS**

### **4.3.1 Vehicular Traffic Impacts**

Overlapping construction activities for the Kapaa Sewer Project and unrelated State highway improvements will cause additional traffic delays along Kuhio Highway between February, 1991 and February, 1993. However, as stated in section 3.4.3, the construction of State highway improvements along Kuhio Highway, between Kapule Highway and Haleilio Road intersections, is expected to begin roughly six months prior to the beginning of the Kapaa Sewer Project. As a result, additional traffic delays along the Kuhio Highway corridor will occur over a 2.5 year period.

The presence of construction activity along the Kuhio Highway over the 30-month period will cause additional traffic delays along the Highway throughout most of the daytime hours. While no detailed traffic impact analysis was conducted for this environmental assessment, it is expected that the level of service along Kuhio Highway will reduce to level of service F where this condition has not already occurred.

Recognizing the potential impact of cumulative construction activities along Kuhio Highway, the County of Kauai intends to establish a County-sponsored carpooling and ride-share program, a public education program, and a County bus service. Further, the County is already meeting with local business interests to solicit cooperation, identify related strategies, increase public understanding. Collectively, these measures will help reduce the amount of cars travelling along the corridor, and, thereby, help mitigate the reduced level of service that will occur along Kuhio Highway.

Traffic control efforts, proposed for the Kapaa Sewer Project, include a proposed detour for northbound traffic along Kealoha and Kalaloku Roads in Kapaa. This and other traffic control activities will help improve northbound peak afternoon flows.

Despite the anticipated benefits from planned mitigative efforts of the County of Kauai, every effort should be taken to reduce the length of traffic delays along the Kuhio Highway corridor. Recommended mitigation measures include the implementation of one or more of the following measures:

1. The construction work day should be between 8:30 a.m. and 3 p.m. in order to facilitate peak morning and afternoon traffic flows.
2. When feasible, nighttime work should be considered along areas which are not adjacent to residential areas, e.g. Coconut Plantation and Marketplace.
3. Designated "alternate road routes" should be established in the northern Kapaa Town along Kaapuni Road, Olohena Road, and Kuamoo Road to help reduce delays during the morning and afternoon peak hours.
4. The County Transportation Office should establish a voluntary program that would encourage public agencies and private employers to implement staggered work hours for those members of the local labor force which commute to and from work via Kuhio Highway.

#### **4.3.2 Commercial Retail Sales Impacts**

Commercial retail sales in Waipouli and Kapaa will be affected by the declining level of service and reduced on-street parking along the Kuhio Highway corridor. This potential impact pertains more to retail services, retail stores, and restaurants which would likely experience a reduction in discretionary spending from regular customers and visitors. The unavailability of onstreet parking and the length of wait for traffic movement along the Highway will discourage resident consumers from entering stores unless the desired consumer purchase is immediately required, e.g. grocery shopping. Those businesses already experiencing difficulties in financial profitability may be adversely affected by increased traffic delays and reduced vehicular park if local entrepreneurs do not make operational adjustments that respond to changing shopping patterns.

The discouragement of resident and visitor expenditures along the Kuhio Highway corridor is not expected to significantly impact the total volume of retail sales and income on Kauai. Rather, residents will tend to shop more during the nighttime hours when less traffic will be present along Kuhio Highway. Visitors that might otherwise be attracted to local shopping and dining opportunities along Kuhio Highway can be expected to carry out more of their shopping and dining within designated shopping areas within hotel and resort facilities where their overnight accommodations are located.

A few commercial services along Kuhio Highway, between the Keaka and Kalaloku Road intersections, will be particularly affected by the detour of northbound vehicular traffic to Kealoha Road (one block makai of Kuhio Highway). Otherwise, this area is primarily dominated by residential land uses.

## REFERENCES

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**APPENDIX A**

**GOVERNMENTAL PERMIT APPLICATIONS**

COUNTY OF KAUAI  
PLANNING DEPARTMENT

- ( ) ZONING PERMIT APPLICATION
- ( ) USE PERMIT APPLICATION
- ( ) PROJECT DEVELOPMENT USE PERMIT APPLICATION
- ( ) VARIANCE PERMIT APPLICATION
- ( ) SPECIAL PERMIT APPLICATION
- (X) SMA PERMIT APPLICATION

APPLICANT County of Kauai, Dept. of Public Works

ADDRESS 4444 Rice Street  
Lihue, Kauai, Hawaii 96766

PHONE NO. (work) 245-4751 (home) \_\_\_\_\_

Tax Map Key 4-3, 4-4, 4-5, 4-6 Lot No. \_\_\_\_\_ Lot Size \_\_\_\_\_ Zoning \_\_\_\_\_

APPLICANT IS: (check one)

- A. Owner of Property \_\_\_\_\_ (Holder of at least 75% of the equitable and legal title.)
- B. Lessee of Property \_\_\_\_\_ \*Number of Years Leased \_\_\_\_\_ From \_\_\_\_\_ to \_\_\_\_\_
- C. Authorized Agent  Attach Letter of Authorization.

NOTE: \*Lessee must have an unexpired and recorded lease of five (5) years or more from date of filing this application. Owner(s) must sign below if lease is less than five (5) years remaining and/or unrecorded.

DESCRIPTION OF PROPOSED USE, IMPROVEMENT, ALTERATION, AND/OR CONSTRUCTION: (specify exact use, number of units, etc.) Construction and renovation of sewer main and force main from North Kapaa town to Lehu Drive, and construction of three sewer pump stations. See attached Environmental Assessment.

**FOR VARIANCE OR USE PERMITS ONLY**

Conditions justifying Variance or Use Permit application: (use additional sheets as required) See attached Environmental Assessment, Kapaa Sewer Project, Phase I

The owner and/or his authorized representative for the purposes of said permit shall, prior to commencing erection, construction, installation or placement of the foundations and/or footings of the improvements allowed hereunder, and after compliance with the foregoing condition, notify the Planning Department no later than 5 working days to commencement of such work, in order that the Planning Department might inspect and certify the applicable and imposed setbacks and other zoning requirements.

The construction, work, use, or activity approved in this permit shall be subject to inspection by the Planning Inspector or authorized personnel of the Planning Department, County of Kauai. The applicant is advised that inspection will occur prior to or during construction and use to ascertain compliance with the provisions of Ordinance No. 164, as amended, (Comprehensive Zoning Ordinance, County of Kauai, and/or other laws which are enforced by the Planning Department.

Signature \_\_\_\_\_

Owner/Applicant  
Kiyoji Masaki, Acting County Engineer  
Dept. of Public Works  
County of Kauai

For Planning Department Use Only	
Zoning Permit No.	_____
Use Permit No.	_____
Variance Permit No.	_____
Special Permit No.	_____
SMA Permit No.	_____
Zoning Permit Class	_____
Date Received	_____ By _____
Date Approved	_____ By _____
Plans By	_____
Permit Fee \$	_____ Date _____

Existing  
Land  
Use

State of Hawaii  
COMMISSION ON WATER RESOURCE MANAGEMENT  
Department of Land and Natural Resources  
Division of Water Resource Management

APPLICATION FOR  
STREAM CHANNEL ALTERATION PERMIT

INSTRUCTIONS: Please print or type and send completed application with attachments to the Division of Water and Land Development, P.O. Box 373, Honolulu, Hawaii 96809. Application must be accompanied by a non-refundable filing fee of \$25.00 payable to the Department of Land and Natural Resources. (Filing fee waived for government agencies.) If necessary, phone 546-7563, Hydrology/Geology Section for assistance.

1. APPLICANT

County of Kauai  
Firm Name Dept. of Public Works Contact Person Harry Funamura  
Address 4444 Rice St., Lihue, Kauai, Hawaii 96766 Phone 245-4751  
Signature \_\_\_\_\_ Date June 20, 1990

2. LANDOWNER

State of Hawaii  
Firm Name Dept. of Land & Natural Resources Contact Person --  
Address 1151 Punchbowl St., Honolulu, HI 96813 Phone 548-6550  
Signature \_\_\_\_\_ Date \_\_\_\_\_

3. CONTRACTOR

not yet selected Phone \_\_\_\_\_  
Address \_\_\_\_\_  
Contractor License No. \_\_\_\_\_

4. STREAM NAME AND LOCATION (Attach USGS map, (scale 1"=2000'), and property tax map showing stream location and access to site of proposed channel alteration referenced to established property boundaries.):

Moikeha Canal (Kapaa, Kauai), Waikaea Canal (Kapaa, Kauai), Uhelekawana  
Stream (Waipouli, Kauai) See attached Environmental Assessment, Fgs 2-5 to 2-8  
State Land Use District urban Tax Map Key No. 4-3, 4-4, 4-5, 4-6 Island Kauai

5. DESCRIPTION OF PROPOSED CHANNEL ALTERATION AND RELATED FACILITIES (attach plans, specifications, and diagrams as appropriate):

Excavation of stream beds 4 feet below stream and canal bottoms. Force  
mains to be installed at least two feet below stream and canal bottoms.  
See enclosed Environmental Assessment.

Estimated Starting Date February, 1991 Estimated Completion Date March, 1993

6. STATEMENT OF PROJECT PURPOSE AND REASON FOR ALTERATION:

To centralize wastewater flows in the Wailua-Kapaa area in order to improve  
overall waste management practices and conserve the water quality and  
resources of the inshore waters and local streams.

7. IDENTIFY AND BRIEFLY DESCRIBE ANY POTENTIAL ENVIRONMENTAL IMPACTS RELATED TO THE PROPOSED ALTERATION (i.e. instream standards):

See Chapter Four of the Environmental Assessment.

For Official Use Only:

Field checked by \_\_\_\_\_ Latitude \_\_\_\_\_ Hydrologic Unit \_\_\_\_\_  
Date \_\_\_\_\_ Longitude \_\_\_\_\_ SCAP No. \_\_\_\_\_