JAMES "KIMO" APANA
Mayor

JOHN E. MIN
Director

CLAYTON I. YOSHIDA
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

February 5, 1999

Mr. Jeyan Thirugnanam, Acting Director
Office of Environmental Quality Control (OEQC)
State Office Tower, Room 702
235 South Beretania Street
Honolulu, Hawaii 96813-2437

Dear Mr. Thirugnanam:

RE: Final Environmental Assessment (EA) for the Waiko Baseyard Subdivision at TMK: 3-5-02:Por. 01, Waikapu, Maui, Hawaii (EA 980010)

The Maui County Planning Department (Department), as the accepting authority, is transmitting for publication in the upcoming OEQC Bulletin the Final Environmental Assessment for the Waiko Baseyard Subdivision in which a Finding of No Significant Impact (FONSI) has been determined. The applicant for the project is Wailuku Agribusiness Company, Inc.

A description of the proposed action is attached to the OEQC Bulletin Publication Form and will also be sent by the applicant by electronic mail (E-Mail) to OEQC in a WordPerfect format. In addition, the Department has enclosed four (4) copies of the Final Environmental Assessment Report (prepared by the applicant).

Thank you for your cooperation. If additional clarification is required, please contact Ms. Ann Cua, Staff Planner, of this office at 243-7735.

Very truly yours,

JOHN E. MIN
Director of Planning

250 SOUTH HIGH STREET, WAILUKU, MAUI, HAWAII 96793
PLANNING DIVISION (808) 243-7735; ZONING DIVISION (808) 243-7253; FACSIMILE (808) 243-7634

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JEM:ATC:cmb
Enclosures
c: Glenn Tadaki, Munekiyo, Arakawa & Hiraga, Inc.
Avery Chumbley, Wailuku Agribusiness Company, Inc.
Clayton Yoshida, Deputy Director of Planning
Ann Cua, Staff Planner
TMK Project File (w/Enclosures)
General File
(s:\all\ann\waikobfo.nsi)

1999-02-23-MA-FEA-

Final Environmental Assessment

WAIKO BASEYARD SUBDIVISION

Prepared for:

WAILUKU AGRIBUSINESS CO., INC.

February 1999

MUNEKIYO, ARAKAWA & HIRAGA, INC.

Final
Environmental Assessment

WAIKO BASEYARD SUBDIVISION

Prepared for:

WAILUKU AGRIBUSINESS CO., INC.

February 1999

MUNEKIYO, ARAKAWA & HIRAGA, INC.

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Preface

The applicant, Wailuku Agribusiness Company, Inc., is proposing to develop a light industrial subdivision in Waikapu, Maui, Hawaii. Identified by TMK (2) 3-5-02: por. 1, the 14.4-acre project will consist of approximately 19 industrial lots ranging in size from approximately 13,864 square feet to 2.8 acres.

The subject property is presently designated "Agriculture" on the Wailuku-Kahului Community Plan. An application for a Community Plan Amendment will be filed to redesignate the property to "Light Industrial". Accordingly, pursuant to Chapter 343, Hawaii Revised Statues, and Chapter 200 of Title 11, Department of Health Administrative Rules, Environmental Impact Statement Rules, this Environmental Assessment has been prepared to document the project's technical characteristics, environmental impacts and alternatives, and advances findings and conclusions relative to the significance of the project.

Chapter I

Project Overview

I. PROJECT OVERVIEW

A. PROJECT LOCATION, EXISTING USE, AND LAND OWNERSHIP

The applicant, Wailuku Agribusiness Company, Inc., (WACI) is proposing to develop a light industrial subdivision consisting of approximately 19 lots in Waikapu, Maui, Hawaii. See Figure 1. The 14.4-acre project site is located approximately 0.5 mile east of Waikapu Village and adjoins Waiko Road, a two-lane County roadway with a posted speed limit of twenty (20) miles per hour (mph). See Figure 2. The project site is identified by TMK (2) 3-5-02: por. 1 and includes the offices of WACI and C. Brewer Homes, Inc. (CBH) as well as WACI's storage, dormitory, and maintenance buildings and Brewer Environmental Industries (BEI) administrative, commercial, and warehouse facility. The remainder of the site is undeveloped and is predominantly vegetated with introduced grass species, as well as lowlying weeds and shrubs, kiawe, and koa haole.

The project site is bordered by a cane-haul road and the Maui Scrap Metal recycling facility to the east, Waiko Road and sugar cane fields to the south, and undeveloped lands to the north and west. Access to the project site is currently provided via an adjoining cane-haul road and from Honoapiilani and Kuihelani Highways via Waiko Road.

WACI is the fee simple owner of the underlying property. The project site is currently designated "Agricultural" by the State Land Use Commission and Maui County zoning and "Agriculture" by the Wailuku-Kahului Community Plan.

B. REGULATORY PROCESSING

As previously indicated, the proposed project will involve the development of an approximately 19-lot light industrial subdivision on land which is

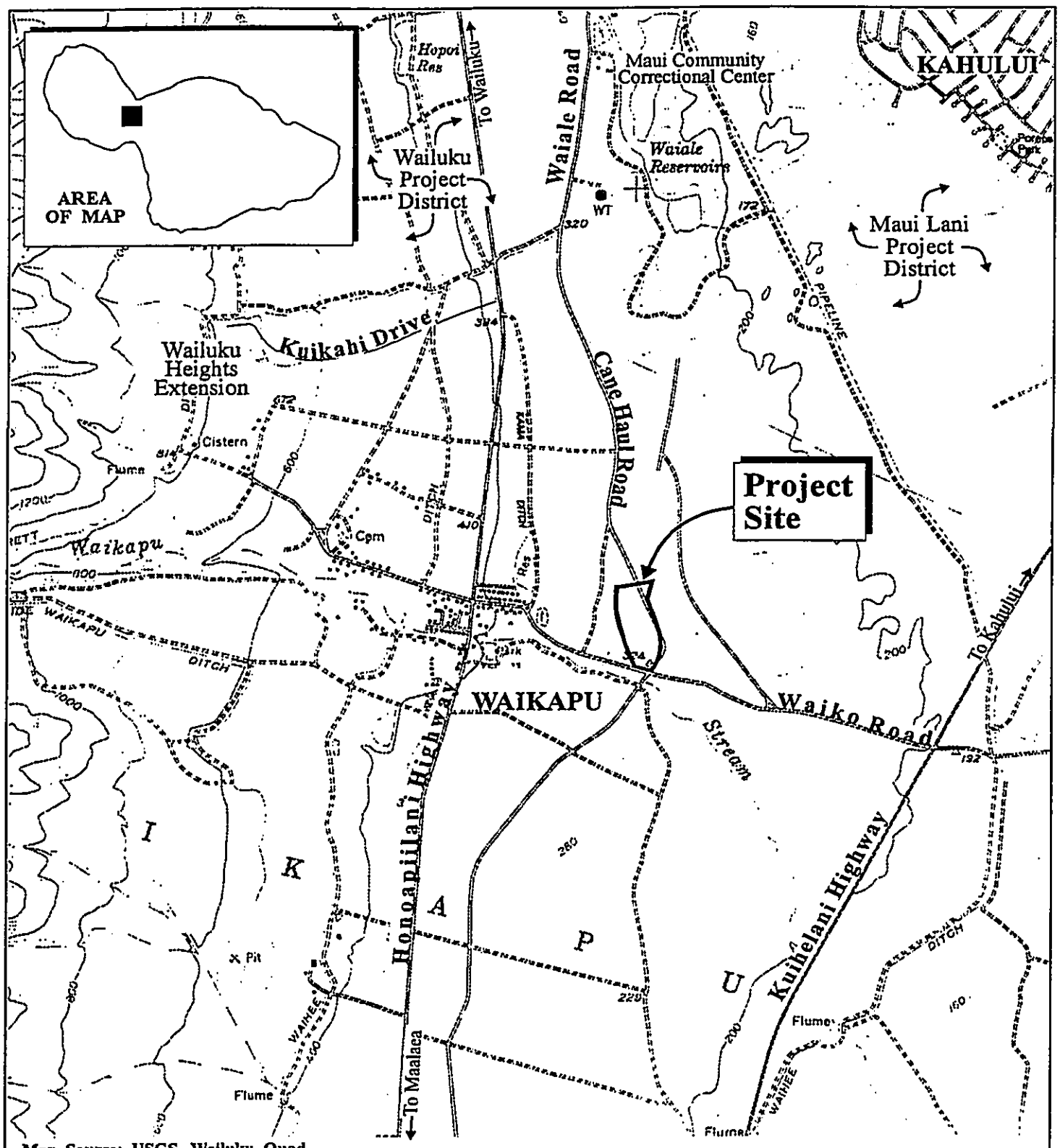


Figure 1 Waiko Baseyard Subdivision

Regional Location Map

MUNEKIYO, ARAKAWA & HIRAGA, INC.

0 1000 2000 4000 Feet

Prepared for: Wailuku Agribusiness Company, Inc.

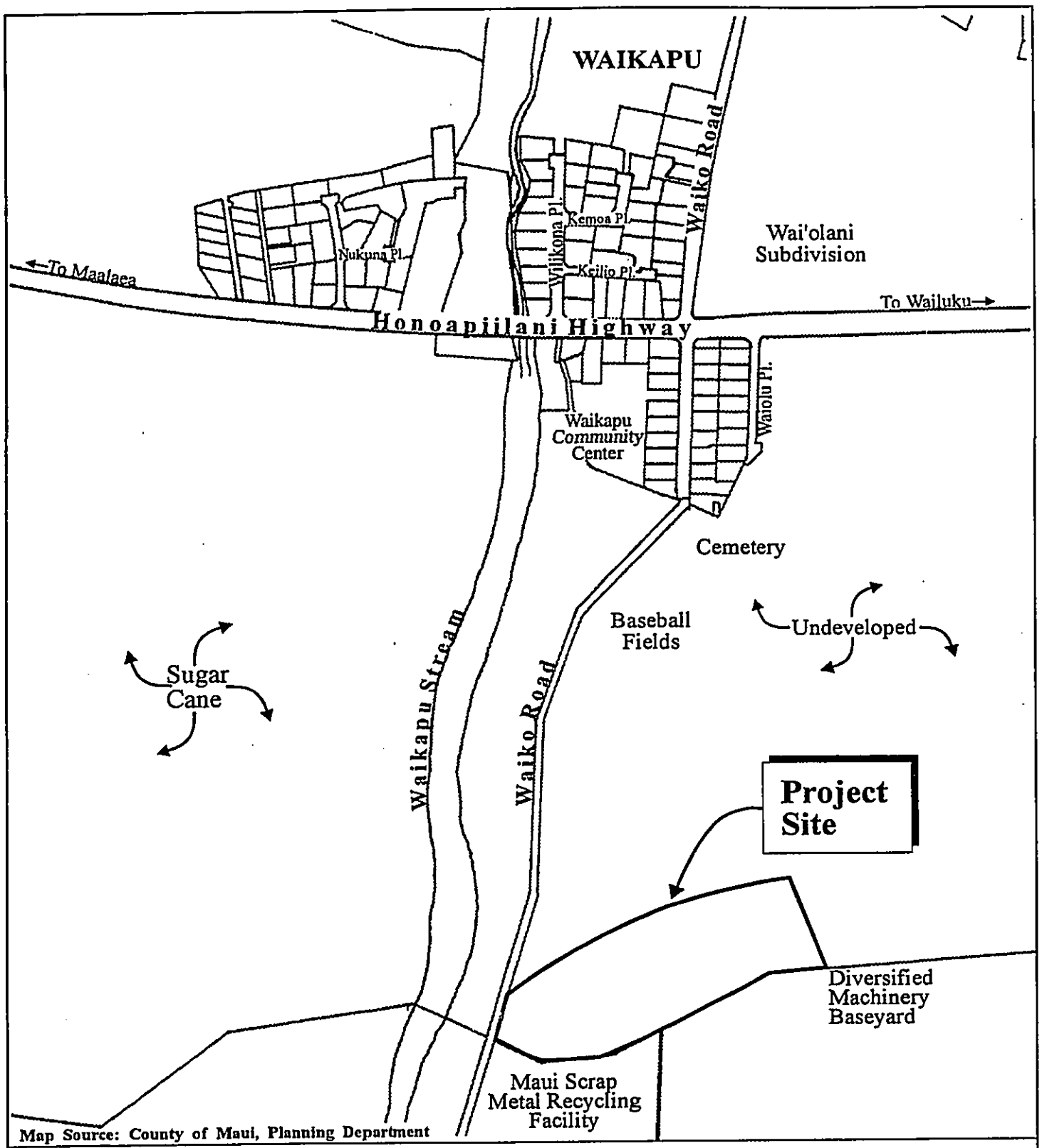


Figure 2 Waiko Baseyard Subdivision
Project Location Map

MUNEKIYO, ARAKAWA & HIRAGA, INC.

0 250 500 1000 Feet

Prepared for: Wailuku Agribusiness Company, Inc.

presently designated "Agricultural" by the State Land Use Commission and Maui County Zoning and "Agriculture" by the Wailuku-Kahului Community Plan.

On the basis of its present State land use and Community Plan designations, the development of the proposed light industrial subdivision will require a District Boundary Amendment, as well as a Community Plan Amendment.

Accordingly, a request to concurrently amend the existing State land use classification from "Agricultural" to "Urban", as well as the present Wailuku-Kahului Community Plan designation from "Agriculture" to "Light Industrial", is being sought in order to establish appropriate land use designations for the subject property and implement the development of the proposed project. In addition, a request for a Change in Zoning to the "M-1, Light Industrial District" is being sought to establish the appropriate County zoning for the proposed development once the State land use District Boundary Amendment and Community Plan Amendment have been approved.

C. ***REASONS JUSTIFYING THE REQUEST***

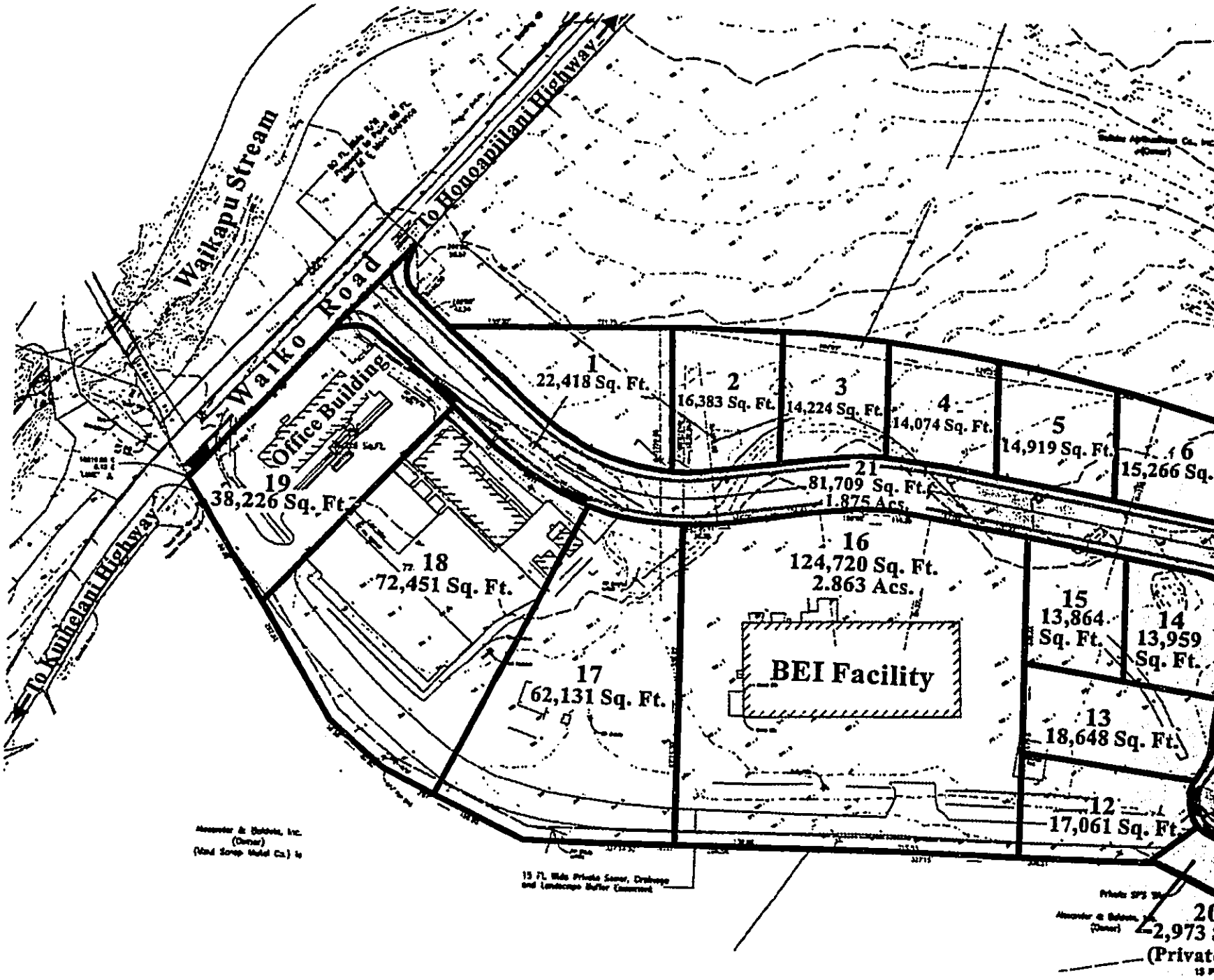
The project site is located within a region of existing and continuing urban development and includes the community of Waikapu, as well as Kehalani (f.k.a., Wailuku Project District) and the Maui Lani Project District. Residential development within the vicinity of the project site is characterized by the village of Waikapu, approximately 0.5 mile to the west of the project site. Kehalani is currently under development and is located beyond the project area to the northwest. The Maui Lani Project District is also being developed and lies beyond the project area to the north and east. In addition to BEI's onsite operations, existing industrial-

related uses, such as the Maui Scrap Metal recycling facility, as well as the Diversified Machinery, Inc., Maui Trucking Inc., and the Fong Construction Company, Ltd. baseyards are situated within close proximity of the project site. In this regard, the proposed project is intended to provide an area for light industrial activities in the context of existing and future urban development and is in consonance with the existing and developing urbanized lands within proximity of the project site.

The proposed development will provide short- and long-term benefits for the Island's economy. On a short-term basis, the proposed project will provide construction employment and support construction-related services and suppliers. Upon completion, businesses located in the light industrial subdivision will contribute to the long-term support of the regional economy through their contributions of property taxes, payment of employee salaries and wages, and purchases of goods and services from local merchants and service providers. In addition, purchases relating to facilities maintenance will similarly benefit the local economy.

D. ***PROPOSED DEVELOPMENT***

The proposed project will involve the development of a light industrial subdivision and associated infrastructure improvements which will provide an appropriate location for true light industrial activities such as baseyard, repair, service, storage, and maintenance operations and facilities. The proposed subdivision will consist of approximately 19 developable lots which will range in size from approximately 13,864 square feet to 2.8-acres. In addition, the subdivision will include two (2) roadway lots, as well as a lot for a private sewage pump station (SPS). See Figure 3. Subdivision improvements will be developed in accordance with applicable regulatory design and construction standards.

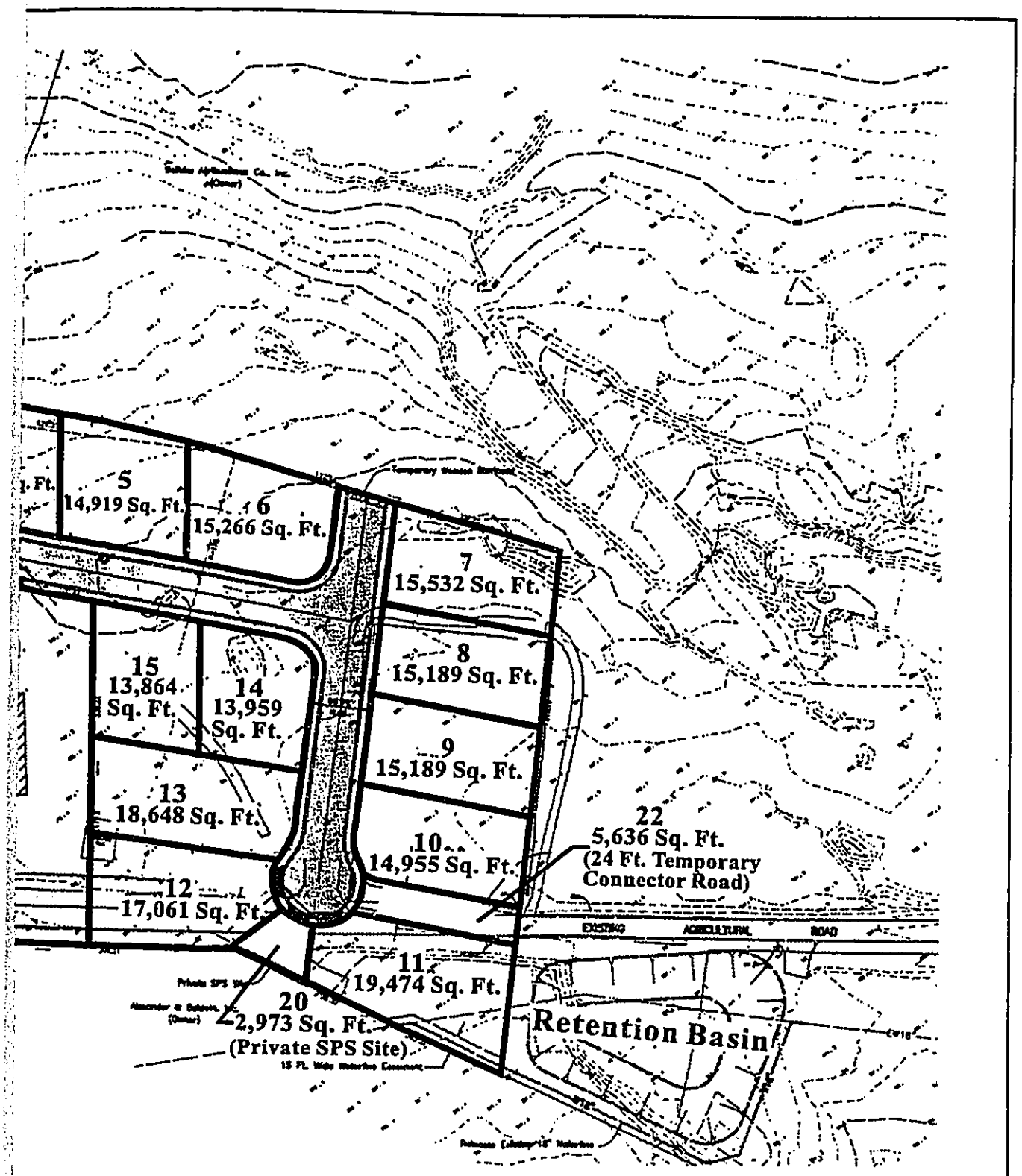


Source: Warren S. Unemori Engineering, Inc.

Figure 3

Waiko Baseyard Subdivisio
Conceptual Site Plan

Prepared for: Wailuku Agribusiness Company, Inc.



eyard Subdivision

ptual Site Plan

MUNEKIYO, ARAKAWA & HIRAGA, INC.

NOT TO SCALE

Cost estimates for the proposed improvements will be established in connection with the development of final detailed plans and specifications. Construction will commence upon the receipt of all applicable permits and approvals.

Since the proposed project involves an amendment to a Community Plan independent of the County's Ten Year Update process, an Environmental Assessment has been prepared pursuant to the requirements of Chapter 343, HRS, and Title 11, Chapter 200, Administrative Rules of the State Department of Health.

Chapter II

Description of the Existing Environment

II. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. PHYSICAL ENVIRONMENT

1. Surrounding Land Uses

With a land area of approximately 727 square miles, the island of Maui is the second largest of the Hawaiian Islands. Maui is flanked by the islands of Molokai to the northwest, Lanai to the west, Kahoolawe to the southwest, and the "Big Island" of Hawaii to the southeast.

Situated along the isthmus separating Mount Haleakala from the West Maui Mountains, the town of Wailuku serves as the County seat of government. The town of Kahului, approximately two (2) miles east of Wailuku contains the State's second busiest airport and harbor and has emerged as the Island's center of commerce.

The project site is bordered by a cane-haul road and the Maui Scrap Metal recycling facility to the east, Waiko Road and cultivated sugar cane fields to the south, and undeveloped lands to the north and west.

Situated along Waiko Road, land uses within proximity of the project site include the Diversified Machinery, Maui Trucking, and Fong Construction baseyards, as well as the County's green waste disposal facility, and a cattle feedlot.

Located beyond the project area to the northwest, the first phase of Kehalani is currently being developed. When completed, the 545-acre development will include a total of 2,400 single- and multi-family housing units, a school site and community center, parks

and open space areas, as well as commercial shopping facilities.

The Maui Lani Project District is also being developed and is located beyond the project area to the north and east. Upon build-out, the 1,012 acre development will include a total of 3,300 single- and multi-family housing units, school sites, open space and recreational areas, including a golf course, and commercial shopping facilities.

2. ***Climate***

Hawaii's tropical location accounts for generally uniform weather conditions throughout the year. Climatic conditions on Maui are characterized by mild and consistent year-round temperatures, moderate humidity, and steady northeasterly tradewinds. Variations in the Island's weather are attributable to regional topographical and climatic conditions.

Based on data collected by the National Weather Services' meteorological facility at the Kahului Airport, average monthly temperatures for 1993 ranged from nearly 70 degrees in February, to about 80 degrees in August. The average annual temperature measured approximately 76 degrees. In addition, rainfall for 1993 ranged from a low of 0.9 inch in June, to a high of 2.19 inches in January. Total annual precipitation measured 12.69 inches (County of Maui/MEDB, Inc., December 1994).

The Island of Maui lies within the path of the northeast tradewinds which predominate throughout most of the year. Although winds may occasionally gust, the tradewinds typically range from ten (10) to twenty (20) mph during afternoons, with lighter wind conditions

prevailing during the morning and evening hours. The diurnal heating and cooling of the land mass gives rise to onshore sea breezes during the day and offshore land breezes at night.

Between the months of October to April, storm-generated winds from the south spawn "Kona" storms which are often characterized by high winds and heavy rainfall. In the absence of the tradewinds and Kona storms, wind conditions may become light and variable.

3. *Topography and Soil Characteristics*

The project site is situated approximately 0.5 mile to the east of Waikapu at the base of the West Maui Mountains. Elevations within the project site range from about 318 feet mean sea level (msl) to approximately 303 feet msl. The project site is characterized by level to gently sloping terrain with a slope of approximately 2 percent.

Underlying the project site and surrounding area are soils of the Pulehu-Ewa-Jaucus association. See Figure 4 . Found on level to moderately sloping terrain, this association consists of deep, well-drained soils that have a moderately fine textured to course textured subsoil.

Jaucas Sand (Jac), Pulehu clay loam (PsA), and Puuone sand (PZUE) define the soil types related to the project site. See Figure 5. The Jaucus series consists of excessively drained soils that occur as narrow strips on coastal plains. These soils are developed in wind- and water-deposited sand from coral and seashells. With slopes ranging from 0 to 15 percent, Jaucas sand is characterized by rapid permeability and slow to very slow runoff.

LEGEND

① Pulehu-Ewa-Jaucas association

② Waiakoa-Keahua-Molokai association

③ Honolua-Olelo association

④ Rock land-Rough mountainous land association

⑤ Puu Pa-Kula-Pane association

⑥ Hydrandepts-Tropaquods association

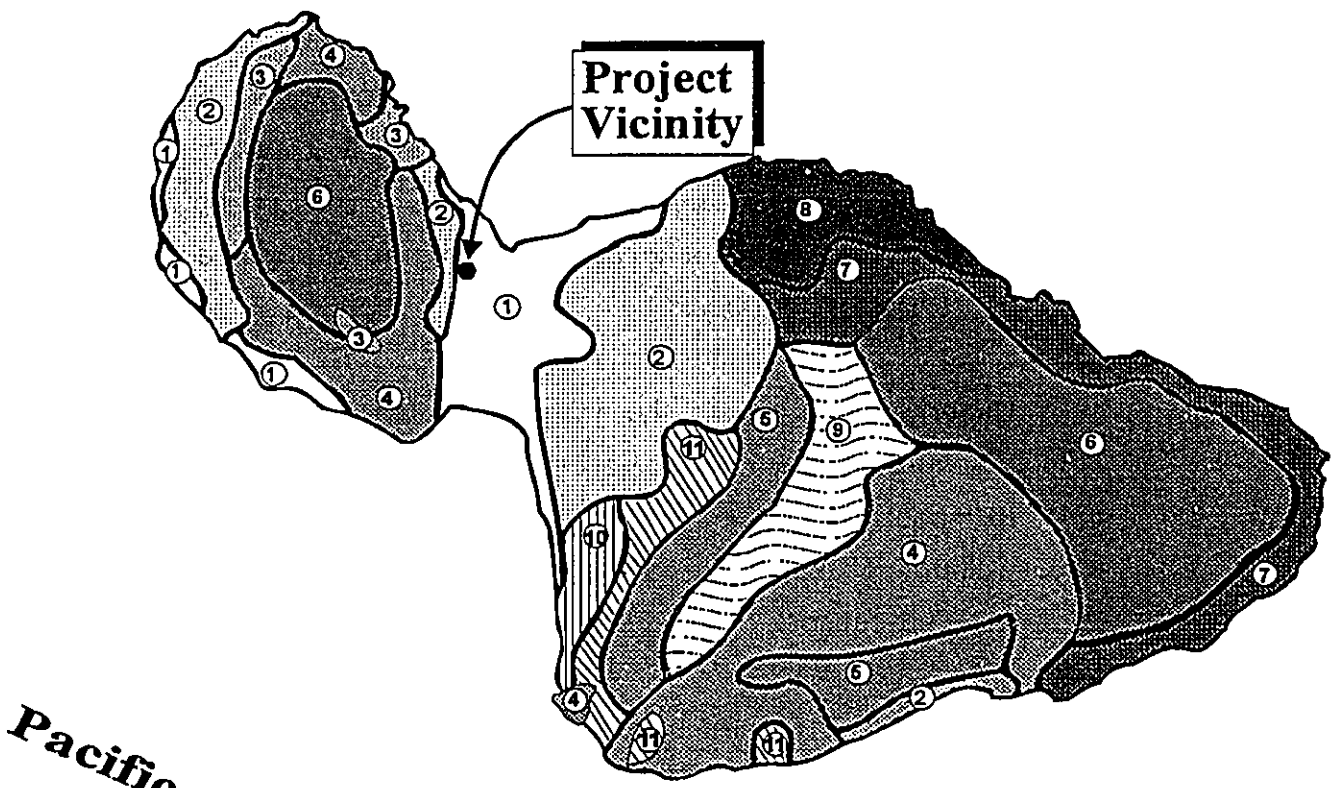
⑦ Hana-Makaalae-Kailua association

⑧ Pauwela-Haiku association

⑨ Laumaia-Kaipoipoi-Olinda association

⑩ Keawakapu-Makena association

⑪ Kamaole-Oanapuka association



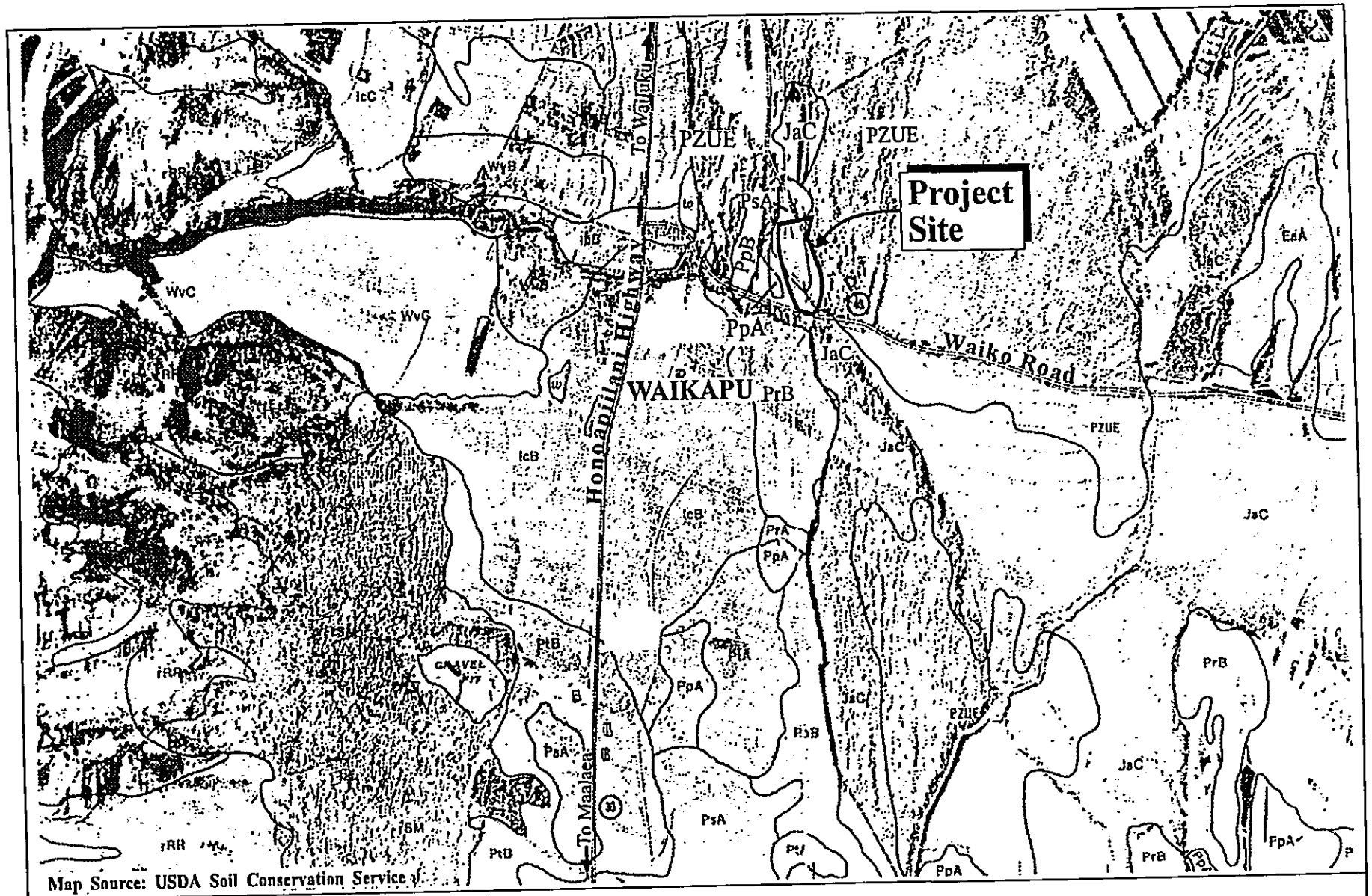
Map Source: USDA Soil Conservation Service

Figure 4 Waiko Baseyard Subdivision
Soil Association Map

MUNEKIYO, ARAKAWA & HIRAGA, INC.

Prepared for: Wailuku Agribusiness Company, Inc.

NOT TO SCALE



Map Source: USDA Soil Conservation Service

Figure 5

Waiko Baseyard Subdivision

Soil Classification Map

1000 0 2000 4000 Feet

MUNEKIYO, ARAKAWA & HIRAGA, INC.

Prepared for: Wailuku Agribusiness Company, Inc.

Hazards from water erosion is slight, although wind erosion may be severe where vegetation has been removed. The Pulehu series consists of well-drained soils in basins, as well as alluvial fans and stream terraces. These soils are developed in alluvium washed from basic igneous rock. Typified by slopes ranging from 0 to 3 percent, Pulehu clay loam is characterized by moderate permeability, slow runoff, and no more than slight erosion hazards. The Puuone series consists of excessively drained soils that have been primarily derived from coral and sea shells. Puuone sand is typified by slopes ranging from 7 to 30 percent, as well as slow runoff, rapid permeability and moderate to severe wind erosion hazards. The Jaucus series is basically associated with recreational areas, urban development, pastures, sugar cane, and truck crops. The Pulehu series is typically utilized for pastures and homesites, as well as the cultivation of truck crops and sugar cane, while the Puuone series is generally used for pastures and homesites.

The Detailed Land Classification-Island of Maui, establishes a soil productivity rating ranging from "A" to "E", with "A" representing the highest level of productivity and "E" being very poor for agricultural production (University of Hawaii Land Study Bureau, May 1967). This rating system is based on factors including machine tillability, stoniness, texture, clay properties, drainage, rainfall, elevation, and slope. The project site varies in soil productivity and includes soils rated "A" and "E".

The State Department of Agriculture has established three (3) categories of Agricultural Lands of Importance to the State of Hawaii (ALISH). Utilizing modern farming methods, "prime"

agricultural lands have the soil quality, growing season, and moisture supply needed to produce sustained high crop yields economically, while "unique" agricultural lands possess a combination of soil quality, location, growing season, and moisture supply currently used to produce sustained high yields of a specific crop. "Other" important agricultural lands include those which have not been rated "prime" or "unique".

As indicated by the ALISH map, the subject property falls within the "prime" and "other" agricultural lands categories and is situated within the vicinity of existing urban development. See Figure 6.

4. ***Flood and Tsunami Hazard***

The project site is located at the eastern base of the West Maui Mountains. As indicated by the Flood Insurance Rate Map for the County of Maui, the project site is situated within Zone C, an area of minimal flooding. See Figure 7.

5. ***Flora and Fauna***

The lands underlying the project site were formerly utilized for sugar cane cultivation. Since the discontinuation of cultivation activities, introduced grass species and lowlying weeds and shrubs have covered most of the ground surface along with other vegetation, such as kiawe and koa haole. In addition to kiawe and koa haole, plant species typically associated with the region include sandbur, lantana, bermuda grass, fingergrass, and bristly foxtail.

Terrestrial fauna in the region include introduced species, such as cats, mice, rats, and mongoose. Avifauna typical of the region include the Spotted Dove, Barred Dove, Japanese White-Eye,

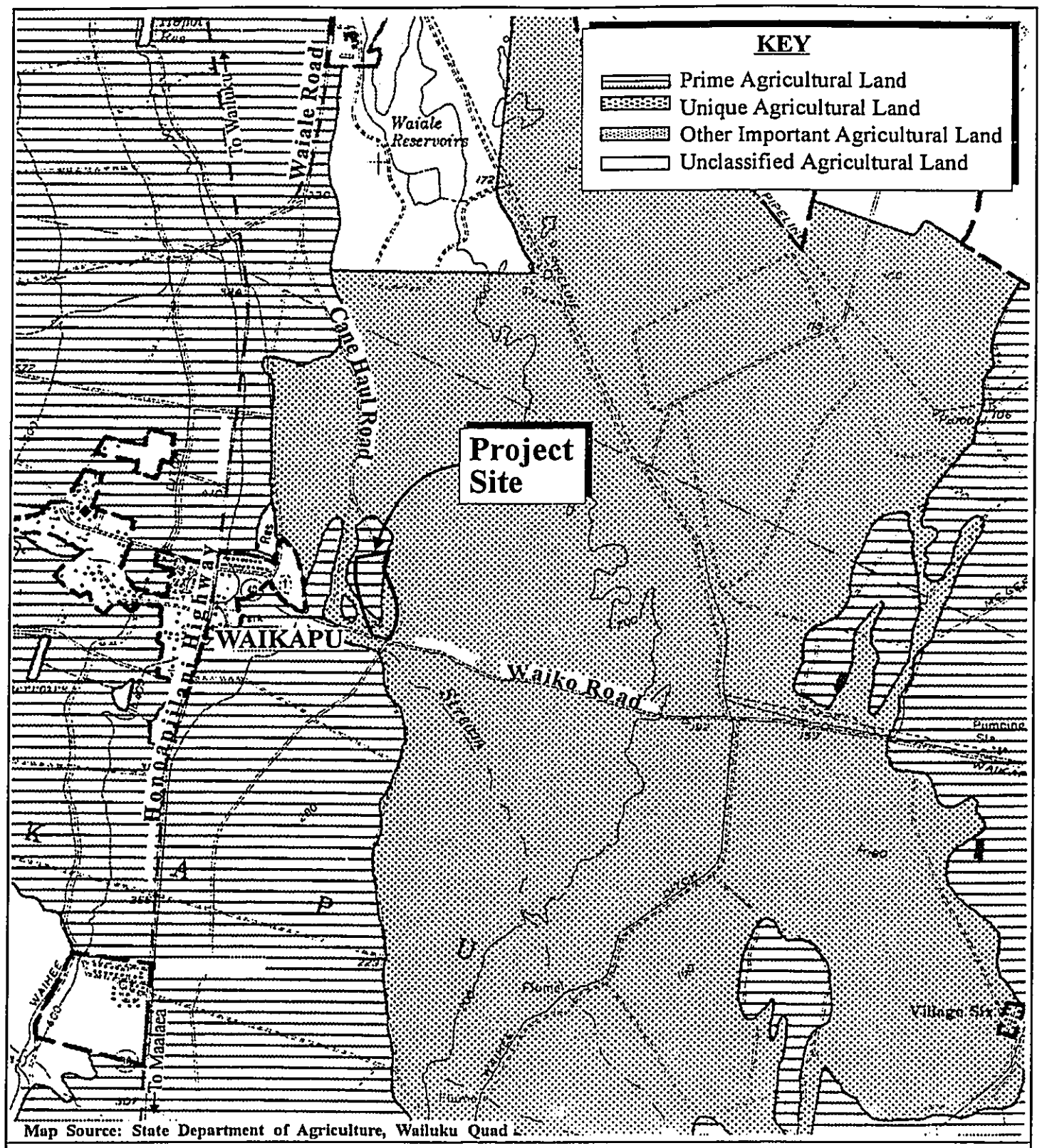


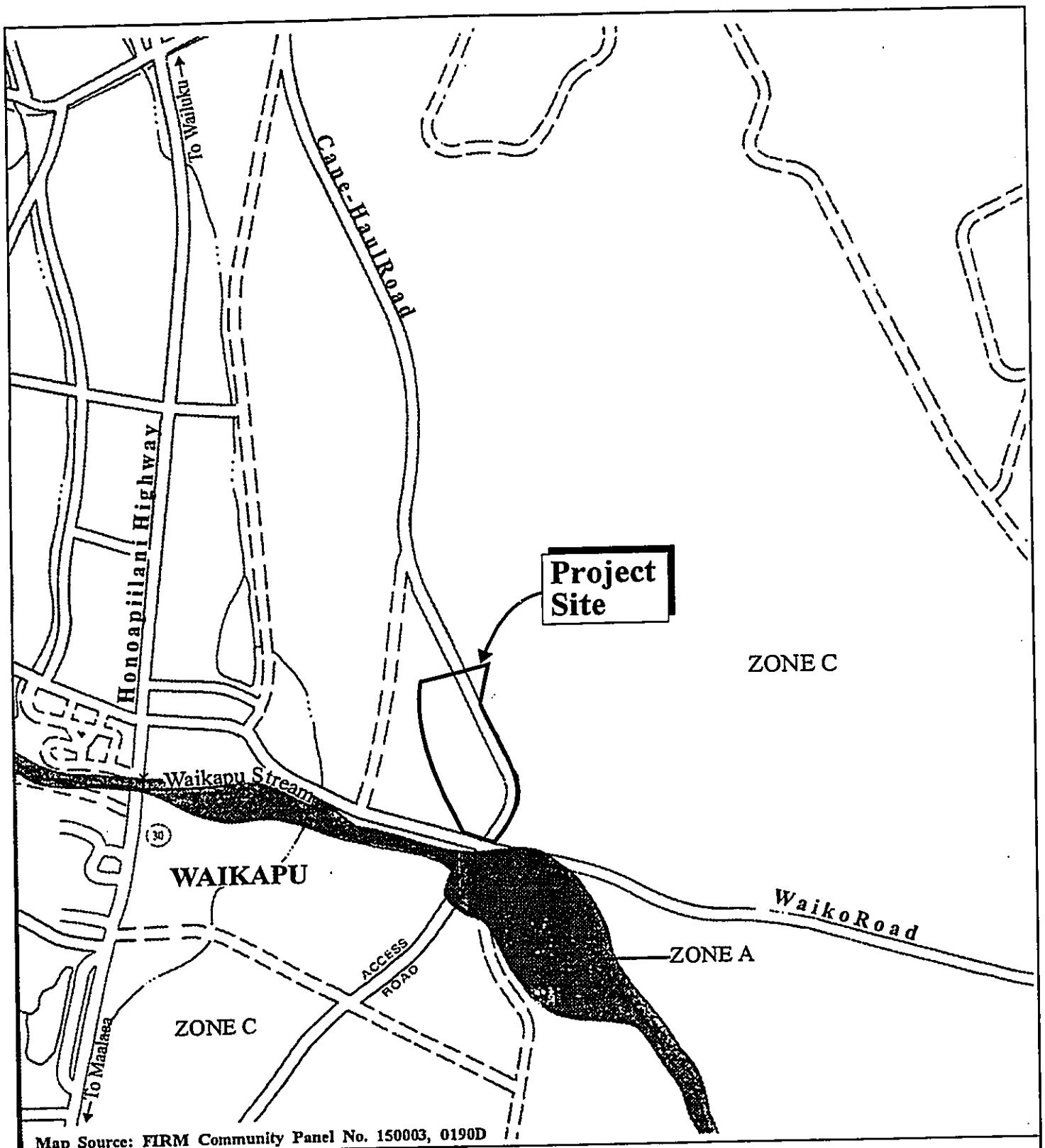
Figure 6 Waiko Baseyard Subdivision

ALISH Map

MUNEKIYO, ARAKAWA & HIRAGA, INC.

1000 0 2000 4000 Feet

Prepared for: Wailuku Agribusiness Company, Inc.



Map Source: FIRM Community Panel No. 150003, 0190D

Figure 7 Waiko Baseyard Subdivision
Flood Insurance Rate Map

MUNEKIYO, ARAKAWA & HIRAGA, INC.

0 500 1000 2000 Feet

Prepared for: Wailuku Agribusiness Company, Inc.

Cardinal, Red-Crested Cardinal, and Mynah.

The design of security measures such as lighting and fencing will be examined in detail during the final design phase of the project. Project-related lighting will utilize appropriate design features to minimize impacts to migratory seabirds that may be traversing the area.

There are no known rare, threatened, or endangered, species of flora and fauna located within the project site. In addition, there are no wetland areas located within the project site.

6. ***Archaeology***

The lands underlying the project site were previously disturbed during former sugar cane cultivation activities, as well as during the subsequent construction of the existing WACI Baseyard improvements.

An archaeological inventory survey for proposed offsite drainage system improvements for the Kehalani development was undertaken by Aki Sinoto Consulting in November 1995. See Appendix A. The purpose of the survey was to determine the existence of surface, as well as subsurface cultural deposits in the survey area, including the project site.

A surface survey involving systematic, pedestrian transects, with varying intervals based on vegetation density and ground visibility, was initially conducted in the project area. No significant surface cultural remains were located during the pedestrian survey.

Based on the results of the surface survey, locations were selected for backhoe trenching on the basis of testing those areas considered most likely to contain subsurface cultural deposits, such as burials and features. A total of thirteen (13) backhoe trenches were excavated. No subsurface cultural remains were encountered during the backhoe trenching and monitoring activities.

7. ***Air Quality***

There are no point sources of airborne emissions within proximity of the project site. Air quality in the vicinity of the project site may be affected by a variety of sources, including smoke and dust from sugar cane harvesting and cultivation operations to the south. Although minimal, airborne pollutants are largely attributable to vehicular exhaust from traffic along the region's roadways. However, these sources are intermittent and prevailing winds quickly disperse the particulates generated by these temporary sources. Overall, air quality in the Wailuku region is considered good.

8. ***Noise***

The project site is located in an area which is currently utilized for industrial-related activities (e.g., Maui Scrap Metal recycling facility, Diversified Machinery, Maui Trucking, and Fong Construction baseyards), as well as existing (e.g., Waikapu Village) and developing (e.g., Kehalani, Maui Lani Project District) single- and multi-family residential developments. With the exception of the Maui Scrap Metal's recycling operations and traffic along regional roadways, ambient noise conditions are generally attributable to natural conditions such as wind and rain. Traffic noise levels in the

vicinity of the project site are minimal due to the low traffic volumes along Waiko Road and the adjoining cane-haul road.

9. Scenic and Open Space Resources

Ranging in elevation from approximately 318 feet msl to about 303 feet msl, the project site encompasses WACI's existing baseyard and undeveloped lands. In addition to Haleakala to the east, Iao Valley and the West Maui Mountains define the scenic resources to the west of the project site. There are no notable physical features within the vicinity of the project site.

B. SOCIO-ECONOMIC ENVIRONMENT

1. Population

The population of Maui County has demonstrated relatively strong growth over the past decade as exemplified by a 52 percent increase in resident population from 71,600 in July 1980 to 108,000 in July 1992 (County of Maui/MEDB, Inc. December 1994). Growth in the County is expected to continue, with resident population projections estimated at 112,349 and 133,459 for the years 2000 and 2010, respectively (Community Resources, Inc., January 1994).

The Wailuku-Kahului region is anticipated to follow the Countywide population growth pattern with the region's 1990 population of 32,816 projected to increase to 40,452 by the year 2000 and to 48,132 by the year 2010 (Community Resources, Inc., January 1994).

2. *Economy*

Wailuku serves as the County's seat of government, and combined with neighboring Kahului, provides a broad range of commercial, social, financial, governmental, professional, and light industrial enterprises and services. The Wailuku-Kahului region is also surrounded by productive agricultural lands which include macadamia nut orchards, as well as pineapple and sugar cane fields. This vast expanse of agricultural land, managed by Hawaiian Commercial & Sugar Company (HC&S) and WACI, is considered a key component of the local economy.

Presently, light industrial activities in the Wailuku region are primarily accommodated by the Wailuku Industrial Park and Millyard Industrial Subdivision, while in Kahului, these uses are supported by the Kahului Industrial Park and the Maui Business Park, which is currently under development.

In 1990, approximately 52,000 Maui residents were employed in jobs relating to tourism, finance, health care, government, retailing, wholesaling, real estate, agriculture, construction, transportation, manufacturing, and public utilities. By the year 2010, the number of jobs are projected to increase to about 72,000, an increase of approximately 38 percent.

Jobs in the trade and service industries are projected to increase from their 1990 levels of about 13,000 and 16,000, to approximately 21,000 and 24,000 by the year 2010, an increase of 56 percent and 44 percent, respectively. (Community Resources, Inc, January 1994).

C. PUBLIC SERVICES

1. Recreational Facilities

County recreational facilities are administered and maintained by the Department of Parks and Recreation (DPR). The Wailuku-Kahului region contains a network of recreational facilities comprised of mini-parks, as well as neighborhood and district parks. The region's seven (7) mini-parks are distributed uniformly throughout the area, while the region's eleven (11) neighborhood and three (3) district parks provide a wide range of facilities to meet the recreational needs of the community. In addition, regional facilities, such as the War Memorial Center and Waiehu Golf Course, also provide a variety of facilities and activities for the community. It should also be noted that many of the region's secondary schools include adjoining playing fields which supplement the recreational facilities provided by the County park system.

County parks and recreational facilities within proximity of the project site include: Wells Park, Wailuku Heights Park, Wailuku Gym and Pool, Wailuku Elementary School Park, and Waikapu Park and Community Center. Consisting of gyms, playgrounds, swimming pools, and community centers, as well as sports courts and playing fields, these facilities provide opportunities for basketball, jogging, picnicking, soccer, swimming, tennis, walking, field sports, and social activities. In addition, the Waikapu Brewer's baseball field, a privately owned and maintained recreational facility, is situated beyond the undeveloped lands to the west of the project site.

2. ***Police and Fire Protection***

With headquarters located in Wailuku, approximately 2.6 miles north of the project site, police services for Maui County are provided by the Maui Police Department (MPD). Including the Wailuku patrol district, MPD's uniformed patrol bureau also serves the Hana, Lahaina, Lanai, and Molokai districts.

Fire prevention, suppression, and protection services for the Wailuku-Kahului region are provided by the Maui Fire Department's (MFD) Wailuku Fire Station, about 2.4 miles to the north of the project site. Additional support is also provided by the MFD's Kahului station, approximately three (3) miles to the northeast of the project site.

3. ***Solid Waste***

Single-family residential solid waste collection service is provided on a weekly basis by the County Department of Public Works and Waste Management (DPWWM) - Solid Waste Division. With the exception of the Hana region, solid waste from throughout the Island is transported to the 55-acre Central Maui Landfill of Pulehu Road, approximately six (6) miles east of the project site. In addition to the Hana landfill, the Central Maui Landfill is the only disposal site which accepts County-hauled residential waste, commercially hauled waste, and self-hauled waste.

4. ***Medical Services***

Maui Memorial Medical Center serves as the Island's only major medical facility. Located in Wailuku, approximately 2.3 miles north of the project site, the 200-bed facility provides acute, general, and emergency care services for the Island's residents. In addition,

numerous privately operated medical and dental clinics as well as offices also provide health care services for the region's residents.

5. Schools

The Wailuku-Kahului region is served by the State Department of Education's (DOE) public school system. Privately operated facilities within the region, such as Christ the King, Emmanuel Lutheran, Kaahumanu Hou and St. Anthony Schools, provide educational services for the Island's students as well.

DOE facilities in the Wailuku area include Wailuku Elementary School (Grades K-5), Iao Intermediate School (Grades 6-8), and Baldwin High School (Grades 9-12). Wailuku Elementary School and Iao Intermediate School are located about 2.2 miles north of the project site, while Baldwin High School is situated about 2.7 miles to the north.

Existing facilities in the Kahului area include Lihikai and Kahului Schools (Grades K to 5), Maui Waena Intermediate School (Grades 6 to 8), and Maui High School (Grades 9 to 12). Maui Community College, a branch of the University of Hawaii system, serves as an institution of higher learning and is located approximately 2.8 miles to the northeast of the project site.

D. INFRASTRUCTURE

1. Roadways

The project site and the Wailuku-Kahului region are served by a network of arterial, collector, and local roadways. Major arterial roadways in the vicinity of the project site include Honoapiilani Highway/High Street and Kuihelani Highway/Dairy Road.

Aligned in a north to south direction, Honoapiilani Highway is a two-lane State highway that provides regional circulation between Wailuku and West Maui. As Honoapiilani Highway enters Wailuku from the south, it becomes High Street. Through rural areas, the posted speed limit along Honoapiilani Highway is 55 mph. As it traverses the village of Waikapu, the posted speed limit decreases to 30 mph. Kuihelani Highway is a two-lane State highway which provides regional circulation between Kahului and West Maui. Extending southwest from Puunene Avenue in Kahului to Honoapiilani Highway, Kuihelani Highway has a posted speed limit of 55 mph. At its eastern extent between Hana Highway and Puunene Avenue, Kuihelani Highway transitions into Dairy Road.

County roadways within vicinity of the project site include Waiale Road and Waiko Road. Waiale Road is a two-lane County roadway that is aligned in a north to south direction. At its northern terminus, Waiale Road passes beneath the Main Street/Kaahumanu Avenue overpass and becomes Lower Main Street. At its southern extent, Waiale Road terminates at the southern entrance to Maui County Correctional Center (MCCC).

Waiko Road is a two-lane County roadway with a posted speed limit of 20 mph. Extending in a southeasterly direction from Honoapiilani Highway to Kuihelani Highway, Waiko Road forms a stop signed-controlled, cross intersection at Honoapiilani Highway and a stop signed-controlled, T-intersection at Kuihelani Highway. Traffic along Waiko Road for a distance of 0.2 mile makai of its intersection with Honoapiilani Highway is limited by County ordinance to vehicles with a gross vehicle weight of 10,000 pounds or less.

Access to the project site is currently provided via Waiko Road and a paved cane-haul road owned by WACI. The cane-haul road adjoins the project site to the east and originates directly south of, and adjacent to Waiale Road. The cane-haul road forms a stop sign-controlled cross intersection, with Waiko Road and an unpaved cane-haul road to the south.

2. *Water*

The Wailuku-Kahului region is served by the Department of Water Supply's (DWS) domestic water system. Situated in the vicinity of Iao Stream and Waiehu Stream, water drawn from the Iao Aquifer supplies the Central Maui Water System. The system services the communities of Waiehu and Waihee to the north, Wailuku, Kahului, and Paia to the east, as well as Waikapu, Maalaea, Kihei, and Makena to the south.

Wells to the north of Wailuku in the Mokuhau area provide most of the water for Waikapu. This source is supplemented by water from the Iao tunnel and Wailuku shaft which then feeds into a 3.0 million gallon (MG) storage tank located to the east of Waiale Road. See Appendix B.

The water from this tank is then pumped to a 0.3 MG storage tank in Wailuku Heights via an 8-inch transmission line and is conveyed by gravity through the Wailuku Heights distribution system to a 0.3 MG storage tank in Waikapu situated at an elevation of 764 feet msl.

A series of 8- and 12-inch lines, which comprise the Waikapu distribution system, then conveys the water along Waiko Road to

its intersection with Honoapiilani Highway. To the east of Honoapiilani Highway, the existing distribution system along Waiko Road reduces to a 4-inch line.

3. ***Wastewater***

Wastewater from the WACI Baseyard is currently disposed of through cesspools located on the project site. The closest County sewer line in the project area is located along Waiko Road at the makai extent of Waikapu Village. This gravity sewer interceptor is located approximately 2,000 feet to the west of the project site and is about 80 feet higher in elevation than the project site. This interceptor connects to a new 18-inch gravity interceptor along Waiale Road to the north. Refer to Appendix B.

North of the Kaahumanu overpass, sewage is conveyed to the Wailuku pump station located to the east of Waiehu Beach Road by a series of 12-, 15-, and 18-inch sewer lines along Lower Main Street. This station then pumps wastewater collected from Wailuku, Waiehu, and portions of Kahului to the Wailuku-Kahului Wastewater Reclamation Facility (WWRF) via an 18-inch force main for treatment and disposal.

The Wailuku-Kahului WWRF is located approximately four (4) miles to the northeast of the project site. The design capacity of the facility was recently increased from 6.0 million gallons per day (MGD) to 7.9 MGD, and excluding groundwater and stormwater infiltration, current sewage flow volume treated by the facility is approximately 6.6 MGD (Department of Public Works and Waste Management, Wastewater Reclamation Division, April 1998).

4. ***Drainage and Erosion***

The project site generally slopes in a west to east direction and ranges in elevation from approximately 318 feet msl to about 303 feet msl with an average slope of 2 percent. The project site and adjoining undeveloped areas are predominantly vegetated with introduced grass species and lowlying weeds and shrubs, as well as kiawe and koa haole. Refer to Appendix B.

There are no existing drainage system improvements serving the project site. Runoff from offsite areas to the west, as well as the project site, currently sheet flows across the site in an easterly direction onto adjacent downstream properties. Current runoff from the project site for a 50-year storm recurrence interval with one (1) hour rainfall is estimated to be 17.25 cubic feet per second (cfs).

5. ***Electrical and Communication Systems***

Electrical and telephone service to the project site are provided by Maui Electric Company, Ltd. and GTE Hawaiian Telephone Company, Inc., respectively, via overhead power and phone lines along the existing cane-haul road which traverses the project site.

Chapter III

Potential Impacts and Mitigation Measures

III. POTENTIAL IMPACTS AND MITIGATION MEASURES

A. IMPACTS TO THE PHYSICAL ENVIRONMENT

1. Surrounding Land Uses

The project site is situated in an area of existing and ongoing urban development. The village of Waikapu is located about 0.5 mile to the west, while Kehalani, currently under development, is situated beyond the project area to the northwest. In addition, the Maui Scrap Metal recycling facility and the Diversified Machinery, Maui Trucking and Fong Construction baseyards are situated within close proximity to the project site. The Maui Lani Project District, also under development, is located beyond the project area to the north and east.

With the exception of the existing baseyard improvements, the project site is currently undeveloped. The proposed project will not involve the displacement or relocation of any residents within the surrounding area.

The proposed project is anticipated to provide an area for light industrial activities in the context of existing and future urban development and is consistent with the existing and ongoing urban development of lands within proximity of the project site.

The development of the proposed project is consistent with surrounding land uses and is not anticipated to create any adverse impacts.

2. Topography and Landform

Site work for the proposed project will involve clearing, grubbing, and grading, as well as excavation and fill. To the extent

practicable, finished contours will follow existing grades to minimize earthwork costs and maintain existing drainage patterns.

While terrain within the project site will be locally modified to meet design requirements, the proposed light industrial use of the property is not anticipated to alter the slope characteristics in the vicinity.

3. ***Flora and Fauna***

There are no known significant habitats or rare, threatened, or endangered species of flora or fauna located on the project site. In addition, the proposed improvements are not anticipated to impact wetland areas and wildlife habitats. Project-related lighting will utilize appropriate design features to minimize impacts to migratory seabirds traversing the area. As such, the development of the project is not anticipated to adversely impact these elements of the natural environment.

4. ***Archaeology***

The results of the archaeological inventory survey of the project area were negative. Refer to Appendix A. No surface remains or subsurface evidence of past human activities were encountered during the survey.

However, based on the general cultural sensitivity of sand dune areas, the survey recommends that archaeological monitoring be conducted for areas which are targeted for construction-related excavation.

In a letter dated May 8, 1996, the SHPD indicated that the proposed project will have "no effect" on known historic sites. See Appendix A-1. The SHPD also concurred with the survey's recommendations that archaeological monitoring be conducted for ground-altering construction activities. In addition, the SHPD indicated that the entire project area will not require monitoring since sections of the project corridor consist of secondary fill to depths of more than 2.9 meters and some areas consist of thin sand layers between coarse alluvial gravel. As noted by the SHPD, the monitoring plan should identify those portions of the project area that would require monitoring based on the information available from backhoe testing.

An archaeological monitoring plan reflecting the nature, scope, and duration of monitoring shall be submitted to the State Historic Preservation Division (SHPD) for review and approval prior to the commencement of construction activities.

In the event that any human remains or artifacts are encountered, work will be halted and the SHPD and the Maui/Lanai Island Burial Council will be appropriately and immediately notified. Applicable procedures to ensure compliance with Chapter 6E, HRS will be implemented accordingly.

The possibility of the existence of native Hawaiian gathering rights on the subject property was examined and the findings noted. See Appendix A-2.

5. ***Air Quality***

Emissions from construction equipment and other vehicles involved in construction activities may temporarily affect the ambient air quality within the immediate vicinity. However, these effects can be minimized by properly maintaining construction equipment and vehicles.

In addition, dust generated during construction, especially from earth-moving operations such as excavating, trenching, and filling, may also result in a temporary decrease in ambient air quality. Mitigation measures include utilizing dust barriers, waterwagons, and/or sprinklers to control dust, and watering graded areas upon the completion of daily construction activities and/or weekends and holidays to the extent practicable.

On a long-term basis, emissions associated with vehicles and equipment involved in daily operations are not expected to adversely impact air quality conditions. Accordingly, the proposed project is not anticipated to generate adverse air quality impacts.

6. ***Noise***

Ambient noise conditions may be temporarily affected by construction activities. Heavy construction machinery, such as backhoes, dump trucks, front-end loaders, paving equipments, and material-transport vehicles, are anticipated to be the dominant noise-generating sources during the construction period.

Proper equipment and vehicle maintenance are anticipated to minimize noise levels. Equipment mufflers or other noise

attenuating equipment may also be employed as required. All construction activities will be limited to daylight working hours.

Upon completion, loading, unloading, delivery, and warehousing activities are anticipated to be the primary source of noise generated by the subdivision's occupants. These activities, however, are not anticipated to adversely affect ambient noise conditions and are considered consistent with BEI's existing light-industrial operations, as well as compatible with existing surrounding operations such as the Maui Scrap Metal recycling facility, Diversified Machinery, Maui Trucking, and Fong Construction baseyards. From a long-term perspective, the proposed project is not anticipated to generate adverse noise conditions.

7. ***Scenic and Open Space Resources***

Elevations at the project site range from approximately 318 feet msl to about 303 feet msl. As viewed from the project site, Haleakala is visible to the east, and Iao Valley and the West Maui Mountains to the west.

The project site is not part of a scenic corridor and is not anticipated to have an adverse effect upon the visual character of the surrounding area.

8. ***Use of Chemicals and Fertilizers***

Use of herbicides will generally be limited to the initial plant establishment period on the expansion site. Pesticides are anticipated to be used only as a treatment and not as a preventive measure. As a treatment, application usage will be minimal. In

addition, plant selection for the project will be based on hardiness, drought tolerance, pest resistance, as well as aesthetic concerns.

Nitrogen/Phosphorus/Potash mixed fertilizers are anticipated to be applied to lawn areas, groundcover, and flowering shrubs. With proper irrigation management practices, leaching and runoff of fertilizers should be negligible.

No adverse effects on surface, underground and marine resources are anticipated.

B. IMPACTS TO THE SOCIO-ECONOMIC ENVIRONMENT AND PUBLIC SERVICES

1. Economy

As previously noted, the number of jobs on Maui are projected to increase to about 72,000 by the year 2010, an increase of approximately 38 percent from the 52,000 jobs in the year 1990. By the year 2010, jobs in the trade and service industries are anticipated to increase by 56 and 44 percent, respectively. These employment sectors also include individuals and businesses engaged in light industrial activities.

In this regard, the proposed project will provide opportunities for economic development and create positive short- and long-term benefits for the Island's economy. On a short-term basis, the proposed project will provide construction employment and support construction-related services and suppliers. Upon completion, businesses located in the light industrial subdivision will contribute to the long-term support of the regional economy through their contributions of property taxes, payment of employee salaries and

wages, and purchases of goods and services from local merchants and service providers. Purchases relating to facilities maintenance will also benefit the local economy.

2. ***Agriculture***

The 14.4-acre project site is situated in a region of existing and ongoing urban development. With the exception of WACI's office, garage, storage, dormitory, and maintenance facilities, the remainder of the project site is presently undeveloped and vegetated with introduced grass species and lowlying weeds and shrubs, as well as kiawe and koa haole. As previously indicated, the subject property has a soils productivity rating of "A" and "E", and as indicated by the ALISH map, falls within the "prime" and "other" agricultural lands categories.

The proposed use of these lands for urban development is not anticipated to affect WACI's economic viability nor will it affect lands available for diversified agricultural use.

3. ***Police, Fire, and Medical Services***

The proposed project is not anticipated to affect the service capabilities of police, fire, medical, and emergency operations. The present operating limits for emergency services are not expected to be extended or affected.

4. ***Recreational and Educational Resources***

The proposed project is not expected to generate a need for recreational facilities or services. In addition, there are no anticipated impacts to existing educational facilities or resources.

5. ***Solid Waste***

A solid waste management plan will be developed in coordination with the Department of Public Works and Waste Management (DPWWM), Solid Waste Division for the disposal of clearing and grubbing material from the project site during construction. Solid waste collection and disposal will be provided by a private refuse service.

C. *IMPACTS TO THE INFRASTRUCTURE*

1. *Roadways*

A traffic study for the proposed project was prepared by Parsons Brinckerhoff in September 1998. See Appendix C. The purpose of the study was to assess existing and future traffic conditions of the proposed development on the intersections and roadway system within the study area. Since the Waiko Baseyard Subdivision is anticipated to be completed within six (6) years, the Year 2004 was selected as the horizon for future traffic analyses.

a. *Subdivision Access*

Access to the existing WACI and BEI facilities is via an access road that intersects Waiko Road opposite a cane haul road. This intersection is configured as a 4-legged, all-way STOP intersection.

To provide access to the proposed light industrial subdivision, the WACI access road north of Waiko Road is proposed to be closed while the cane haul road to the south of Waiko Road would remain, forming a T-intersection with Waiko Road. Access to the Waiko Baseyard Subdivision is proposed to be located approximately 200 feet west of the

existing WACI access road and would form a new T-intersection with Waiko Road. Both this new intersection and the cane haul road intersection would be controlled by STOP signs on the minor approach. In addition, the STOP sign on Waiko Road at the existing WACI cane haul road intersection is also proposed to be removed, thereby eliminating the all-way STOP operation on Waiko Road.

Tenants of the proposed subdivision will be encouraged to use Kuihelani Highway as primary access to and from Waiko Road. (WACI and BEI are currently doing so.) Waiko Road intersects Kuihelani Highway at an unsignalized, T-intersection with STOP-sign control on the Waiko Road approach. At this time, Kuihelani Highway is a two-lane, undivided arterial roadway with a posted speed limit of 55 mph. In the near future, it is expected that the State Department of Transportation (DOT) will initiate a project that will widen Kuihelani Highway to a 4-lane, divided arterial roadway. This widening project is expected to be completed by the build out of the Waiko Baseyard Subdivision.

Some passenger car traffic will also utilize Waiko Road toward Honoapiilani Highway. Waiko Road intersects Honoapiilani Highway at an unsignalized, 4-legged intersection with STOP-sign control on the Waiko Road approaches. In the vicinity of Waiko Road, Honoapiilani Highway is a two-lane, undivided roadway with a posted speed of 30 mph. Exclusive left-turn lanes are provided within Honoapiilani Highway for vehicles turning into Waiko Road. An exclusive right-turn lane is provided for

southbound Honoapiilani Highway traffic at Waiko Road, and the westbound Waiko Road approach is channelized into an exclusive right-turn lane and a shared through/left-turn lane.

Commercial trucks associated with Waiko Baseyard Subdivision activities will be directed to utilize Kuihelani Highway as much as possible. In addition, improvement requirements to Waiko Road from the project site to Kuihelani Highway will be coordinated with the DPWWM. Since most of the potential destinations, West Maui, Kihei-Makena, Upcountry, Paia-Hana, and Kahului, are all conveniently served via Kuihelani Highway, using Kuihelani Highway would cause an out of direction path only when accessing Wailuku from the Waiko Baseyard Subdivision. To address this situation, it is proposed to provide occupants of the subdivision with permits that will allow them to utilize an existing WACI cane haul road that connects the Waiko Baseyard area directly with Wailuku. This cane haul road connects to the public roadway system at Waiale Road, just south of the Maui Community Correctional Center.

b. Existing and Future Intersection Operations

The intersections on Waiko Road are projected to operate very well during the peak traffic hours. Levels of service (LOS) at the proposed Waiko Baseyard Subdivision Access and the existing cane haul road intersections are projected to be LOS A for all analyzed movements. LOS is an index that ranges from A to F with LOS A indicating little delay to vehicles and LOS F indicating significant delay.

The intersection of Waiko Road with Kuihelani Highway is also projected to operate very well, mostly LOS A with LOS C or better for the left turn out of Waiko Road onto Kuihelani Highway.

The intersection of Waiko Road with Honoapiilani Highway currently operates and is projected to continue to operate well overall during the peak traffic hours. Left-turn movements from Waiko Road to Honoapiilani Highway do experience delay, but these delays are within acceptable limits for peak hour conditions given the relatively low volume of traffic on Waiko Road. Westbound Waiko Road approach delay increases slightly with the proposed development (approximately four (4) seconds per vehicle).

c. ***Conclusion and Recommendations***

The additional traffic generated by the proposed Waiko Baseyard Subdivision is relatively small, only 66 vehicles per hour (vph) during the morning peak hour and 64 vph during the evening peak hour. This traffic will have only minor impacts on traffic operations at intersections in the vicinity of the proposed development.

The analyses also indicates that it will be acceptable, from a traffic operations perspective, to remove the STOP signs on Waiko Road at the existing WACI cane haul road intersection.

No intersection improvements are needed at the Waiko Road/Honoapiilani Highway intersection.

A major reconfiguration of Kuihelani Highway is to be part of the widening project that is expected to be initiated by the DOT in the near future. Overall, the Kuihelani Highway/Waiko Road intersection operates well, and the individual movement delays are acceptable during both peak hours. It is recommended that separate right- and left-turn lanes be provided on Waiko Road at Kuihelani Highway.

Truck traffic should continue to be encouraged to utilize Kuihelani Highway instead of Honoapiilani Highway. It should be noted that traffic along Waiko Road for a distance of 0.2 mile makai of its intersection with Honoapiilani Highway is limited by County ordinance to vehicles with a gross vehicle weight of 10,000 pounds or less. To minimize the potential of truck use of Honoapiilani Highway to Wailuku, Waiko Baseyard Subdivision tenants will be given permits to utilize an existing WACI cane haul road that continues north of the subdivision and joins Waiale Road just south of the Maui County Corrections Center.

Given the results of the peak hour intersection analyses, it is concluded that the proposed Waiko Baseyard Subdivision can be accommodated by the surrounding roadway system and that the proposed development is expected to have minimal traffic impacts on the study area.

2. ***Water***

The average water demand for the proposed subdivision is projected to range from 45,000 to 73,500 gallons per day (gpd),

with actual consumption subject to the type of light industrial activity which will occur on each lot. Refer to Appendix B.

The applicant's pro-rata contribution for new source development will be through meter fees as prescribed in the Rules and Regulations for the DWS. Storage for the proposed subdivision will be provided by the 0.3 MG storage reservoir in upper Waikapu. Storage assessment for the proposed project will be paid as part of the meter fee.

To service the proposed subdivision, approximately 2,900 feet of new 12-inch line will connect to the existing 12-inch line which presently ends at Honoapiilani Highway. A 12-inch diameter distribution system capable of delivering a fire flow 2,000 gallons per minute (gpm) will be extended into the proposed subdivision from Waiko Road. Fire hydrants will be spaced at maximum intervals of 250 feet along the subdivision streets. Each lot will be metered separately.

The proposed water system improvements will be constructed in accordance with applicable regulatory design standards. The proposed project is not anticipated to have an adverse effect on water sources and storage facilities as well as transmission and distribution systems.

3. ***Wastewater***

At a rate of 2,000 gallons per acre a day (gpAd), the proposed subdivision is projected to generate approximately 24,500 gpd of wastewater. Refer to Appendix B. A gravity sewer system located within the subdivision streets will be designed to receive

wastewater from each lot and convey it to a private sewer pump station in the northeast corner of the project site.

The lift station will then pump the collected wastewater through 3,600 feet of force main to the existing gravity interceptor in the vicinity of Waikapu Village. All wastewater system improvements will be constructed in accordance with applicable regulatory design standards.

As previously noted, the capacity of the Wailuku-Kahului WWRF was recently expanded from 6.0 mgd to 7.9 mgd. The proposed project is not anticipated to have an adverse impact upon the region's wastewater capacities and facilities.

4. ***Drainage and Erosion Control***

The project site includes an area of approximately 5.5 acres which is currently utilized as the WACI Baseyard. The project site slopes in a west to east direction from an elevation of 318 feet msl to 303 feet msl with an average slope of 2 percent.

Currently, there are no drainage system improvements which serve the project site. Based on a 50-year storm recurrence interval with one (1) hour rainfall, approximately 17.25 cfs of onsite surface runoff is presently generated by the project site. Project generated runoff presently sheet flows in an easterly direction across the project site onto adjacent downstream properties.

The post-development onsite runoff volume generated by the proposed project is estimated to be approximately 53 cfs. As a

result of the proposed development, a net increase of approximately 35.7 cfs is anticipated.

As part of the subdivision improvements, new curb-inlet type catch basins and an underground drainage system will be installed within the subdivision streets to intercept and convey onsite runoff to a retention basin which will be located offsite to the north of the project site. The retention basin will be designed to store the additional onsite runoff generated by the proposed development. Accordingly, the volume of surface runoff flowing off the project site will not be increased as a result of the proposed development. All drainage system improvements will be constructed in accordance with applicable regulatory design standards. The proposed project is not anticipated to have an adverse effect on adjacent or downstream properties.

Grading activities for the proposed project will be less than the allowable fifteen (15) acres. Upon completion of grading, all exposed areas will be grassed as required. In addition, the following measures will be implemented to control erosion during construction:

1. Minimize the time of construction.
2. Retain existing ground cover until the latest possible date to complete construction.
3. Early construction of drainage features.
4. Use temporary area sprinklers in non-active construction areas when ground cover is removed.
5. Station water truck on site during construction period to provide for immediate sprinkling, as needed, in

active construction zones (weekends and holidays included).

6. Use temporary berms, filter berms, and cut-off ditches, where needed, for control of erosion.

7. Graded areas shall be thoroughly watered after construction activity has ceased for the day and on weekends.

8. All cut and fill slopes shall be sodded or planted immediately after grading work has been completed.

5. ***Electrical and Communication Systems***

The distribution system for power and telephone services will be placed underground along the shoulders of the subdivision streets in accordance with applicable regulatory design standards. Each lot will be provided with service laterals to accommodate these utilities.

The proposed project is not anticipated to adversely impact electrical and telephone services in the Wailuku-Kahului region.

D. CUMULATIVE AND SECONDARY IMPACTS

A cumulative impact is defined as an impact to the environment which results from the incremental impact of an action when added to other past, present, and reasonable foreseeable future actions regardless of what agency or person undertakes such other actions. Actions, such as those that involve the construction of public facilities or infrastructure, may stimulate secondary impacts such as population growth and increases demands for public services and infrastructure.

On a long-term basis, the Waiko Baseyard Subdivision will benefit the community by addressing the need and providing an appropriate location

for true light industrial activities which are in consonance with existing light industrial uses in the vicinity, as well as future urban growth and development. In addition, the proposed development would support additional employment opportunities, either directly or indirectly, and contribute to the local economy through its contribution of wages, salaries, and benefits.

Chapter IV

Relationship to Governmental Plans, Policies, and Controls

IV. RELATIONSHIP TO GOVERNMENTAL PLANS, POLICIES, AND CONTROLS

A. STATE LAND USE DISTRICTS

Pursuant to Chapter 205, HRS, all lands in the State have been divided and placed into one (1) of four (4) land use districts by the State Land Use Commission. These land use districts have been designated "Urban", "Rural", "Agricultural", and "Conservation". The lands underlying the project site are presently designated "Agricultural". See Figure 8.

While light industrial uses are compatible with the Urban designation, these activities are not considered permissible within the "Agricultural" District. As such, a District Boundary Amendment from the "Agricultural" to "Urban" District is being requested to establish the appropriate State land use designation for the development of the proposed 14.4-acre light industrial subdivision.

B. LAND USE COMMISSION RULES, CHAPTER 15-15, HAWAII ADMINISTRATIVE RULES

The proposed reclassification of 14.4 acres from the "Agricultural" to "Urban" District is in conformance with the following standards established for "Urban" District as set forth in Chapter 15-15-18, Hawaii Administrative Rules:

(1) It shall include lands characterized by "city-like" concentrations of people, structures, streets, urban level of services and other related land uses.

Comment: The area of the proposed reclassification is located approximately 0.5 mile east of Waikapu. Situated within the Urban District, Waikapu is characterized by lands which are presently engaged in commercial and residential uses. In addition to BEI's

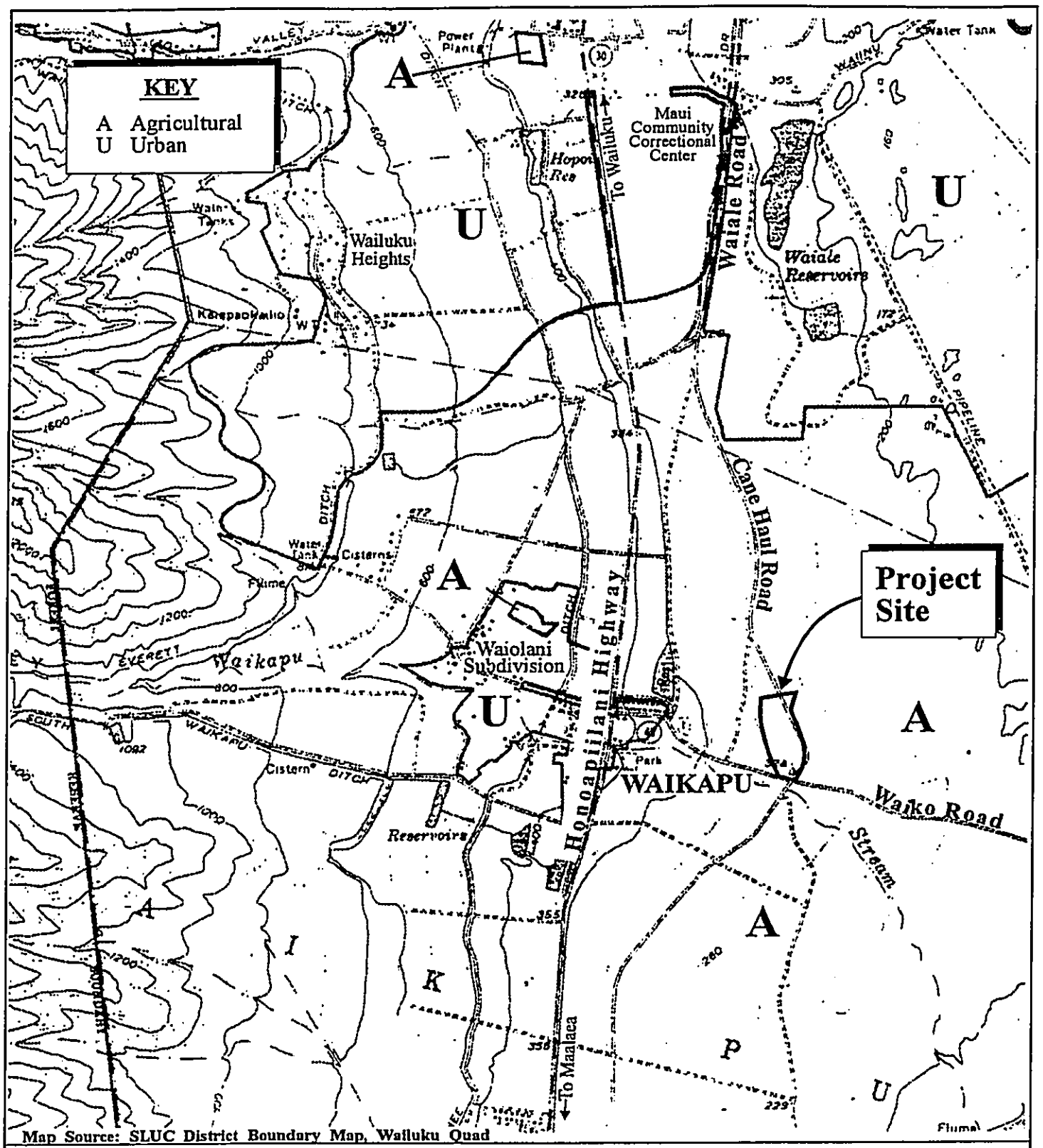


Figure 8 Waiko Baseyard Subdivision

State Land Use District Designations

MUNEKIYO, ARAKAWA & HIRAGA, INC.

1000 0 2000 4000 Feet

Prepared for: Wailuku Agribusiness Company, Inc.

onsite operations, existing industrial-related activities such as the Maui Scrap Metal recycling facility and the Diversified Machinery, Maui Trucking, and Fong Construction baseyards are situated within close proximity to the project site.

(2) It shall take into consideration the following specific factors:

a. <u>Proximity to centers of trading and employment except where the development would generate new centers of trading and employment.</u>

<u>Comment:</u> *Situated within proximity of the commercial and* employment centers of Wailuku and Kahului, the project site is located approximately two (2) miles south and three (3) miles southwest of Wailuku and Kahului, respectively.

b. <u>Substantiation of economic feasibility by the petitioner.</u>

<u>Comment:</u> The petitioner, Wailuku Agribusiness Company, Inc. is proposing to develop an approximately 19-lot light industrial subdivision. In addition to the residential community of Waikapu, the project site is situated within the vicinity of Kehalani and the Maui Lani Project District. The project site includes BEI's light-industrial facility and is also located near other existing industrial-related uses such as the Maui Scrap Metal recycling facility and the Diversified Machinery, Maui Trucking, and Fong Construction baseyards. Considering its proximity and context to existing and ongoing urban development, the proposed reclassification will provide for light industrial growth opportunities in a centralized area having relatively easy access to Wailuku and Kahului, as well as South and West

Maui. Given the scale and location of the proposed light industrial subdivision, project implementation is considered economically feasible.

c. ***Proximity to basic services such as sewers, transportation services, water, sanitation, schools, parks, and police and fire protection.***

Comment: Access to the project site from Honoapiilani and Kuihelani Highways is currently provided via Waiko Road, a two-lane County roadway, and a paved cane-haul road owned by WACI, located directly south of, and adjacent to Waiale Road. Existing water lines and a gravity sewer interceptor are located in Waikapu, within close proximity to the project site, while electrical and telephone service to the project site is provided via overhead wires along the adjoining cane-haul road. Wastewater will be pumped from an onsite lift station where it will be conveyed to the Wailuku-Kahului WWRF. Drainage system improvements will be constructed in accordance with applicable regulatory design standards.

The project site is located within proximity to existing educational and recreational facilities and resources, and is also within the service area of emergency fire, police, and medical services, as well as regular solid waste collection services.

d. ***Sufficient reserve areas for urban growth in appropriate locations based on a ten (10) year projection.***

Comment: Adopted in 1987, the Wailuku-Kahului Community Plan land use map designates the project site as "Agriculture". The Community Plan also recommended that the present State Agricultural District boundaries be modified to allow for the contiguous outward expansion of Waikapu, Wailuku, and Kahului in order to accommodate future residential growth over the next 20 years. The 14.4 acres proposed for reclassification are intended to provide diversity for light industrial expansion opportunities. The site's location in an area including and surrounded by other light industrial activities establishes a compatible land use context which can be developed within a near-term time horizon.

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

Comment: The project site is characterized by level to gently sloping topography with a slope of approximately 2 percent. Onsite and offsite drainage improvements will accommodate storm water runoff and is not anticipated to have any adverse effects to downstream or adjoining properties. Situated within Zone C, an area of minimal flooding, the project site is not subject to tsunami inundation and unstable soil conditions. Smoke and dust from sugar cane harvesting and cultivation operations to the south are intermittent and its effects temporary.

(4) ***In determining growth for the next ten (10) years, or in amending the boundary, land contiguous with existing urban areas shall be given more consideration that non-contiguous land, and more particularly when indicated for future urban use on State or County general plans.***

Comment: The proposed District Boundary Amendment involves lands situated within close proximity to areas of existing and ongoing urban development, as well as lands which are currently engaged in industrial-related activities. The project site is located *approximately 0.5 mile east of Waikapu, which is in the* Urban District, and is situated within the vicinity of Kehalani, which is currently being developed, and the Maui Lani Project District, which is also being developed. In addition to BEI's onsite operations, existing industrial-related uses (granted through Special Use Permits) such as the Maui Scrap Metal recycling facility and the Diversified Machinery, Maui Trucking and Fong Construction baseyards are located near the project site.

(5) ***It shall include lands in appropriate locations for new urban concentrations and shall give consideration to areas to urban growth as shown on the State and County general plans.***

Comment: As previously indicated, the project site is situated within close proximity to existing and ongoing urban development. In addition, the current Wailuku-Kahului Community Plan recommends that the existing State Agricultural District boundaries be modified to provide for the contiguous outward expansion of Waikapu in order to accommodate future residential growth over the next 20 years. The proposed light-industrial subdivision is intended to supplement the future residential and urban growth of the region. It is in this context that a Community Plan land use

amendment is being sought to establish the appropriate underlying "Light Industrial" designation for the property.

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

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

Comment: As previously noted, the project site is located in proximity to areas which are presently in the Urban District. The nearby village of Waikapu is situated approximately 0.5 mile to the east, while Kehalani, which is currently under development, and the Maui Lani Project District, which is also being developed, are within the vicinity of the project site.

(b) ***Only when those lands represent a minor portion of this district.***

Comment: The project site encompasses an area of approximately 14.4-acres and comprises a minor portion of Urban designated lands within the context of existing and future urbanized land uses.

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

Comment: The proposed reclassification does not contribute to scattered spot urban development. The project site includes BEI's light industrial facility and is located in close proximity to lands

presently utilized for industrial-related activities such as the Maui Scrap Metal recycling facility and the Diversified Machinery, Maui Trucking, and Fong Construction baseyards, as well as lands which are currently in the Urban District such as Waikapu Village, Kehalani, and the Maui Lani Project District. In addition, the proposed project will not necessitate unreasonable public investment for infrastructure improvements or public services.

(8) ***It may include lands with a general slope of 20 percent or more which do not provide open space amenities or scenic values if the commission finds that those lands are desirable and suitable for urban purposes and that official design and construction controls are adequate to protect the public health, welfare, and safety, and the public's interest in the aesthetic quality of the landscape.***

Comment: The area of the proposed reclassification contains an average slope of 2 percent and is significantly less than 20 percent.

C. *MAUI COUNTY GENERAL PLAN*

The 1990 update of the Maui County General Plan establishes broad objectives and policies to guide the long-range development of the County. As indicated by the Maui County Charter, "The purpose of the General Plan is to recognize and state the major problems and opportunities concerning the needs and development of the County and the social, economic, and environmental effects of such development and set forth the desired sequence, patterns, and characteristics of future development".

The proposed project is in keeping with the following General Plan objectives and policies relating to land use and economic activity.

Objectives:

1. To use the land within the County for the social and economic benefit of the County's residents.

2. To provide an economic climate which will encourage controlled expansion and diversification of the County's economic base.

Policies:

a. Maintain a diversified economic environment compatible with acceptable and consistent employment.

b. Support programs, services, and institutions which provide economic diversification.

D. *WAILUKU-KAHULUI COMMUNITY PLAN*

The project site is located in the Wailuku-Kahului Community Plan region, one (1) of the nine (9) Community Plan regions established in the County of Maui. Planning for each region is guided by the respective Community Plans, which are designed to implement the Maui County General Plan. Each Community Plan contains recommendations and standards which guide the sequencing, patterns, and characteristics of future development in the region.

Land use guidelines are established by the Wailuku-Kahului Community Plan land use map, and as indicated, the project site is situated within an area currently designated for agricultural use. See Figure 9.

In order to establish the appropriate community plan designation, as well as provide consistency with the proposed District Boundary Amendment request, an amendment to change the subject's existing community plan designation from "Agriculture" to "Light Industrial" is being requested for the development of the proposed project.

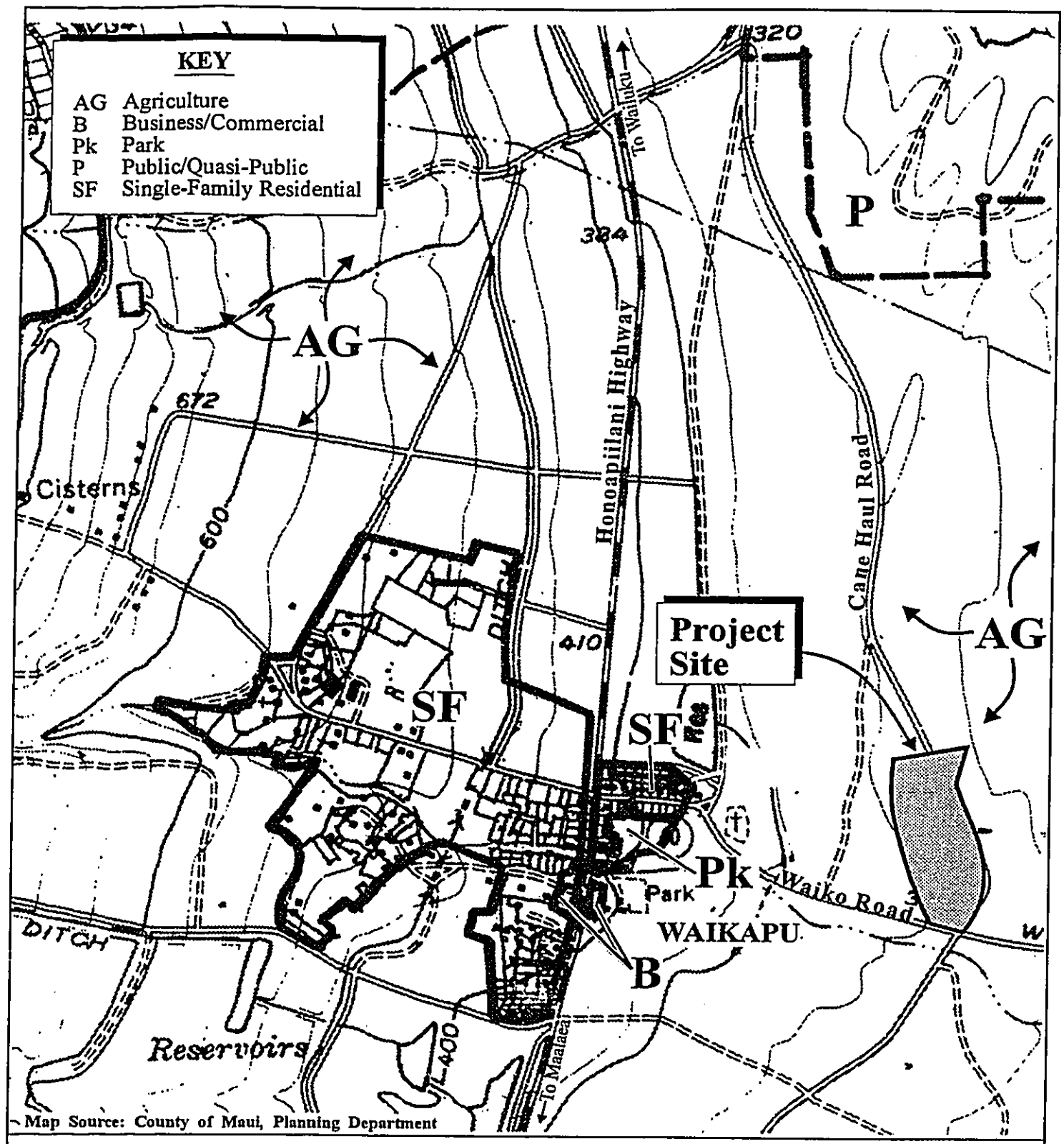


Figure 9

Waiko Baseyard Subdivision

Wailuku-Kahului Community Plan Land Use Map

MUNEKIYO, ARAKAWA & HIRAGA, INC.

0 500 1000 2000 Feet

Prepared for: Wailuku Agribusiness Company, Inc.

Adopted in 1987, the Wailuku-Kahului Community Plan recommended that the existing State Agricultural District boundaries be modified to provide for the contiguous expansion of Waikapu, Wailuku and Kahului in order to accommodate future residential growth over the next twenty (20) years.

As previously noted, the village of Waikapu is located approximately 0.5 mile west of the project site, while Kehalani and the Maui Lani Project District are located within the general vicinity. The proposed project is anticipated to complement the residential and commercial uses within these areas of urban development and is situated in an area which includes BEI's light industrial facility and is presently utilized for other industrial-related activities (e.g., Maui Scrap Metal recycling facility, Diversified Machinery, Maui Trucking and Fong Construction baseyards).

It is noted that the Community Plan Amendment request will be processed separate from the County's Ten Year Update of the Wailuku-Kahului Community Plan, which is pending review and action by the Maui County Council.

E. MAUI COUNTY ZONING

As designated by Maui County Zoning, the project site is located in the "Agricultural District".

In this regard, a request for a Change in Zoning from the "Agricultural" District to the "M-1, Light Industrial" District is being sought to establish the appropriate County zoning for the development of the proposed light industrial subdivision.

Chapter V

Adverse Environmental Effects Which Cannot Be Avoided

V. ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

The proposed project will result in some construction-related impacts as described in Chapter III, Potential Impacts and Mitigation Measures.

Potential effects include noise-generated impacts occurring from site preparation and construction activities. In addition, there may be temporary air quality impacts associated with dust generated from construction activities, and exhaust emissions discharged by construction equipment.

The proposed project is not anticipated to create any significant, long-term, adverse environmental effects.

Chapter VI

Alternatives to the Proposed Action

VI. ALTERNATIVES TO THE PROPOSED ACTION

A. PREFERRED ALTERNATIVE

The availability of appropriate sites for accommodating true light industrial uses (e.g., baseyard, repair, service, storage, and maintenance activities) is best accomplished through the development of the Waiko Baseyard Subdivision. As previously indicated, the project site is owned by WACI and includes BEI's existing operations. The proposed subdivision is also situated in the immediate vicinity of other light industrial uses in the area such as the Maui Scrap Metal recycling facility and the Diversified Machinery, Maui Trucking, and Fong Construction baseyards. As with BEI, these other light industrial uses have been granted Land Use Commission Special Use Permits (SUP) to operate in the State Agricultural District. Considering its location, land ownership, infrastructure, existing light industrial uses, and economic benefits to the community, the project site provides an appropriate location for a light industrial subdivision which will meet the requirements of its tenants, as well as address the community's need for a facility which will provide for true light industrial uses.

B. NO ACTION ALTERNATIVE

Under the "no action" alternative, land use spatial patterns will continue to be driven by the incremental Special Use Permit process. Since demand for baseyard sites and related industrial use sites will continue over time, a broader land use planning perspective is deemed appropriate in this instance. Such a perspective will ensure the coordinated use of unproductive agricultural lands as well as the coordinated implementation of infrastructure improvements to serve the area's tenants. In this context, the "no action" option is not considered desirable.

In light of the projected increase in jobs relating to the trade and service industries, as well as site suitability and economic development considerations, the "no action" alternative does not represent an appropriate option.

C. *DEFERRED ACTION ALTERNATIVE*

As with the "no action" alternative, the "deferred action" alternative is not deemed appropriate.

D. *DESIGN ALTERNATIVE*

During the conceptual planning stage, several subdivision layouts were considered. However, these preliminary plans were discounted due to considerations relating to subdivision access, development costs, and internal traffic circulation.

Although there may be other subdivision layouts which could be examined, the proposed subdivision layout is intended to best accommodate the needs of its tenants by providing a development which provides for convenient access, adequate infrastructure, compatibility with its existing surrounding environs and a sufficient range of lot sizes for true light industrial uses.

Chapter VII

Irreversible and Irretrievable Commitment of Resources

VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The proposed project will involve the commitment of fuel, labor, and material resources, as well as private funds.

Development of the proposed project will also involve the commitment of land for improvements which would preclude other land use options for the site. This commitment is consistent with existing and future land uses surrounding the project site.

Chapter VIII

Findings and Conclusions

VIII. FINDINGS AND CONCLUSIONS

The "Significance Criteria", Section 12 of the Administrative Rules, Title 11, Chapter 200, "Environmental Impact Statement Rules", were reviewed and analyzed to determine whether the proposed project will have significant impacts to the environment. The following analysis is provided:

1. ***No Irrevocable Commitment to Loss or Destruction of any Natural or Cultural Resource Would Occur as a Result of the Proposed Project***

   The project will not result in any adverse environmental impacts. There are no known, rare, endangered or threatened species of flora, fauna or avifauna located within the project site.

   An archaeological inventory survey encompassing the project site did not locate any cultural artifacts or human remains. However, due to the general cultural sensitivity of sand dune areas, an archaeological monitoring plan shall be submitted to the SHPD for review and approval prior to the start of construction activities. Should any artifacts or human remains be encountered during construction, work will stop in the immediate vicinity of the find and the SHPD and the Maui/Lanai Island Burial Council will be appropriately and immediately notified to establish an appropriate mitigation strategy.

2. ***The Proposed Action Would Not Curtail the Range of Beneficial Uses of the Environment***

   The proposed project and the commitment of land resources would not curtail the range of beneficial uses of the environment.

3. ***The Proposed Action Does Not Conflict with the State's Long-term Environmental Policies or Goals or Guidelines as Expressed in Chapter 334, Hawaii Revised Statutes***

The State's Environmental Policy and Guidelines are set forth in Chapter 344, Hawaii Revised Statutes. The proposed action is in consonance with the following policies and guidelines:

Environmental Policy:

(1) Conserve the natural resources, so that land, water, mineral, visual, air and other natural resources are protected by controlling pollution, by preserving or augmenting natural resources, and by safeguarding the State's unique natural environmental characteristics in a manner which will foster and promote the general welfare, create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of the people of Hawaii.

Guideline:

(2) Land, water, mineral, visual, air and other resources.

(F) Maintain an integrated system of state land use planning which coordinates the State and County general plans.

(5) Economic development.

(A) Encourage industries in Hawaii which would be in harmony with our environment.

* * *

(7) Energy.

(A) Encourage the efficient use of energy resources.

* * *

(10) Citizen participation.

* * *

(B) Provide for expanding citizen participation in the decision making process so it continually embraces more citizens and more issues.

4. ***The Economic or Social Welfare of the Community or State Would Not be Substantially Affected***

The proposed project would have a direct beneficial effect on the local economy during construction. In the long term, the proposed project will support the local economy through the contribution of salaries, wages, and benefits, as well as through the purchases of goods and services from local merchants and service providers.

5. ***The Proposed Action Does Not Affect Public Health***

No impacts to the public's health and welfare are anticipated as a result of the proposed project.

6. ***No Substantial Secondary Impacts, Such as Population Changes or Effects on Public Facilities are Anticipated***

No significant population changes are anticipated as a result of the proposed project.

From a land use standpoint, the proposed project is an enhancement of existing uses. In addition to BEI's existing onsite operations, the proposed project is compatible with surrounding light-industrial land uses in the vicinity such as the Maui Scrap Metal Recycling Facility and the Diversified Machinery, Maui Trucking, and Fong Construction baseyards.

The proposed improvements will hookup to existing County water and wastewater systems. No adverse impacts to water and wastewater capacities and facilities are anticipated. Onsite and offsite surface runoff are expected to be accommodated by the proposed drainage system improvements. The project is not expected to significantly impact public services such as police, fire, and medical services. Impacts upon

educational, recreational, and solid waste collection and disposal facilities and resources are considered minimal.

7. ***No Substantial Degradation of Environmental Quality is Anticipated***

During the construction phase of the project, there will be short-term air quality and noise impacts as a result of the project. In the long term, effects upon air quality and ambient noise levels should be minimal. The project is not anticipated to significantly affect the open space and scenic character of the area.

No substantial degradation of environmental quality resulting from the project is anticipated.

8. ***The Proposed Action Does Not Involve a Commitment to Larger Actions, Nor Would Cumulative Impacts Result in Considerable Effects on the Environment***

The proposed project does not involve a commitment to larger actions.

9. ***No Rare, Threatened or Endangered Species or Their Habitats Would be Adversely Affected by the Proposed Action***

There are no rare, threatened or endangered species of flora, fauna, avifauna or their habitats on the subject property.

10. ***Air Quality, Water Quality or Ambient Noise Levels Would Not be Detrimentally Affected by the Proposed Project***

Construction activities will result in short-term air quality and noise impacts. Dust control measures, such as regular watering and sprinkling, will be implemented to minimize wind-blown emissions. Noise impacts will occur primarily from construction-related activities. It is anticipated that construction will be limited to daylight working hours. Water quality is not expected to be affected.

In the long term, the project is not anticipated to have a significant impact on air and water quality or ambient noise levels.

11. ***The Proposed Project Would Not Affect Environmentally Sensitive Areas, Such as Flood Plains, Tsunami Zones, Erosion-prone Areas, Geologically Hazardous Lands, Estuaries, Fresh Waters or Coastal Waters***

The project is not located within and would not affect environmentally sensitive areas. The project site is not subject to flooding or tsunami inundation. Soils of the project site are not erosion-prone. There are no geologically hazardous lands, estuaries, or coastal waters within or adjacent to the project site.

12. ***The Proposed Action Would Not Substantially Affect Scenic Vistas and Viewplanes Identified in County or State Plans or Studies***

The project site is not identified as a scenic vista or viewplane. The proposed project will not affect scenic corridors and coastal scenic and open space resources.

13. ***The Proposed Action Would Not Require Substantial Energy Consumption***

The proposed project will involve the short-term commitment of fuel for equipment, vehicles, and machinery during construction activities. However, this use is not anticipated to result in a substantial consumption of energy resources. In the long term, the project will create an additional demand for electricity. However, this demand is not deemed substantive or excessive within the context of the region's overall energy consumption.

Based on the foregoing findings, it is concluded that the proposed action will not result in any significant impacts.

Chapter IX

Agencies Consulted During the Preparation of the Draft Environmental Assessment; Letters Received and Responses to Substantive Comments

IX. AGENCIES CONSULTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT; LETTERS RECEIVED AND RESPONSES TO SUBSTANTIVE COMMENTS

The following agencies were consulted during the preparation of the Draft Environmental Assessment. Agency comments and responses to substantive comments are also included in this section.

1. Linda Hihara-Endo, Acting Chief
Department of the Army
U.S. Army Engineer District, Honolulu
ATTN: Operation Division
Building T-1, Rm. 105
Fort Shafter, Hawaii 96858-5440

2. Neal S. Fujiwara, Soil Conservationist
Natural Resources Conservation Service
U.S. Department of Agriculture
210 Imi Kala Street, Suite 209
Wailuku, Hawaii 96793-2100

3. Brooks Harper
U. S. Fish and Wildlife Service
P.O. Box 50167
Honolulu, Hawaii 96850

4. Randall Ogata, Administrator
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

5. Michael Wilson, Director
State of Hawaii
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

6. Mr. Don Hibbard
Department of Land and Natural Resources
State Historic Preservation Division
33 South King Street, 6th Floor
Honolulu, Hawaii 96813

7. Kazu Hayashida, Director
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

8. Lisa M. Nuyen, Director
County of Maui
Department of Planning
250 South High Street
Wailuku, Hawaii 96793

9. Charles Jencks, Director
County of Maui
Department of Public Works and Waste Management
200 South High Street
Wailuku, Hawaii 96793

10. David Craddick, Director
County of Maui
Department of Water Supply
200 South High Street
Wailuku, Hawaii 96793

11. Ron Davis, Chief
Department of Fire Control
County of Maui
200 Dairy Road
Kahului, Hawaii 96732

12. Tom Phillips, Chief
County of Maui
Department of Police
55 Mahalani Street
Wailuku, Hawaii 96793

13. Robbie Ann A.K. Guard, Coordinator
County of Maui
Office of Economic Development
200 South High Street
Wailuku, Hawaii 96793

14. **Waikapu Community Association**
Attention: Warren Orikasa
65 W. Kaahumanu Avenue
Kahului, Hawaii 96732

15. **Waiolani Community Association**
Attention: John Henry
P.O. Box 1376
Wailuku, Hawaii 96793

Comments

SEP 0 2 1998

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

REPLY TO
ATTENTION OF

September 1, 1998

Civil Works Branch

Mr. Glenn Tadaki, Planner
Munekiyo, Arakawa, and Hiraga
305 High Street, Suite 104
Wailuku, Maui, Hawaii 96793

Dear Mr. Tadaki:

Thank you for the opportunity to review and comment on the Project Summary for the Waiko Baseyard Subdivision, Wailuku, Maui (TMK 3-5-2: por. 1). The following comments are provided in accordance with Corps of Engineers authorities to provide flood hazard information and to issue Department of the Army permits.

a. Based on Corps of Engineers references, a site visit will need to be conducted to determine if wetlands are present at the project site. For further information, please contact Ms. Lolly Silva of our Regulatory Section at (808) 438-9258 and refer to file number 980000297.

b. According to the enclosed Federal Emergency Management Agency's Flood Insurance Rate Map, panel number 150003 0190D (dated March 16, 1995), the project site is located in Zone C (areas of minimal flooding). For further information regarding the flood zone designation, please contact Ms. Jessie Dobinchick of our Engineering-Environmental Section at (808) 438-8876.

Sincerely,

Paul Mizue, P.E.
Chief, Civil Works Branch

Enclosure

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MAUI COUNTY, HAWAII

PANEL 190 OF 400
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
150003 0190 D

MAP REVISED:
MARCH 16, 1995

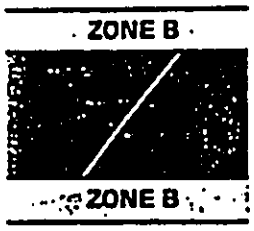
Federal Emergency Management Agency

KEY TO MAP

500-Year Flood Boundary ——————

100-Year Flood Boundary ——————

Zone Designations



100-Year Flood Boundary ——————

500-Year Flood Boundary ——————

Base Flood Elevation Line With Elevation In Feet** ——513——

Base Flood Elevation in Feet Where Uniform Within Zone** (EL 987)

Elevation Reference Mark RM7×

Zone D Boundary — — — — —

River Mile M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
AO	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Areas of special flood hazard (100-year flood) include Zones A, A1-30, AE, AH, AO, A99, V, V1-30 AND VE.

Certain areas not in the Special Flood Hazard Areas (zones A and V) may be protected by flood control structures.

Coastal base flood elevations apply only landward of the shoreline shown on this map.

For adjoining map panels, see separately printed Index to Map Panels.

INITIAL IDENTIFICATION:
DECEMBER 6, 1977

FLOOD HAZARD BOUNDARY MAP REVISIONS:

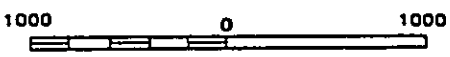
FLOOD INSURANCE RATE MAP EFFECTIVE:
JUNE 1, 1981

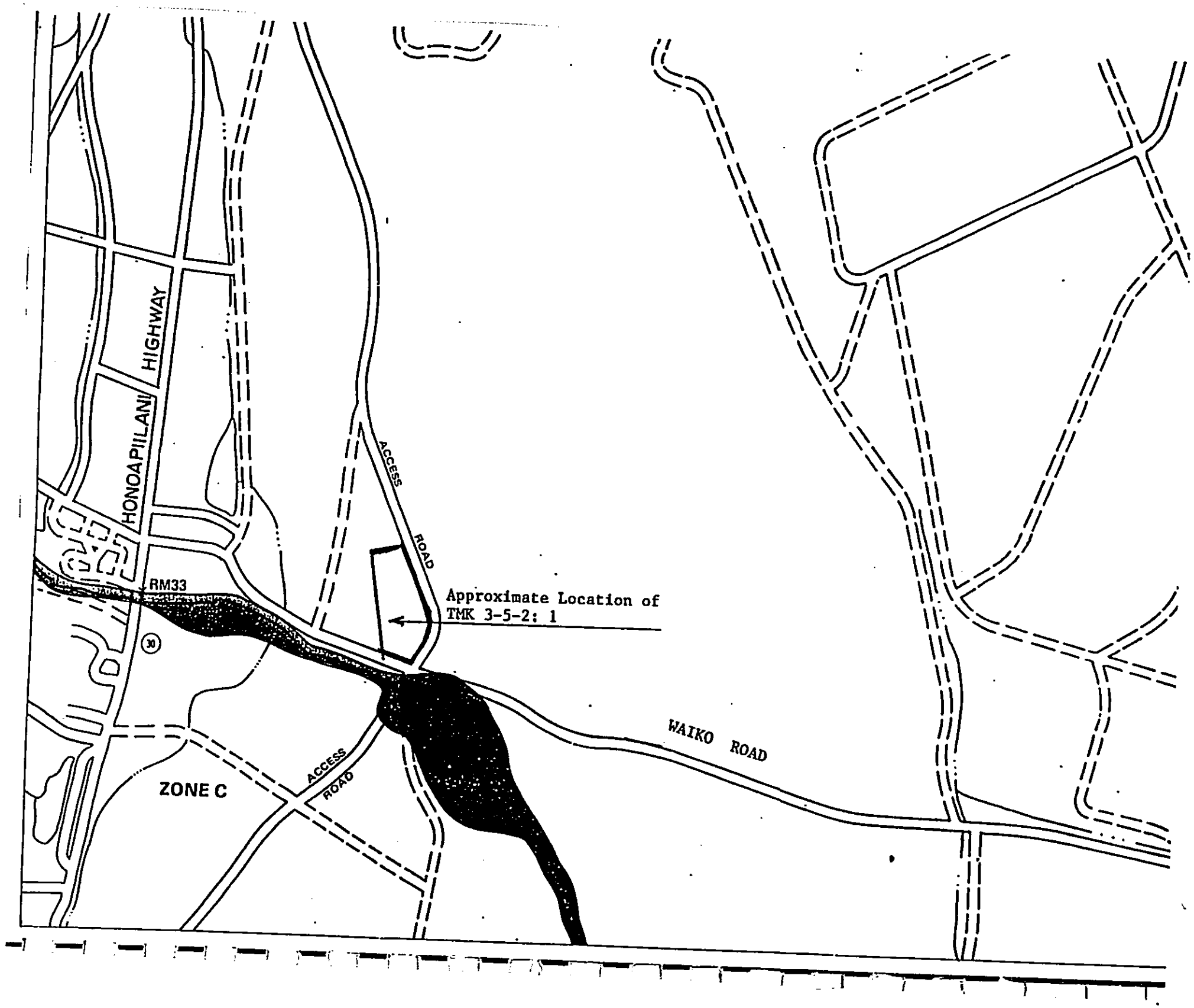
FLOOD INSURANCE RATE MAP REVISIONS:
SEPTEMBER 6, 1989

Map revised MARCH 16, 1995 to add base flood elevations, to change special flood hazard areas, and to include previously issued letters of map revision.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

APPROXIMATE SCALE IN FEET




HIGHWAY
HONOAPIILANI
ACCESS
ROAD
RM33
Approximate Location of
TMK 3-5-2: 1
ZONE C
ACCESS
ROAD
WAIKO ROAD

OCT 1 1 1998

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Boulevard, Room 3122
Box 50088
Honolulu, Hawaii 96850

In Reply Refer To: DH

SEP 10 1998

Glen Tadaki, Planner
Munekiyo, Arakawa & Hiraga, Inc.
305 High St., Suite 104
Wailuku, HI 96793

Re: Waiko Baseyard Subdivision, Wailuku, Maui, Hawaii

Dear Mr. Tadaki;

The U.S. Fish and Wildlife Service (Service) has reviewed the project summary for the development of a light industrial park and associated infrastructure within the Waiko subdivision (TMK 3-5-02:1) in Wailuku, Maui. The proposed project area covers 14.4 acres and is situated in fallow agricultural land adjacent to other administrative, storage, and maintenance facilities. The area is currently zoned as "Agricultural" and the solicitor Wailuku Agribusiness Company, Inc. (WACI) will apply for a zoning change to "Light Industrial." The Service offers the following comments for your consideration.

According to our records, no federally listed endangered or threatened species or other rare species are known to utilize the proposed site or areas adjacent to it. The project summary provided to us does not include adequate information on the fish and wildlife resources that exist at the proposed project site. The Service recommends that the Draft Environmental Assessment (DEA) include information on the proposed project and the existing fish and wildlife resources that is sufficient for evaluating the potential for project-related impacts to those resources. We also recommend that sequential mitigation be incorporated into the proposed project, including the avoidance of unnecessary impacts, the minimization of unavoidable impacts, and the compensation for significant, unavoidable impacts, and that this be documented in the DEA.

Waiko Baseyard Subdivision
Wailuku, Maui, Hawaii

The Service appreciates the opportunity to review the project summary and provide technical assistance on development of the DEA. If you have questions regarding these comments, please contact Fish and Wildlife Biologist Dave Hopper at 808/541-3441.

Sincerely,

Robert P. Smith
Pacific Island Manager

cc: DOFAW, Maui

SEP 14 1998

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

September 11, 1998

Mr. Glenn Tadaki, Planner
Munekiyo, Arakawa & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

PCR (98) 3

Re: Waiko Baseyard Subdivision

Dear Mr. Tadaki:

Thank you for the opportunity to provide preliminary comments on the Draft Environmental Assessment for the Waiko Baseyard Subdivision, TMK 3-5-02: por. 01. The project involves developing a light industrial subdivision on a 14.4-acre site in Waikapu, Maui.

We would like your Draft Environmental Assessment (DEA) to address specifically the possibility that native Hawaiian gathering rights may exist on the property. A recent Hawaii Supreme Court decision makes it clear that the existence of native rights must be addressed. We suggest that the preparers also seek expert opinion among the Hawaiian community about this issue.

Given the information provided in your letter and project summary, it is difficult for us to provide further detailed comments at this time. We do support and commend your effort to seek early input from interested parties, and we look forward to reviewing the DEA when it is completed.

Should you have any questions concerning our comments, please contact Richard Messier, Acting Land and Natural Resources Division Officer, or Nami Ohtomo, Acting Natural Resource Specialist at 594-1755. Please reference the document number, PCR (98) 3, noted at the top of this letter.

Sincerely,

Colin Kippen
Deputy Administrator

Richard Messier
Acting LNR Division Officer

cc: Board of Trustees
CAC, Island of Maui

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

September 8, 1998

Glenn Tadaki, Planner
Munekiyo, Arakawa and Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

LOG NO: 22186 ✓
DOC NO: 9809CD03

Dear Mr. Tadaki:

SUBJECT: **Chapter 6E-8, Historic Preservation Review Waiko Baseyard Subdivision**
Waikapu, Wailuku, Maui
TMK: 3-5-02:001 por

Thank you for the opportunity to comment on the proposed development of a light industrial subdivision and related infrastructure improvements.

Based on our records, the subject area appears likely to have been the location of pre-Contact agriculture and perhaps habitation. We have no record of known historic sites on this parcel. However, several archaeological inventory surveys, including both surface and sub-surface investigations have been conducted in the immediate vicinity of the proposed project area. None of these surveys found any evidence of historic sites (either surface features or sub-surface deposits). In addition, our records show that this area has been previously disturbed by previous construction and grading activity. Given these findings, it seems unlikely that significant historic sites are within the proposed project area. Therefore, we believe that this project will have "no effect" on such sites.

If human skeletal remains are encountered during construction, HRS Chapter 6E-43 requires that all work in the vicinity of the find cease and the State Historic Preservation Division be notified immediately.

If you have any questions please contact Cathleen Dagher at 587-0002.

Aloha,

Don Hibbard, Administrator
State Historic Preservation Division

CD:jen

BENJAMIN J. CAYETANO
GOVERNOR

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
BRIAN K. MINAAI
GLENN M. OKIMOTO

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

IN REPLY REFER TO:
STP 8.8794

September 8, 1998

Mr. Michael Munekiyo
President
Munekiyo, Arakawa, Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Attention: Mr. Glenn Tadaki

Dear Mr. Munekiyo:

Subject: Waiko Baseyard Subdivision
TMK: 3-5-02: por. 01

Thank you for your transmittal requesting our concerns regarding the subject development.

In general, the developer should be responsible for mitigating the impacts attributable to his development, and contribute towards required roadway improvements.

The specific requirements for improvements however, would be tied into the findings of a Traffic Impact Analysis Report (TIAR). The TIAR should reflect the subject development and other major developments in the area; identify the impacts to the transportation facilities, and recommend required mitigation measures, specifying those improvements to be provided by the developer.

While the proposed development is going through a zone change, other planned projects in the area have had conditions put on them under Special Use or Conditional Use permits. The developer is advised to coordinate with these developers to investigate the possibility of cost share arrangements.

We have no objections to the continued processing and scheduling of public hearings for the subject application.

We appreciate the opportunity to provide comments.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

c: Ms. Lisa M. Nuyen, Maui Department of Planning

LINDA LINGLE
Mayor

DAVID W. BLANE
Director

LISA M. NUYEN
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

CLAYTON I. YOSHIDA
Planning Division

AARON H. SHINMOTO
Zoning Administration and
Enforcement Division

September 2, 1998

Mr. Glenn Tadaki
Munekiyo, Arakawa & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Tadaki:

RE: Preliminary Comments on the Draft Environmental Assessment (EA) for the Proposed Waiko Baseyard Subdivision at TMK: 3-5-02:Por. of 1

Thank you for the opportunity to comment on the above draft EA. As you know, the Waiko Road area has been, and continues to be used by various companies through the State Land Use Commission Special Use Permit process as quasi-industrial area. The County of Maui has allowed these uses into the area under restrictive conditions. The primary uses in the area have been equipment/dead storage areas. These uses required limited improvements and generated minimal impacts to traffic, drainage, fire demand, or water use. Restrictive conditions generally do not allow for offices or general retailing.

Under the current L-1 Light Industrial zoning code, uses such as general retailing/commercial uses are permitted. As we have seen with the Wailuku and Kahului Industrial Areas and the Mill Yard, these industrial areas are filled with commercial/retail businesses. Often these general retailing/commercial uses generate higher volumes of traffic, sewer, and fire demands, and can pay high rent rates. Areas that were intended to be for "Industrial type use" are sometimes filled with shopping centers and mini-marts. As we have seen with businesses in the Waiko Road area, there is a demand for affordable equipment/dead storage areas.

We would encourage the applicant to look at establishing an industrial subdivision which can meet the needs of true industrial-type business.

Should you require further clarification, please contact Mr. Joseph W. Alueta, Staff Planner, of this office at 243-7735.

Sincerely,

for: LISA M. NUYEN
Director of Planning

LMN:JWA:cmh
c: Clayton Yoshida, AICP, Planning Program Administrator
Aaron Shinmoto, Planning Program Administrator
Joseph W. Alueta, Staff Planner
General File
S:\ALL\JOE\WAIKODRA.EA

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
AND WASTE MANAGEMENT
LAND USE AND CODES ADMINISTRATION
250 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

September 15, 1998

Mr. Glenn Tadaki
Munekiyo, Arakawa & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Tadaki:

SUBJECT: EARLY CONSULTATION
WAIKO BASEYARD SUBDIVISION
TMK (2) 3-5-002:001

We reviewed the subject submittal and have the following comments.

1. Waiko Road from Kuihelani Highway to the project site should be reconstructed to provide for a minimum two-lane roadway with a Type "A" structural section, street lights, traffic control devices, and other improvements, as reviewed and approved by the Department of Public Works and Waste Management, Engineering Division.

2. A detailed drainage master plan for this development including adjacent sites shall be submitted for our review and approval. All drainage improvements as determined by the drainage master plan and as directed by the County shall be constructed and paid for by the developer.

3. The proposed subdivision shall comply with the provisions of Title 18, Maui County Code, "Subdivisions," and the grading and construction shall comply with the provisions of Chapter 20.08, "Soil Erosion and Sedimentation."

If you have any questions, please call David Goode at 243-7845.

Sincerely,

for CHARLES JENCKS
Director of Public Works
and Waste Management

DG:co/mt
S:\LUCA\CZM\WAIKO.WPD

LINDA LINGLE
MAYOR

RONALD P. DAVIS
CHIEF

HENRY A. LINDO, SR.
DEPUTY CHIEF

COUNTY OF MAUI
DEPARTMENT OF FIRE CONTROL

200 DAIRY ROAD
KAHULUI, MAUI, HAWAII 96732
(808) 243-7561

August 31, 1998

Mr. Glenn Tadaki, Planner
Munekiyo, Arakawa & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

RE: Change in Zoning Requested by Wailuku Agribusiness, Inc.;
TMK: 3-5-02:por. 1; Waiko Baseyard Subdivision

Dear Mr. Tadaki,

The Department of Fire Control has no objection to granting the requested change in zoning. However, the department wishes to reserve the right to comment until plans and specifications are submitted for review for any and all construction or activity that is to occur on this property.

If you have any questions, direct them in writing to the Fire Prevetion Bureau, 21 Kinipopo Street, Wailuku, HI 96793.

Sincerely,

LEONARD F NIEMCZYK
Captain, FPB

MFD-FPB CIZ

SEP 14 1998

POLICE DEPARTMENT
COUNTY OF MAUI

LINDA LINGLE
MAYOR

55 MAHALANI STREET
WAILUKU, HAWAII 96793
(808) 244-6400
FAX (808) 244-6411

THOMAS PHILLIPS
CHIEF OF POLICE
CHARLES H.P. HALL
DEPUTY CHIEF OF POLICE

OUR REFERENCE
RN:at
YOUR REFERENCE

September 8, 1998

Mr. Glenn Tadaki, Planner
Munekiyo, Arakawa & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Tadaki:

SUBJECT: Waiko Baseyard Subdivision
TMK 3-5-02:por. 01

Thank you for your letter of August 24, 1998 requesting input regarding the above subject.

After reviewing the project summary, we would like to recommend that the roadway be in adequate condition to accommodate any vehicle, truck, or machinery associated with the construction of the subdivision. Also, that proper lighting, fencing, environmental designs to help discourage criminal activity due to remoteness of the area be considered.

Thank you for giving us the opportunity to comment on the proposed project.

Very truly yours,

THOMAS M. PHILLIPS
Chief of Police

Responses

MUNEKIYO, ARAKAWA & HIRAGA, INC.

September 30, 1998

Charles Jencks, Director
Department of Public Works
and Waste Management
County of Maui
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: Waiko Baseyard Subdivision
TMK 3-5-02: por. 01

Dear Mr. Jencks:

Thank you for your September 15, 1998 letter concerning the proposed project, as well as for meeting with us on September 29, 1998 to discuss your comments. As discussed, Wailuku Agribusiness Company, Inc. will participate in addressing improvement requirements to Waiko Road (from the project site to Kuihelani Highway) in coordination with the Department of Public Works and Waste Management. In particular, we look forward to working with you in formulating a fair-share methodology which partners the County, Wailuku Agribusiness Company, Inc. and other area users to ensure that Waiko Road can be improved in a manner which advances the rational nexus concept.

A Drainage and Soil Erosion Control Report will be included in the Draft Environmental Assessment for the proposed project to address drainage issues. In addition, the project will also comply with the applicable provisions of the Maui County Code pertaining to "Subdivisions" and "Soil Erosion and Sedimentation".

Thank you again for commenting on the proposed project.

Sincerely,

Glenn Tadaki, Planner

GT:to
cc: Avery Chumbley, Wailuku Agribusiness Co., Inc.
Warren S. Unemori, Warren S. Unemori Engineering, Inc.
wac/wacbayd/dpwwmltr.001

Planning • Environmental Studies • Project Management
305 High Street, Suite 104 • Wailuku, Hawaii 96793 • Phone: (808) 244-2015 • Fax: (808) 244-8729

Chapter X

Letters Received During the Draft Environmental Assessment Public Comment Period and Responses to Substantive Comments

X. LETTERS RECEIVED DURING THE DRAFT ENVIRONMENTAL ASSESSMENT PUBLIC COMMENT PERIOD AND RESPONSES TO SUBSTANTIVE COMMENTS

LETTERS RECEIVED DURING THE DRAFT ENVIRONMENTAL ASSESSMENT PUBLIC COMMENT PERIOD AND RESPONSES TO SUBSTANTIVE COMMENTS		
Federal Agencies	**Date of Letter**	**Status of Response**
Natural Resources Conservation Service - Maui	11/12/98	NRR
U.S. Fish and Wildlife Service	11/27/98	NRR
State Agencies	**Date of Letter**	**Date of Response**
Department of Health - Maui	12/1/98	NRR
Department of Transportation	12/29/98	RP
Department of Land and Natural Resources - Honolulu	12/2/98	NRR
State Land Use Commission	11/12/98	RP
Office of Environmental Quality Control	12/8/98	RP
Office of Planning	12/21/98	RP
Office of Hawaiian Affairs	12/28/98	NRR
Department of Hawaiian Home Lands	11/19/98	NRR
Department of Labor and Industrial Relations	12/2/98	NRR

LETTERS RECEIVED DURING THE DRAFT ENVIRONMENTAL ASSESSMENT PUBLIC COMMENT PERIOD AND RESPONSES TO SUBSTANTIVE COMMENTS*		
County Agencies	***Date of Letter***	***Status of Response***
Department of Water Supply	12/30/98	NRR
Department of Fire Control	11/18/98	NRR
Department of Police	11/23/98	NRR
Others	***Date of Letter***	***Date of Response***
Maui Electric Company, Ltd.	11/24/98	NRR
RP - Response Provided NRR - No Response Required		

Pursuant to the requirements of the environmental review process, comments received from the above-referenced agencies and utilities as well as responses to substantive comments, are included in this section.

DRAFT ENVIRONMENTAL ASSESSMENT COMMENT LETTERS

United States
Department of
Agriculture

Natural
Resources
Conservation
Service

420 Imi Kala St.
Suite 209
Wailuku, HI
96793-2100

Our People...Our Islands...In Harmony

98 NOV 13 P1:11

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

DATE: November 12, 1998

Ms. Lisa M. Nuyen, Director
Department of Planning
County of Maui
250 S. High Street
Wailuku, Hawaii 96793

Dear Ms. Nuyen,

SUBJECT: Waiko Baseyard Subdivision
TMK: 3-5-002: port. of 1
I.D. CPA 980003, DBA 980010, CIZ 980022

I have reviewed the subject application and have no comment to offer.

Thank you for the opportunity to comment.

Sincerely,

Neal S. Fujiwara
District Conservationist

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Boulevard, Room 3122
Box 50088
Honolulu, Hawaii 96850

In Reply Refer To: DH

NOV 27 1998

Ann T. Cua, Staff Planner
Dept. of Planning, Maui County
250 S. High St., Suite 104
Wailuku, HI 96793

Re: Application for District Boundary Amendment, Community Plan Amendment, and Zoning Change, Waiko Baseyard Subdivision, Wailuku, Maui, Hawaii

Dear Ms. Cua:

The U.S. Fish and Wildlife Service (Service) has reviewed the project summary and Environmental Assessment (EA) for the development of a light industrial park and associated infrastructure in the above referenced application. The project sponsor is the Maui County Department of Planning. The proposed project area covers 14.4 acres and is situated in fallow agricultural land adjacent to other administrative, storage, and maintenance facilities. The area is currently zoned as "Agricultural" and the application is for a zoning change to "Light Industrial." The Service offers the following comments for your consideration.

The Service feels that the EA adequately identifies the fish and wildlife resources that exist at the proposed project site and that the proposed project will not have significant impacts to most of these resources in the area. However, the EA states that low-impact outdoor lighting will only be "considered." For the applicant to minimize unavoidable impacts to fish and wildlife, only lighting that has been shown to minimize impacts to migratory seabirds should be used in the development, and this measure should be described in the EA.

Information on the protection of migratory Hawaiian seabirds may be obtained from the Hawaii Division of Forestry and Wildlife. Provided that the project-related lighting is constructed to minimize impacts to seabirds, the Service would concur with a Finding of No Significant Impact (FONSI) for the proposed project.

Waiko Baseyard Subdivision
Wailuku, Maui, Hawaii

The Service appreciates the opportunity to comment on this EA. If you have questions regarding these comments, please contact Fish and Wildlife Biologist Dave Hopper at 808/541-3441.

Sincerely,

for Robert P. Smith
Pacific Island Manager

cc: DOFAW, Maui

BENJAMIN J. CAYETANO
GOVERNOR

LAWRENCE MIIKE
DIRECTOR OF HEALTH

ALFRED M. ARENSDORF, M.D.
DISTRICT HEALTH OFFICER

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, MAUI, HAWAII 96793

'98 DEC -1 P3:21

December 1, 1998

Ms. Lisa M. Nuyen
Director
Planning Department
County of Maui
250 South High Street
Wailuku, Hawai'i 96793

Dear Ms. Nuyen:

Subject: Waiko Baseyard Subdivision
TMK: (2) 3-5-002:001, 3-5-002:por. 1
CPA 980003, DBA 980010, CIZ 980022

Thank you for the opportunity to comment on the proposed project. We have the following comments to offer:

1. The noise created during the construction phase of the project may exceed the maximum allowable levels as set forth in Hawaii Administrative Rules, Chapter 11-46, "Community Noise Control". A noise permit may be required and should be obtained prior to the commencement of work.

2. Any construction discharge into state waters (Waikapu Stream) will require a National Pollutant Discharge Elimination System (NPDES) permit coverage.

Should you have any questions, please call me at 984-8230.

Sincerely,

HERBERT S. MATSUBAYASHI
District Environmental Health Program Chief

BENJAMIN J. CAYETANO
GOVERNOR

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
BRIAN K. MINAAI
GLENN M. OKIMOTO

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

IN REPLY REFER TO:

STP 8.8947

December 29, 1998

Ms. Lisa M. Nuyen
Director
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

'99 JAN -5 P12:23

Dear Ms. Nuyen:

Subject: Waiko Baseyard Subdivision
Community Plan Amendment (CPA 980003)
District Boundary Amendment (DBA 980010)
Change in Zoning (CIZ 980022)
TMK: 3-5-2: 001, 3-5-002: Por. 1

Thank you for your transmittal requesting our comments on the subject project.

The concerns stated in our letter of September 8, 1998, STP 8.8794 to Munekiyo, Arakawa, Hiraga, Inc. regarding the subject development was not adequately addressed in the subject applications.

The Traffic Impact Analysis Report (TIAR) failed to identify the impact(s) the subject development and the other major developments in the area would cumulatively have on our transportation facilities. Furthermore, the TIAR did not recommend mitigation measures to address these impacts, nor did it specify those improvements that would be attributable to and provided by the Waiko Baseyard Subdivision developer.

Other developments in the area have had conditions placed on them under Special and Conditional Use permits. The developer should investigate, and if feasible, coordinate and arrange for the cost sharing of overlapping improvements.

We also would like to reiterate our concern about the piecemeal development of the Waikapu area. Our recommendation would be to develop a master plan of the area to determine the local and regional infrastructure improvements needed to accommodate the various projects and promote equitable cost sharing and optimize partnering opportunities.

We appreciate the opportunity to provide comments.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

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

'98 DEC -3 P12:45

DEC - 2 1998

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND DIVISION
STATE PARKS
WATER RESOURCE MANAGEMENT

REF: PS:EH

Ms. Lisa M. Nuyen, Director
Department of Planning
County of Maui
250 South High Street
Wailuku, Maui, HI 96793

Dear Ms. Nuyen:

Subject: Waiko Baseyard Subdivision Application for District Boundary Amendment and Change in Zoning

We have reviewed the subject application and have no comments or objection to the proposed project.

Thank you for the opportunity to review this matter.

Very truly yours,

Dean Uchida,
Administrator

7071

BENJAMIN J. CAYETANO
GOVERNOR

ESTHER UEDA
EXECUTIVE OFFICER

'98 NOV 16 P1:01

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
P.O. Box 2359
Honolulu, HI 96804-2359
Telephone: 808-587-3822
Fax: 808-587-3827

November 12, 1998

Ms. Lisa M. Nuyen
Director of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Dear Ms. Nuyen:

Subject: Application for District Boundary Amendment (DBA 980010), Community Plan Amendment (CPA 980003), and Change in Zoning (CIZ 980022), Waiko Baseyard Subdivision, TMK 3-5-02: por. 1

We have reviewed the application for the subject approvals forwarded by your transmittal dated November 5, 1998, and have the following comments:

1) We confirm that the project site, as represented on Figure 8 of the Draft Environmental Assessment (DEA), is designated within the State Land Use Agricultural District. We note that Figure 8 does not reflect the area along Honoapiilani Highway, immediately south of Waikapu, which was urbanized under County Docket No. 91/DBA-004 Maui Tropical Plantation.

2) As pointed out in the DEA, the project site is located in proximity to several light industrial related uses, including the 31.16-acre Fong Construction Baseyard, which the Commission approved by special permit in LUC Docket No. SP94-387/Fong Construction pursuant to Findings of Fact, Conclusions of Law, and Decision and Order dated September 19, 1995, subject to 24 conditions.

By Order Granting Request for a Time Extension dated July 21, 1997, the Commission approved a time extension to the period by which the applicant was required to initiate construction of the baseyard. It is our understanding that the applicant has requested another

time extension, which request is pending before the Planning Commission.

3) The DEA notes that the project site currently includes administrative offices, storage, dormitory and maintenance buildings, and commercial and warehouse facilities. According to our records, these uses were approved under County special use permits 90/SUP-004 (Wailuku Agribusiness) and 88/SUP-010 (C. Brewer Properties), both of which are still active. Clarification should be provided regarding the disposition of these permits and respective uses in the event the proposed reclassification of the project site is approved.

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

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

Sincerely,

ESTHER UEDA
Executive Officer

EU:th

BENJAMIN J. CAYETANO
GOVERNOR

DEC 0 7 1998

GARY GILL
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

December 8, 1998

Ms. Lisa M. Nuyen, Director
Planning Department
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Dear Ms. Nuyen:

Subject: Draft Environmental Assessment for Waiko Baseyard Subdivision, Maui

Thank you for the opportunity to review the subject document. We have the following comments and questions.

1. This project will develop a light industrial subdivision above well-drained soils near the boundary of Kahului Aquifer and Iao Aquifer. Iao Aquifer is the most important aquifer in Maui for drinking water supply. Please describe the likelihood of pollutants from industrial activities leaching into the above aquifers. Discuss mitigation measures that will minimize this impact.

2. Please describe the range of activities that are allowable in Maui County's M-1, Light Industrial District.

3. The proposed light industrial subdivision will be visible from Waiko Road. We recommend landscaping with native Hawaiian plants to reduce the visual impacts.

4. The water demand for this project is expected to range from 45,000 to 73,500 gallons per day. Existing water withdrawal from the Iao Aquifer is approximately equivalent to its sustainable yield. Please describe the source of water for this project and how is would impact the Iao Aquifer.

5. The project is located next to Waikapu Stream. Please provide details of the Best Management Practice (BMP) procedures that will be implemented to minimize water quality impacts on Waikapu Stream.

6. The proposed subdivision will range in size from 14,000 square feet to 2.8 acres. Please consider applying sustainable building techniques as presented in the enclosed draft "Guidelines for Sustainable Building Design in Hawaii." In the final EA include a description of any of the techniques you will implement.

Thank you for your consideration of this matter. Should you have any questions, please call Jeyan Thirugnanam at 586-4185.

Sincerely,

Gary Gill
Director

c: Munekiyo and Arakawa
Wailuku Agribusiness, Company

DEPARTMENT OF BUSINESS,
ECONOMIC DEVELOPMENT & TOURISM

OFFICE OF PLANNING
235 South Beretania Street, 6th Flr., Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

BENJAMIN J. C E
SEIJI F.
DIRI
BRADLEY J. M S

DIRECTOR, OFFICE OF PLA

Tel.: (808) 5
Fax: (808) 5

'98 DEC 30 P12:29

Ref. No. P-7857

December 21, 1998

Ms. Lisa M. Nuyen
Director of Planning
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 97693

Dear Ms. Nuyen:

Subject: CP 980003, DBA 980010, CIZ 98022
Waiko Baseyard Subdivision
Wailuku Agribusiness Co., Inc.
TMK: 3-5-002:001, 3-5-002: Por. 1, Waikapu, Maui

The Office has reviewed the subject application for a State Land Use District Boundary Amendment, Community Plan Amendment, and Change in Zoning to establish a light industrial subdivision on approximately 14.4 acres on Waiko Road, Waikapu, Maui. The parcel is classified in the State Agricultural Land Use District and is designated Agriculture on the existing Wailuku-Kahului Community Plan maps.

The application proposes to establish 19 developable light industrial lots, ranging in size from approximately 13,864 square feet to 2.8 acres, for activities such as baseyard, repair, service, storage, and maintenance operations and facilities. The parcel was formerly cultivated in sugar and pineapple, but is now fallow. The parcel has been the site of sand quarrying operations as well. The application indicates Wailuku Agribusiness Company, Inc. (WACI) and C. Brewer Homes offices, Brewer Environmental Industries facilities, and WACI support buildings are located on the site. These facilities will be incorporated in the proposed subdivision.

The proposed project will front Waiko Road, a two lane County road intersecting two major arterials, Honoapiilani Highway and Kuihelani Highway, serving Wailuku and Kahului respectively. On the south side of Waiko Road, across from the property, are lands in sugar cultivation and Waikapu Stream which drains toward Kealia Pond. Several light industrial facilities and baseyards have located along or in the vicinity of Waiko Road. Most of these have been permitted to operate in the Agricultural District by Special Permits and Conditional Use Permits.

The closest residential community lies approximately a half-mile to the west, with approved residential projects being developed in the northerly and northeasterly direction. These existing and planned communities currently represent the southernmost reaches of the Wailuku-Kahului planned urban area. It is our understanding that agricultural lands in the project area are being

considered for urban designation in the Wailuku-Kahului Community Plan revision process currently underway.

The Office has a number of concerns regarding the application, some of which have been raised in agency letters included in the application document. Our primary concern is for the long-range land use policy for industrial uses in the Wailuku-Kahului region. The Planning Department's letter in the application document refers to the displacement of industrial users due to the establishment of commercial and retail uses in existing industrial areas. This situation has been cited by applicants seeking special permits for low cost facilities for baseyards and light industrial uses on agricultural lands outside the Wailuku-Kahului urbanized area. We are very concerned by the incremental and unplanned conversion of prime agricultural land that is resulting from this process.

Should it be determined that industrial use is desired and acceptable to the community at this location and the application is approved, we recommend the following be considered to ensure that the area serves the long-term needs of industrial users and avoids further encroachment on agricultural lands:

1) Require the execution of covenants or other deed, lease or license provisions restricting use of the project's lots to industrial or light industrial uses, and requiring best management practices in the storage, handling, and disposal of environmental contaminants;

2) Establish effective means by which the applicant and other industrial tenants in the area can cost-share in the construction of improvements to roads, drainage, etc., necessary to adequately service industrial uses and ensure public health and safety (In their comment letter in the application document, the State Department of Transportation identifies a need for Waiko Road improvements, particularly at the intersection with Kuihelani Highway.); and

3) Master plan the Waiko Road area for industrial use to ensure appropriate infrastructure to support industrial uses and provide for open space and transitional land uses to buffer neighboring residential areas from the deleterious impacts of industrial activities.

The applicant should also ensure that the proposed drainage system will be designed and constructed so that stormwater runoff and other discharges do not enter Waikapu Stream. We defer to the State Historic Preservation Division as to appropriate measures regarding the potential for human burials on the site.

Thank you for the opportunity to review and comment on the application.

Sincerely,

Bradley J. Mossman
Director
Office of Planning

cc: Ms. Esther Ueda, LUC

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

'98 DEC 31 P12:53

December 28, 1998

Lisa M. Nuyen
Director of Planning
County of Maui
Department of Planning
250 So. High Street
Wailuku, Hawai'i 96793

PA 161

Re: I.D.: CPA 980003, DBA 980010, CIZ 980022; Waiko Baseyard Subdivision, TMK: 3-5-2:001and 3-5-2: por 1

Dear Ms. Nuyen:

Thank you for the opportunity to review Wailuku Agribusiness' permit application for its Waiko Baseyard. We have no comments on the project at this time. If you have any questions, or need to forward any additional information, please contact Lynn Lee, EIS Planner at 594-1936.

Sincerely

Colin Kippen
Deputy Administrator

C. Sebastian Aloot
Land and Natural Resources Division Officer

cc: Board of Trustees
Maui Community Affairs Office

BENJAMIN J. CAYETANO
GOVERNOR
STATE OF HAWAII

KALI WATSON
CHAIRMAN
HAWAIIAN HOMES COMMISSION

JOBIE M. K. M. YAMAGUCHI
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAII 96805

'98 NOV 24 P12:07

November 19, 1998

Ms. Lisa M. Nuyen, Planning Director
County of Maui, Department of Planning
250 South High Street
Wailuku, Maui, Hawaii 96793

Attn: Ann Cua

Dear Ms. Nuyen:

Subject: Waiko Baseyard Subdivision, CPA 980003, DBA 980010, CIZ 980022, TMK 3-5-2:01, 3-5-2:01 por., Wailuku, Maui, Dated October, 1998

Thank you for the opportunity to review the subject application. The Department of Hawaiian Home Lands has no comment to offer.

If you have any questions, please call Daniel Ornellas at 586-3837.

Aloha,

for KALI WATSON, Chairman
Hawaiian Homes Commission

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LABOR AND INDUSTRIAL RELATIONS
830 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

MAUI PLANNING DEPARTMENT
98 DEC -3 P12:45
LISA UON CLAY

December 2, 1998

Ms. Ann Cua
Staff Planner
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Dear Ms. Cua:

Thank you for providing the Department of Labor and Industrial Relations (DLIR) the opportunity to comment on the Application for District Boundary Amendment, Community Plan Amendment, and Change in Zoning for the proposed Waiko Baseyard Subdivision.

According to the document provided, workers will be needed during the construction phase of the proposed project. Maui County's economy has slowed down the past several years and has caused the construction industry to lose over 1,000 jobs from 1991 to 1997. This project will help support the industry and Maui's economy by providing the county with much-needed construction opportunities. The project will also support construction-related services and suppliers. One a long-term basis, businesses opening in the light industrial subdivision will create additional jobs, and this will benefit Maui's economy. The department would like to offer its assistance in recruiting job applicants to fill the positions through its various employment and training agencies.

If you have any questions or need additional information, please call Ms. Naomi Harada, Chief of DLIR's Research and Statistics Office, at (808) 586-8999.

Very truly yours,

for Lorraine H. Akiba
Director

Subject I D CPA 980003, DBA 980010, CIZ 980022
TMK 3-5-002 001, 3-5-002 Por 1

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-7109
Telephone (808) 243-7816 • Fax (808) 243-7833

'98 DEC 31 P2:34

December 30, 1998

Ms. Lisa Nuyen
County of Maui
Planning Department
250 South High Street
Wailuku, Maui, Hawaii 96793

Re: I.D.: CPA 980003, DBA 980010, CIZ 980022
TMK: 3-5-:02:001, 3-5-02: Por. 1
Project Name: Waiko Baseyard Subdivision

Dear Ms. Nuyen,

Thank you for the opportunity to comment on this application. We provide these comments and general concerns:

DWS standards require reservoir capacity to meet maximum day rate plus fire flow for duration of fire for 3/4 full reservoir. The available storage may be inadequate to serve this project. Domestic, fire, and irrigation calculations will be reviewed in detail during the subdivision and building permit process. The applicant is recommended to contact our Engineering Division at 243-7835 as soon as possible to discuss these issues.

As stated in the Preliminary Engineering Report, we have no water lines or fire protection facilities serving the subject property. The applicant will be subject to DWS rules and regulations for providing adequate fire protection and water service.

Our water system, in this vicinity, is the Central Maui System. The major source of water for this system is the Iao Aquifer. Rolling annual average groundwater withdrawals from the Iao Aquifer as of December1, 1998 were 17.894 MGD. The regulatory sustainable yield of this aquifer is 20 MGD. On August 13, 1997, the State Commission on Water Resource Management (CWRM) elected not to designate Iao Aquifer as a State Groundwater Management Area. However, if rolling annual average withdrawals exceed 20 mgd, CWRM will designate Iao Aquifer. Two wells in North Waihee were brought on-line in

July 1997. The Department is continuing to implement a plan to bring new sources on-line and to mitigate withdrawals. No moratorium is currently in effect. Nevertheless, the applicants should be made aware that the timing of this project may be affected with possible delays until new sources can be brought on-line. No guarantee of water is granted or implied as a result of these comments or the approval of the requested permits. Water availability will be reviewed at the time of application for meter or meter reservation.

This project overlies the Kahului Aquifer System. In order to protect the aquifer, DWS recommends that the applicant utilize Best Management Practices (BMPs) designed to minimize infiltration from construction activities and various base yard functions after construction. We have attached sample BMPs for principle operations for reference. Additional information is available from the State Department of Health.

At the time of development, various water resource conservation measures should be considered. The applicant should refer to the attached documents and consider these measures:

Utilize Low-Flow Fixtures and Devices: Maui County Code Subsection 16.20.675 requires the use of low flow water fixtures and devices in faucets, showerheads, urinals, water closets and hose bibs. Water conserving washing machines, ice-makers and other units are also available, and can help cut back on water bills.

Maintain Fixtures to Prevent Leaks: A simple, regular program of repair and maintenance can prevent the loss of hundreds or even thousands of gallons a day. Refer to the attached handout, "The Costly Drip". The applicant should establish a regular maintenance program.

Use Appropriate Plants: For landscaping of expansion site, consider using appropriate plants. The project is located in Maui County planting zone 3 and 4. Native plants, adapted to the area, conserve water and further protect the watershed from degradation due to invasive alien species. Please refer to attached list of native and Polynesian plant species.

Prevent Over-Watering By Automated Systems: If irrigation is intended, provide rain-sensors on all automated irrigation controllers. Check and reset controllers at least once a month to reflect the monthly changes in evapotranspiration rates at the site. As an alternative, provide the more automated, soil-moisture sensors on controllers.

If you have any questions, please contact the Water Resource Planning Division anytime, at 243-7199.

Sincerely,

David Craddick
Director

emk

cc. Engineering Division
Applicant, with attachments:

Sample BMPs from "Water Quality Best Management Practices Manual for Commercial and Industrial Businesses."

Sample BMPs from "Guidance Specifying Management Measures For Sources of Nonpoint Pollution In Coastal Waters"

References for Further Reading from "The Megamanual - Nonpoint Souce Management Manual". Commonwealth of Massachusetts

"The Costly Drip"

"Some of Maui's Native and Polynesian Plants" - Island of Maui

Maui County Department of Water Supply, "Plant Zones."

Ordinance 2108 - An ordinance amending Chapter 16.20 of the Maui County Code, pertaining to the plumbing code"

XERISCAPE - Water Conservation through Creative Landscaping"

A Checklist of Water Conservation Ideas For Golf Courses and Industrial Landscapes

LINDA CROCKETT LINGLE
MAYOR

RONALD P. DAVIS
CHIEF

HENRY A. LINDO, SR.
DEPUTY CHIEF

'98 NOV 19 P4:07

COUNTY OF MAUI
DEPARTMENT OF FIRE CONTROL

200 DAIRY ROAD
KAHULUI, MAUI, HAWAII 96732
(808) 243-7561

November 18, 1998

Ms Ann T. Cua, Staff Planner
County of Maui, Department of Planning
250 South High Street
Wailuku, HI 96793

RE: Waiko Baseyard Subdivision; TMK: 3-5-02:01, 3-5-02:por. 1;
CPA 980003, DBA 980010; CIZ 980022

Dear Ms Cua,

Thank you for the opportunity to comment on the Waiko Baseyard Subdivision.

The Department of Fire Control has no objection to granting the various permits applied for by the applicant. However, the department still wishes to reserve the right to comment on any and all plans and specifications submitted for a building permit or building permit waiver.

If you have any questions, you may contact me at extension 7568.

Sincerely,

LEONARD F NIEMCZYK
Captain, Fire Prevention Bureau

cc: Inspector L. Dunn

MFD-Waiko Baseyard (11.98)

POLICE DEPARTMENT
COUNTY OF MAUI

LINDA LINGLE
MAYOR

55 MAHALANI STREET
WAILUKU, HAWAII 96793
(808) 244-6400
FAX (808) 244-6411

'98 NOV 24 P2:45

THOMAS M. PHILLIPS
CHIEF OF POLICE
CHARLES H.P. HALL
DEPUTY CHIEF OF POLICE

OUR REFERENCE
at
YOUR REFERENCE

November 23, 1998

MEMORANDUM

TO : **DIRECTOR, PLANNING DEPARTMENT**

FROM : **THOMAS M. PHILLIPS, CHIEF OF POLICE**

SUBJECT : **I.D.: CPA 980003, DBA 980010, CIZ 980022**
TMK: 3-5-002:001, 3-5-002:Por. 1
Project Name:Waiko Baseyard Subdivision
Applicant: Wailuku Agribusiness Co., Inc.
Avery B. Chumbley, President

/ **No recommendation or special condition is necessary or desired.**

___ **Refer to attachment(s).**

for: **THOMAS M. PHILLIPS**
Chief of Police

Maui Electric Company, Ltd. • 210 West Kamehameha Avenue • P O Box 398 • Kahului, Maui, HI 96733-6898 • (808) 871-8461

'98 NOV 25 P12:31

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

November 24, 1998

Ms. Lisa Nuyen
Director of Planning
County of Maui
Department of Planning
250 So. High Street
Wailuku, HI 96793

Dear Ms Nuyen:

Subject: Waiko Baseyard Subdivision
CPA 980003, DBA 980010, CIZ 980022
(TMK: 3-5-002:001, 3-5-002:Por. 1)

Thank you for allowing us to comment on the subject project.

In reviewing the information transmitted and our records, Maui Electric Company (MECO) at this time has no objections to the proposed project.

MECO encourages that the project's consultant meet with us as soon as practical so that we may plan for the project's electrical requirements.

If you have any further questions or concerns, please call Fred Oshiro at 872-3202.

Sincerely,

Edward Reinhardt

Edward Reinhardt
Manager, Engineering

ER/fo:lkh

DRAFT ENVIRONMENTAL RESPONSE LETTERS

MUNEKIYO, ARAKAWA & HIRAGA, INC.

January 29, 1999

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

SUBJECT: Waiko Baseyard Subdivision
TMK 3-5-02: por. 01

Dear Mr. Hayashida:

Thank you for your December 29, 1998 letter commenting on the subject project. In response to your comments, we would like to note that the Traffic Impact Analysis Report (TIAR) included recommendations for improvements to Waiko Road and concluded that the proposed project is not expected to have a significant impact on the Department of Transportation's (DOT) facilities.

It should be noted that the proposed project addresses the existing and future need for the development of appropriately designated industrial land uses in the Waiko Road area, as well as concerns regarding the incremental development of properties in the area through the Special Use Permit (SUP) approval process.

In addition, coordination between Wailuku Agribusiness and the Maui County Departments of Planning and Public Works and Waste Management will be continued to discuss effective means by which the applicant and other industrial users in the area can master plan and cost-share in the construction of infrastructure improvements in the project area.

Planning • Environmental Studies • Project Management
305 High Street, Suite 104 • Wailuku, Hawaii 96793 • Phone: (808) 244-2015 • Fax: (808) 244-8729

Thank you for expressing your interest in the proposed project. Please feel free to contact us should you have any questions or require additional information.

Sincerely,

Glenn Tadaki, Planner

GT:to
cc: Avery Chumbley, Wailuku Agribusiness Company, Inc.
Wayne Yoshioka, Parsons Brinckerhoff
Warren Unemori, Warren S. Unemori Engineering, Inc.
Ann Cua, Planning Department

wacl/wacibeyd/dothr.001

MUNEKIYO, ARAKAWA & HIRAGA, INC.

December 24, 1998

Esther Ueda, Executive Office
Land Use Commission
Dept. of Business, Economic
Development & Tourism
P.O. Box 2359
Honolulu, Hawaii 96804-2359

SUBJECT: Waiko Baseyard Subdivision
DBA 98-0010; CPA 98-0003; CIZ 98-0022
TMK 3-5-02: por. 01

Dear Ms. Ueda:

Thank you for your letter of November 12, 1998 commenting on the proposed project. With regard to the disposition of the Land Use Commission Special Use Permits (SUP) granted by the County of Maui (SUP 88-010, SUP 90-004) we would like to note the following.

The SUP for the relocation of C. Brewer Properties offices to the Wailuku Agribusiness baseyard (SUP 88-010) will be extinguished once the subject's District Boundary Amendment (DBA), Community Plan Amendment (CPA), and Change in Zoning (CIZ) are approved.

The SUP granted to Wailuku Agribusiness for the operation of a commercial garage for the repair, storage, and maintenance of heavy trucks and equipment (SUP 90-004) was rescinded on November 12, 1996 when the Maui Planning Commission approved a SUP for the relocation of Brewer Environmental Industries (BEI) administrative, commercial, and warehouse operations to the structure housing the commercial garage operations (which had been terminated by then). The SUP for BEI's operations (SUP 96-004) will also be extinguished upon approval of the DBA, CPA, and CIZ requests. In approving SUP 96-004, the Maui Planning Commission has required that a DBA, CPA, and CIZ be obtained prior to the expiration of the SUP on October 31, 2001.

Planning • Environmental Studies • Project Management
305 High Street, Suite 104 • Wailuku, Hawaii 96793 • Phone: (808) 244-2015 • Fax: (808) 244-8729

Thank you for expressing your interest in the proposed project. Please feel free to contact us should you have any questions or require additional information.

Sincerely,

Glenn Tadaki, Planner

GT:to
cc: Avery Chumbley, Wailuku Agribusiness Co., Inc.
Ann Cua, Planning Department
wac/wactbeyd/tuctr.001

MUNEKIYO, ARAKAWA & HIRAGA, INC.

January 12, 1999

Gary Gill, Director
Office of Environmental
Quality Control
235 S. Beretania Street, Suite 702
Honolulu, Hawaii 96813

Subject: Waiko Baseyard Subdivision
Draft Environmental Assessment
TMK 3-5-02: por. 01

Dear Mr. Gill:

Thank you for your letter of December 8, 1998 commenting on the Draft Environmental Assessment (EA) for the proposed project. In response to your comments, we would like to note the following.

1. The proposed project involves the development of a li[illegible] intended for true light industrial activities such as b[illegible] storage, and maintenance uses. Typical industrial activ[illegible] the site include vehicular maintenance operations. Prop[illegible] procedures for the storage, handling, and disposal [illegible] materials, as well as monitoring and the use of contai[illegible] utilized to mitigate these potential adverse effects. Such[illegible] have already been implemented by Brewer Environment[illegible] BEI facility was recently moved to the subject property a[illegible] designated as Lot 16 on Figure 3 of the Environmental [illegible].

2. The range of activities that are permitted in the M-1, Li[illegible] be further described in the Final EA.

begin ✓

3. Landscaping with native Hawaiian plants to screen the [illegible] Waiko Road will be implemented to the extent practicabl[illegible]

4. The source of water for the proposed project will be the Iao Aquifer which has a current sustainable yield of about 20.0 million gallons per day (MGD). Water sources that are currently providing additional domestic water for the County of Maui, and are not connected to the Iao Aquifer, include the Iao Ditch (1.2 MGD to 1.5 MGD), the Iao Tunnel (1.0 MGD to 1.5 MGD), and two (2) wells in north Waihee (1.5 MGD each). With the water provided by these additional sources,

MUNEKIYO, ARAKAWA & HIRAGA, INC.

January 12, 1999

Gary Gill, Director
Office of Environmental
Quality Control
235 S. Beretania Street, Suite 702
Honolulu, Hawaii 96813

Subject: Waiko Baseyard Subdivision
Draft Environmental Assessment
TMK 3-5-02: por. 01

Dear Mr. Gill:

Thank you for your letter of December 8, 1998 commenting on the Draft Environmental Assessment (EA) for the proposed project. In response to your comments, we would like to note the following.

1. The proposed project involves the development of a light industrial subdivision intended for true light industrial activities such as baseyard, repair, service, storage, and maintenance uses. Typical industrial activities which may occur on the site include vehicular maintenance operations. Proper training and operating procedures for the storage, handling, and disposal of these products and materials, as well as monitoring and the use of containment measures can be utilized to mitigate these potential adverse effects. Such measures, for example, have already been implemented by Brewer Environmental Industries (BEI). (The BEI facility was recently moved to the subject property and is located in the area designated as Lot 16 on Figure 3 of the Environmental Assessment.)

2. The range of activities that are permitted in the M-1, Light Industrial District will be further described in the Final EA.

3. Landscaping with native Hawaiian plants to screen the proposed project from Waiko Road will be implemented to the extent practicable.

4. The source of water for the proposed project will be the Iao Aquifer which has a current sustainable yield of about 20.0 million gallons per day (MGD). Water sources that are currently providing additional domestic water for the County of Maui, and are not connected to the Iao Aquifer, include the Iao Ditch (1.2 MGD to 1.5 MGD), the Iao Tunnel (1.0 MGD to 1.5 MGD), and two (2) wells in north Waihee (1.5 MGD each). With the water provided by these additional sources,

demands on the Iao Aquifer have been reduced to about 17.9 MGD, a point where withdrawals are now less than its sustainable yield (source: County of Maui, Department of Water Supply, December 1998).

5. Measures to control soil erosion during construction are included in the Draft EA on page 42 and on page 6 of the Soil Erosion Control Report in Appendix A. In addition, Best Management Practices (BMPs) will be prepared in connection with final, detailed construction plans for the proposed project (as required by the recently revised Maui County Grading Ordinance). Appropriate mitigative measures will also be examined during the preparation of Covenants, Conditions, and Restrictions (CC&Rs) for the project to ensure that purchasers of lots within the subdivision comply with applicable standards for water quality protection and maintenance.

6. The guidelines for sustainable building design will be considered in establishing design guidelines for buildings in the proposed subdivision.

Thank you for expressing your interest in the proposed project. Please feel free to contact us should you have any questions or require additional information.

Sincerely,

Glenn Tadaki, Planner

GT:to
cc: Avery Chumbley, Wailuku Agribusiness Co., Inc.
Ann Cua, Planning Department
wac/wacibayd/oeqcltr.001

MUNEKIYO, ARAKAWA & HIRAGA, INC.

January 28, 1999

David Blane, Director
Office of Planning
Department of Business, Economic
Development and Tourism
P. O. Box 2359
Honolulu, Hawaii 96804

SUBJECT: Waiko Baseyard Subdivision; TMK 3-5-02:por. 01

Dear Mr. Blane:

Thank you for the Office of Planning's December 21, 1998 letter commenting on the subject project. In response to your comments, we would like to note that the proposed project addresses the existing and future need for the development of appropriately designated industrial land uses in the Waiko Road area. The proposed subdivision is intended to provide for true, long-term industrial uses in the area, as well as address concerns regarding the incremental development of properties in the area through the Special Use Permit (SUP) approval process. In addition to the preceding, we offer the following responses to your other comments.

1. The Covenants, Conditions, and Restrictions (CC&Rs) that will be prepared for the project will consider a framework for industrial uses within the proposed development. In addition, the CC&Rs will include appropriate measures for the storage, handling, and disposal of environmental contaminants within the proposed subdivision.

2. Coordination between Wailuku Agribusiness and the Maui County Departments of Planning and Public Works and Waste Management will be continued to discuss effective means by which the applicant and other industrial users in the area can master plan and cost-share in the construction of infrastructure improvements in the project area, including improvements required for Waiko Road.

Planning • Environmental Studies • Project Management
305 High Street, Suite 104 • Wailuku, Hawaii 96793 • Phone: (808) 244-2015 • Fax: (808) 244-8729

Thank you for expressing your interest in the proposed project. Please feel free to contact us should you have any questions or require additional information.

Very truly yours,

Glenn F. Tadaki, Planner

GFT:lfm
cc: Avery Chumbley, Wailuku Agribusiness Co., Inc.
Warren Unemori, Warren S. Unemori Engineering, Inc.
Ann Cua, Department of Planning, County of Maui (via delivery)
d\wac\wac\bsyd\osprspn.ltr

Chapter XI

List of Permits and Approvals

XI. LIST OF PERMITS AND APPROVALS

The following permits and approvals will be required prior to the implementation of the project.

County of Maui

1. District Boundary Amendment
2. Community Plan Amendment
3. Change in Zoning
4. Construction Permits (e.g., grubbing, grading, NPDES, building, electrical, plumbing)

References

References

Community Resources, Inc. Maui County Community Plan Update Program Socio-Economic Forecast Report, January 1994.

County of Maui, Consolidated Plan, Fiscal Year 1995.

County of Maui, Department of Public Works and Waste Management, Wastewater Reclamation Division, Plant Capacity Status as of April 30, 1998.

County of Maui, The General Plan of the County of Maui 1990 Update, Amended April 1993.

County of Maui, Wailuku-Kahului Community Plan, December 1987.

County of Maui, Office of Economic Development and Maui Economic Development Board, Inc., Maui County Data Book, December 1994.

GMP Associates, Inc., Final Environmental Assessment for the Waiale Drive, Mahalani Street, and Imi Kala Street Extensions, Wailuku, Maui, Hawaii, April 1995.

Maui News, March 17, 1996.

Michael T. Munekiyo Consulting, Inc., Special Use Permit for Wailuku Agribusiness Company's Request to Establish a Commercial Heavy Truck and Equipment/Maintenance Service at the Waikapu Garage, January 1990.

Michael T. Munekiyo Consulting, Inc. and Parsons Brinckerhoff Quade & Douglas, Inc., Traffic Master Plan for C. Brewer Properties - Executive Summary and Technical Appendix, April 1991.

Michael T. Munekiyo Consulting, Inc., Wailuku Project District No. 3 - Project District Development Approval Application (Phase II), December 1991.

Munekiyo & Arakawa, Inc., Final Environmental Assessment - Aircraft Rescue and Fire Fighting Training Facility at Kahului Airport, April 1995.

Munekiyo & Arakawa, Inc., Final Environmental Assessment - Maui Central Park Roadway, Papa Avenue Extension and Related Drainage Improvements, October 1995.

Munekiyo & Arakawa, Inc., Final Environmental Assessment - Waiale Road Affordable Rental Project, September 1995.

Munekiyo, Arakawa, Inc., Application for District Boundary Amendment, Community Plan Amendment, Change in Zoning and Conditional Permit - Maunaloa Town Center, November 1995.

Munekiyo, Arakawa, Inc., Application for Conditional Use Permit - BEI Administration, Commercial and Warehouse Facilities in Waikapu, January 1997.

Parsons Brinckerhoff Quade & Douglas, Inc., Traffic Impact Report - Wailuku Project District - Phase 1, Final, April 1994.

R.M. Towill Corporation, Maui Public Facilities Assessment, Final, August 17, 1992.

State of Hawaii, Office of State Planning, The Hawaii State Plan, 1991.

University of Hawaii, Land Study Bureau, Detailed Land Classification Island of Maui, May 1967.

University of Hawaii, Department of Geography, Atlas of Hawaii, Second Edition, 1983.

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

Wilson Okamoto & Associates, Inc. Maui Community Plan Update Infrastructure Assessment, September 1992.

Appendices

Appendix A

Archaeological Inventory Survey

ASC 96-3

ARCHAEOLOGICAL INVENTORY SURVEY OF THE PROPOSED RETENTION BASIN AND ADJOINING LANDS WAIKAPU AND WAILUKU AHUPUA'A, WAILUKU DISTRICT, MAUI ISLAND (TMK 3-5-02:01 Por.) (TMK 3-5-01:17 Por.)

by

Paul Titchenal, M.A.

for

C. Brewer Homes, Inc.
24 N. Church Street, Suite 205
P.O. Box 1437
Wailuku, Maui, Hawaii 96793

March 1996

Aki Sinoto Consulting
2333 Kapiolani Blvd. #2704
Honolulu, Hawaii 96826

ABSTRACT

At the request of C. Brewer Homes, Inc., Aki Sinoto Consulting of Honolulu undertook archaeological inventory survey procedures for a proposed water retention basin and adjoining lands in a project corridor situated between the towns of Waikapu and Wailuku, on the Island of Maui. This work took place in November 1995 with the objective of determining the presence or absence of archaeological remains in the project area.

No significant cultural remains were encountered during either the surface survey or subsurface testing procedures. A total of 13 backhoe trenches were excavated in the project corridor in selected areas considered most likely to contain subsurface cultural materials and permit sampling of representative portions of the total length of the corridor. Although no cultural materials were encountered, profiles of the test trenches revealed a diversity of depositional data that may provide insight into the formative geology of the project area.

The current survey resulted in negative findings and no further work is recommended prior to commencement of construction. However, due to the general cultural sensitivity of sand dune areas associated with the Puuone, archaeological monitoring is recommended for those areas slated for construction-related excavation. An archaeological monitoring plan shall be prepared and submitted to the State Historic Preservation Division of the Department of Land and Natural Resources for approval.

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

At the request of C. Brewer Homes, Inc., Aki Sinoto Consulting of Honolulu undertook an archaeological inventory survey for a proposed water retention basin and adjoining areas in Waikapu, Wailuku, Maui. This work took place during the 20th through 22nd and the 27th through 30th of November 1995. The objective of this investigation was to determine the presence or absence of extant surface cultural features, as well as subsurface cultural deposits in the project area.

PROJECT LOCATION

The project area, situated on the isthmus of Maui, straddles the boundary between Waikapu and Wailuku *ahupua'a*, Wailuku District, Maui Island (TMK 3-5-02: por. of 01, TMK 3-5-02: por. of 02). The project corridor, encompassing over 2400 meters (8000 feet), roughly parallels the Waiale Road extension from a point approximately one-half-mile south of the Maui Community Correctional Center to its intersection with Waiko Road (Fig. 1). The elongate, irregularly-shaped corridor averages approximately 213 meters (700 feet) in width in the southern segment, 152 meters (500 feet) in the central segment, and narrowing to a width of 30.5 meters (100 fect) in the northern segment. In addition to the project corridor, the narrow strip of land between Waiko Road and Waikapu Stream was also inspected. An outlet channel, the location for which was not finalized at the time of the survey, is slated to cross Waiko Road roughly 200 feet east of the junction with the Waiale Road extension and empty into the stream.

ENVIRONMENT

The project corridor occupies the northwestern margin of the Kahului isthmus in the region where alluvial slopes emanating from Waikapu Valley of the West Maui Mountains interface with the Wailuku Sand Hills, a consolidated dune complex formed during the Pleistocene, which stretches across the isthmus of Maui from Kahului to Kihei. Elevation in the project area ranges from 91 to 107 meters (300-350 feet) above sea level. Rainfall averages between 20 and 30 inches annually, with most of the precipitation occurring during the winter months from November through March. Waikapu Stream, which represents the nearest source of water, passes within 50 meters (164 feet) of the southern boundary of the project area. Although the terrain of the project area has been artificially altered to a large degree, the surrounding and remnant landforms indicate a gently sloping, lightly dissected, alluvial fan with a slope aspect of approximately 10 degrees to the northeast. Relative to the adjacent terrains, the project area occupies a fairly level

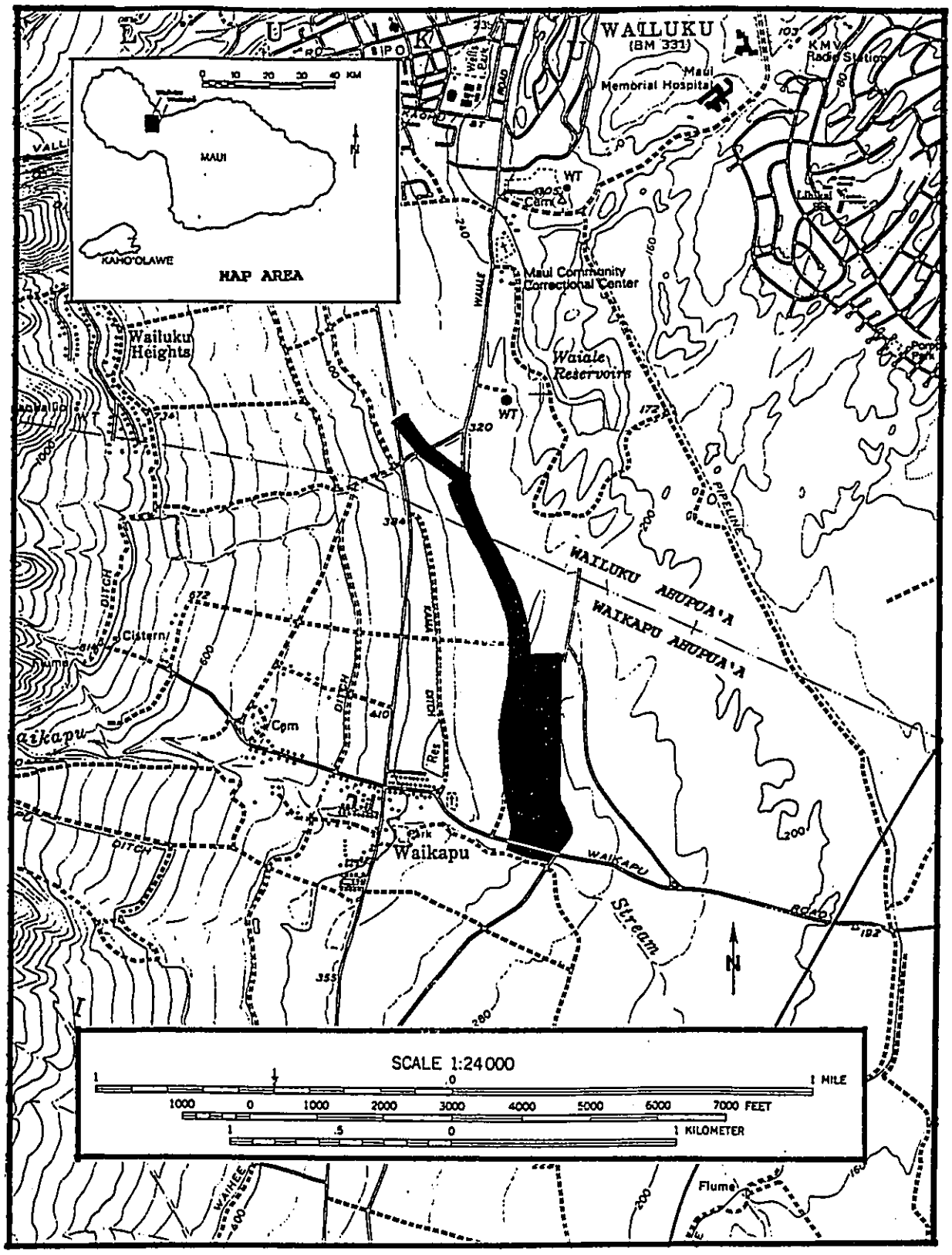


Figure 1. Location of Project Area on USGS Wailuku Quadrangle.

topographic contour on what might be characterized as a terrace or bench apparently formed by the alternating banking of wind driven Puuone sand and alluvial material descending from the West Maui Mountains.

Two distinctive soil types are present in the project area: Entisols, characterized as weakly developed soils found in Hawaii on old beach sand; and Mollisols which are well-drained, relatively young soils that develop on coral, lava, or alluvium and occur in moderately dry areas of the islands, and are generally rich in plant nutrients (Armstrong 1973:41). The dune formation is composed of lithified and non-lithified calcareous sand of the Puuone Series. Pockets of Pulehu Series silty loam were encountered within the dune margin, and a deep stratum of Iao Series soils, which are geographically associated with soils of the Pulehu Series, abuts against the dune formation in the northern segment of the project area (Foote et al.1972).

Because of varying geological and environmental conditions, the project corridor, for the purposes of this report will be discussed in terms of the southern, central, and northern segments (Fig. 2). The southern segment includes a 14.5 acre parcel adjoining the proposed retention basin as well as road and drainage easements (see Fig. 2). The eastern half of this segment, adjacent to the Waiale Road extension, is currently occupied by several office and support buildings and a maintenance yard in an area that appears to have been previously quarried for sand or cultivated, and subsequently graded for development (Fig. 3). To the west of these buildings and adjacent to Waiko Road, is an area previously cultivated in sugarcane but presently dominated by *koa haole*, (*Leucaena glauca*), and various grasses and shrubs. A narrow strip of land between Waiko Road and the Waikapu Stream was also inspected. No unaltered remnants of land appear to remain in this segment.

The central segment of the project corridor, where the proposed water retention basin will be located, includes areas east and west of the Waiale Road extension (see Fig. 2). The area east of the Waiale Road extension is presently occupied by a nursery and an open field previously in sugarcane now dominated by *koa haole*, and various grasses. East of the Waiale Road extension, sand quarrying activities have removed the upper three to four meters (9-12 feet) of deposit in most of the project corridor except in a few areas where lithification of the sand into eolianite appears to have prevented quarrying. Even in these areas, however, the surface has been removed. *Koa haole* and various grasses sparsely cover the area (Fig. 4).

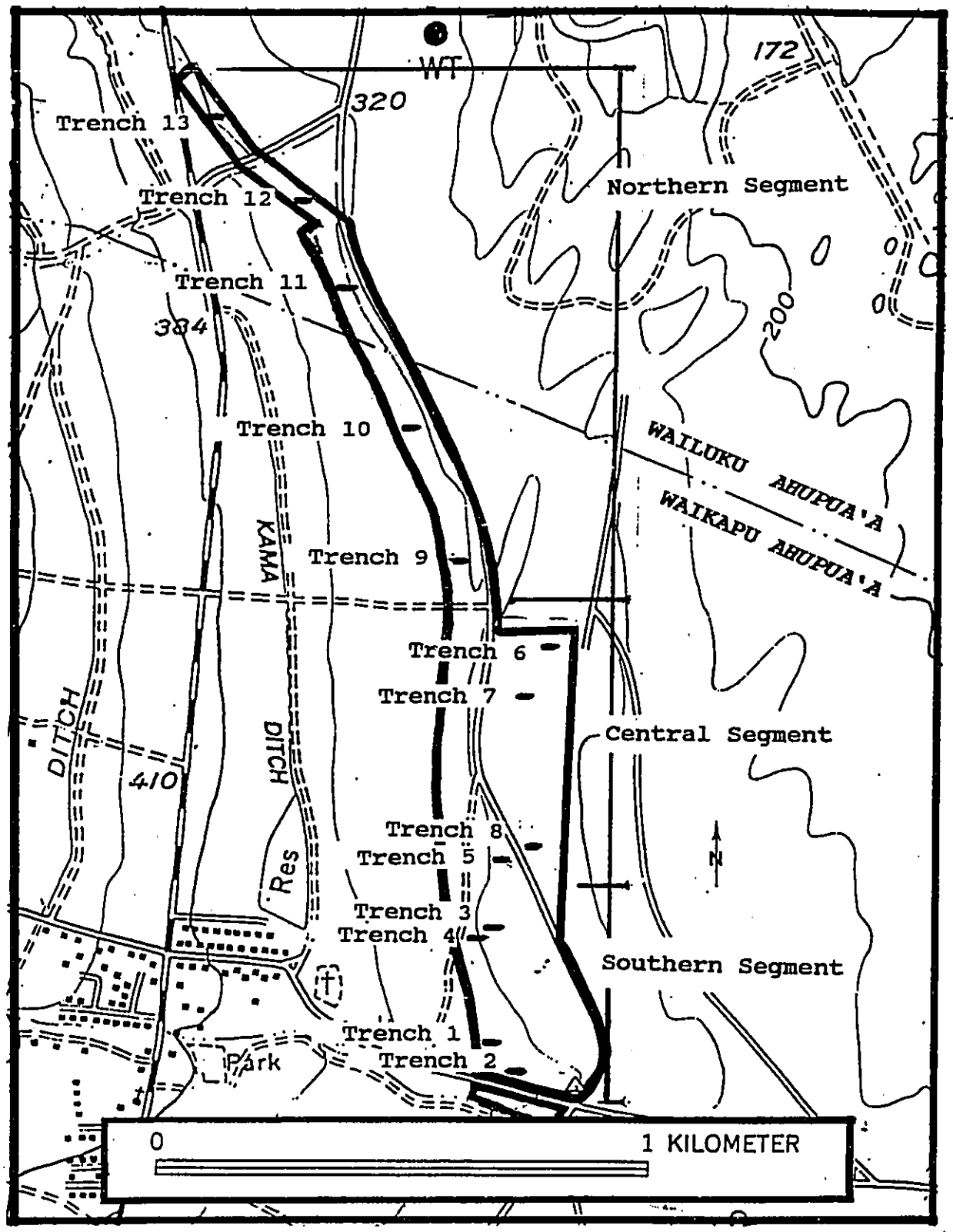


Figure 2. Map of Project Area

Figure 3. Southern Segment of Project Area, View East.

Figure 4. Central Segment of Project Area, View Southwest

The northern segment of the project corridor, in which open-channel drainage and road realignment easements have been proposed, follows the Waiale Road extension northward, then angles to the northeast and terminates at the intersection of Hono-a-Pi'ilani Highway and Kuikahi Drive (see Fig. 2). The southern portion of this segment traverses a recently cleared cane field (Fig 5). The northernmost corner is a plowed pineapple field (Fig. 6). *Koa haole* and grasses now occupy the margins of these fields.

HISTORY

The streams and valleys of West Maui are known to have been settled relatively early (Kirch 1974), eventually supporting large populations which became centers of socio-agricultural development and political power (Handy and Handy 1972, Kirch 1984). The history of the project area, which includes portions of both Waikapu and Wailuku *ahupua'a*, is generally described in reference to the old *'okana* or land division named Na Wai Eha, meaning "The Four Streams" (Handy and Handy 1972:496):

> The old 'okana (land division) named Na Wai Eha (Na Wai Eha means "The Four Streams") comprised the four great valleys which cut far back into the slopes of West Maui and drain the eastward watershed of Pu'u Kukui and the ridges radiating northeastward, eastward, and southeastward from it. Two of the great valleys, Waihe'e and Waiehu, open toward the ocean and their streams empty into it. Wailuku is partly landbound, but its stream flows into Kahului Bay, which has been eroded by the ocean out of what was formerly the stream mouth. Waikapu is landbound. The waters of its great stream, now utilized for irrigating a great acreage of sugar cane, formerly was diverted into lo'i and its overflow was dissipated on the dry plains of the broad isthmus between West and East Maui (Handy and Handy 1972:496).

A number of legends and oral traditions concerning Waikapu and Wailuku *ahupua'a* have been recorded. Among these was a story describing the origin and meaning of the name Waikapu. It was said that in ancient times a great conch shell (*pu*) was hidden in a cave on the south side of the stream, about a mile inland. Hence the name *Wai-ka-pu*, "Water-of-the-conch" (Handy and Handy 1972:497,498). Another account places the cave in the valley, a mile or more above the village. The conch was heard in the valley frequently, but never witnessed by the people. A dog, named Puapualenalena, coveted the conch and finally succeeded in stealing it, after which its sound was not heard again.

Oral traditions also recount a number of battles which took place in the region. Among these, Fornander's (1969:153) account of the battle of the Waikapu Commons or the "*Ahulau ka pi'ipi'i i Kakanilua*" is generally credited as the oldest historic reference to the region. An excerpt from this account describes the battle taking place in the sand hills southeast of Wailuku, possibly in the vicinity of the present project:

Figure 5. South End of Northern Segment of Project Area, View North.

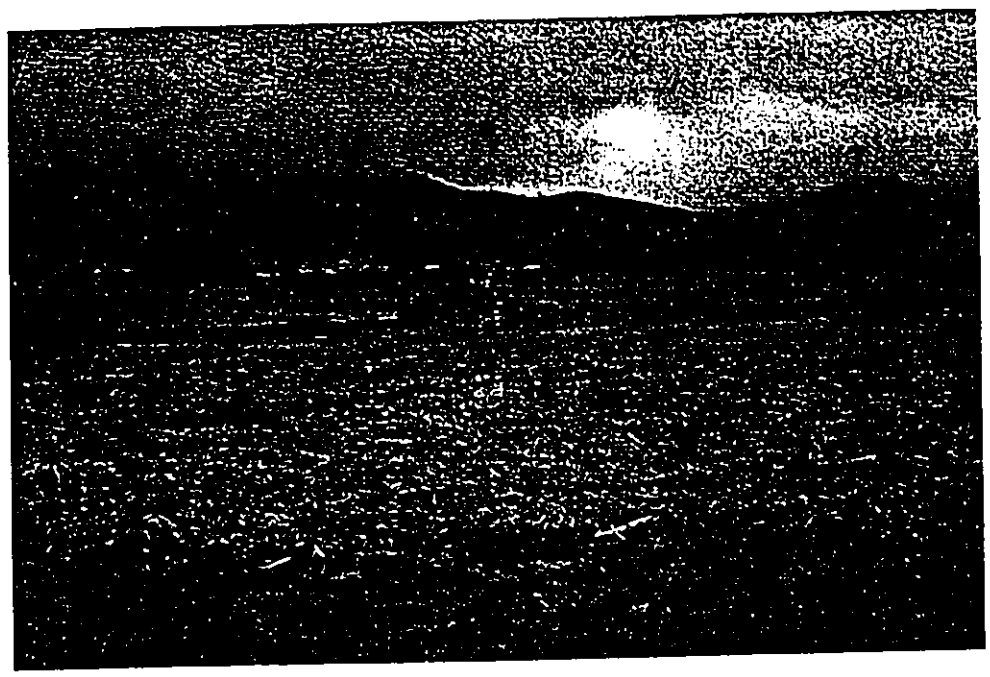


Figure 6. North End of Northern Segment of Project Area, View Northwest.

> ...The detachment or regiment known as the Alapa, mustering 800 men, was selected for this hazardous expedition, and with high courage they started across the isthmus of Kamaomao, now known as the Waikapu common, as the legend says, "to drink the waters of Wailuku that day. "...Little did this gallant troop apprehend the terrible fate that awaited them...Kahekili distributed his forces in various directions on the Wailuku side of the common, and fell upon the Hawaii corps d'armee as it was entering among the sandhills south-east of Kalua, near Wailuku. After one of the most sanguinary battles recorded in Hawaiian legends,...the gallant and devoted Alapa was literally annihilated; only two out of the 800 escaped alive to tell Kalaniopuu of this Hawaiian Balaclava (Fornander 1969:153).

Seafarers visiting Maui in the early 1800s provided several descriptions of the region. The reader is referred to Smith's (1991 Appendix A, in Brisbin et al.) noteworthy summary of historic references to Waikapu for a more complete treatment of the subject. That the valleys of Wailuku and Waikapu supported substantial populations in the 17th century is attested to by the following traveler's account which, in passing, also provides an alternative derivation of the name Waikapu:

> The first village of any note on the way to Wai-lu-ku is Wai-ka-pu. It contains a population of about 500. Here the forces of Kamehameha the Great once assembled for battle at the sounding of the conch shell. Hence the name, Wai-ka-pu (water of the conch or trumpet) (Bates 1854:309).

Sugarcane cultivation was introduced to the region relatively early in the historic period by a Spaniard named Antone Catalina, who made cane syrup at Waikapu in 1828, marking the beginning of the sugar industry in the Wailuku District. The Waikapu plantation was started by James Louzada who sent his first sugar to market in 1863. After several changes in ownership, the plantation passed into the control of Wailuku Sugar Company in 1894 (Maui News, February 3, 1926). Claus Spreckles was awarded a portion of Wailuku *ahupua'a* by King Kalakaua in 1882 and established the Hawaiian Commercial and Sugar Company. These lands passed into the control of Alexander and Baldwin in 1926.

During the Great Mahele of 1848, the entire *ahupua'a* of Wailuku was awarded to Princess Ruth Ke'elikolane, great-granddaughter of Kamehameha and Kamamalu (LCA 7731, Apana 23). Numerous smaller LCA's were awarded in Waikapu *ahupua'a* but none appear to have been located within the present project area. For a discussion of these awards, the reader is referred to Smith (1991: Appendix A, in Brisbin et al.). An 1885 map by F.S. Dodge shows that the majority of the current project area was held by the Waikapu Sugar Company, within Grant 3152, awarded to H. Cromwell (TMK 3-5-02:01). Several hundred meters of the northern extremity of the project area extends into LCA 71 (TMK 3-5-01:17), with Wailuku Sugar Company listed as owner of both parcels.

The project area is located down-slope, within a half-mile of the village of Waikapu, and immediately adjacent to Waikapu Stream. Although the area is currently dominated by either former agricultural or sand quarrying manifestations, a fairly comprehensive picture of the transition of land use, from traditional times to present, was provided by Handy's observations of Native Hawaiian planting techniques gathered in the 1930's. Among these are fairly specific references to the vicinity of the project area:

> ...Spreading north and south from the base of Waikapu to a considerable distance below the valley are the vestiges of extensive wet-taro plantings, now almost obliterated by sugar-cane cultivation; a few here and there are preserved in plantation camps and under house and garden sites along the roads. Among these gardens there were in 1934, a few patches of dry Japanese taro. *Far on the north, just above the main road and at least half a* mile below the entrance to the canyon, an extensive truck garden on old terrace ground showed the large area and the distance below and away from the valley that was anciently developed in terraced taro culture (Handy and Handy 1972:497).

In addition to traditional agricultural development, a number of religious structures are reported to have formerly existed in the area. Ashdown (1971) observed that "Waikapu had many temples and sites, as did the other valleys of Na Wai 'Eha, the four waters." Two *heiau*, one large and one small, are said to have been located near the Catholic Church in Waikapu (Thrum 1917:52-61). Apparently none of these have survived to present times.

PREVIOUS ARCHAEOLOGY

Prior to the 1970s, in spite of its social and political significance, Maui remained less intensively studied archaeologically than either O'ahu or Hawai'i and no intensive studies had been undertaken in the traditional population centers in the valleys of West Maui (Kirch 1985:136). Emory (1921) provided an inventory of archaeological sites in Haleakala Crater as early as 1921. As part of the Statewide Inventory of Historic Places, the Bishop Museum conducted a comprehensive inventory of known sites on Maui during 1973 and 1974. During the 1970's, resort and urban development generated a number of contract archaeology reports for various coastal regions of Maui, but especially in the Wailea/Makena region. An intensive settlement pattern analysis was completed for the Kahikinui area of Maui by Chapman and Kirch (1979). For a brief summary and synthesis of these reports, the reader is referred to Kirch (1985).

In Wailuku *ahupua'a*, in the region east of the present project area, several archaeological reports from the Wailuku Sand Hills area have recently been generated in connection with the Maui Lani development. The reader is referred to Rotunno-Hazuka (et al. 1994) for a

list of these investigations, year completed, and location of each study. Although no surface structural remains have been recorded in the Wailuku Sand Hills province, a number of human burials have been recorded in the area. A complex of human burials was identified in an exposed section of a former sand borrow pit and designated Site 50-50-04-2797 (Rotunno-Hazuka et al. 1994). A subsurface sampling phase in which 95 trenches were excavated in pre-selected areas resulted in the discovery of six new burials in three separate localities. A predictability model for burial location was tested, but results were inconclusive and showed that the placement of burials in the dune area did not appear to follow any discernible pattern within the project area with the exception of the previously identified burial complex and at the highest dune in the area. More generally, the occurrence of burials found to date were most frequent at the marginal areas of the Puuone zone (Pantaleo and Sinoto 1995).

Human skeletal remains were also identified at the Maui Homeless Shelter construction site and has been designated Site 50-50-04-2916 (Donham 1992). A number of burials have been encountered during the recent installation of a sewer line along Waiale Road and multiple burials have been discovered in connection with the widening of Lower Main Street. Just east of the southern terminus of the present project area, human remains have been identified within the Maui Trucking baseyard.

In Waikapu *ahupua'a*, recent studies undertaken in connection with golf course and resort construction have documented agricultural and residential complexes on the upland slopes adjacent to Waikapu Valley (Brisbin et al. 1991). In addition to lending credence to early historic reports of large populations occupying the upland regions, this research indicates extensive and intensive agricultural development of this area in prehistoric and perhaps into early historic times (Brisbin et al. 1991:7).

Only one previous archaeological study has been undertaken within the current project area. In 1989, Archaeological Consultants of Hawaii performed subsurface testing of a 14 acre parcel (TMK3-5-02:por 1) slated for sand mining. No surface or subsurface cultural remains were encountered during this investigation of the sand dune area located within the cental segment of the current project corridor (Kennedy, 1989).

SETTLEMENT PATTERNS

Based on the foregoing historic and archaeological indicators, it seems probable that the lower coastal valleys of West Maui were settled early; fostered an increasingly stratified, agriculturally oriented society; and sustained an expanding population into the late

prehistoric period, at which time population growth generated the establishment of extensive agricultural complexes in the upland Valleys of West Maui. These populations appear to have been centralized in either coastal or upland regions with less productive areas, such as the Wailuku Sand Hills, left unsettled.

These population centers are characterized by extensive terrace and pondfield agricultural systems with dispersed, rather than centralized, residential structures throughout and on the margins of these agricultural complexes. Additionally, religious structures were significant components of both coastal and upland population centers. Fishponds were also important elements of leeward coastal centers.

SITE EXPECTABILITY

Traditional land use in the project area and the nature of those cultural manifestations most likely to be encountered, may be summarized in terms of the two physiographic components: the sand hills and the adjacent alluvial fan. Major portions of the Wailuku Sands Hills appear to have remained unsettled by Native Hawaiian populations. It seems likely, however, that populations occupied, or in other ways utilized, the coastal and selected inland margins of the sand hills complex. Recent investigations associated with the widening of Lower Main Street encountered unidentified stone alignments, amorphous structural features and a possible midden component (Spear, pending). To date, evidence indicates that the interior and southwestern margins of the sand hills complex remained unoccupied and not intensively exploited prehistorically.

The common and significant element of investigations in the sand hills complex was the utilization of this region by native populations for interment of the dead. Burials appear to be more concentrated in the coastal margins and around the perimeter of the dunes, but are regularly encountered throughout the region. It is possible that the alluvial fan, up to the margin of the sand hills, at one time, supported agricultural and residential activities. Within the current project area, the potential for the presence of human burials in the sand dune areas and the remains of structural features and cultural deposits in the alluvial fan (non-dune areas) is present. However, the degree of surface alteration in both of these provinces minimizes the potential for intact remains within the project area.

METHODS

Archaeological and historical background research was undertaken to determine the nature of potential cultural resources in the project area. This research was conducted at the State Historic Preservation Division library of the Department of Land and Natural

Resources and the Hawaii State Library, both in Honolulu. Historic maps, documents citing past land tenure data, and archaeological reports were reviewed to facilitate predictability and interpretation of potential findings in the project area.

During fieldwork, a surface survey was initially conducted in each of the three segments of the project corridor. Systematic, walk-through transects, with varying intervals based on differential vegetation density and ground visibility, were conducted to cover the entire project area. Since no boundaries were marked on the ground, a topographic map, provided by the client, was used to determine the limits of the survey.

Based on the results of the surface survey, localities were selected for backhoe trenching with the criteria of testing those areas considered most likely to contain subsurface cultural deposits and, at the same time, provide a representative sample of the entire project area. The excavation of thirteen backhoe trenches were monitored.

Trench positions were plotted by compass and tape on the project area map. Multiple compass bearings to prominent landmarks were obtained for each trench. A representative stratigraphic profile of a one-meter column was drawn for each trench. A black and white photographic record, in 35mm format, was obtained for each trench and soil colors where described in reference to Munsell color designations.

Each trench was numbered and its location was clearly marked with flagging tape for subsequent location by surveyors. Following completion of the fieldwork, trench locations were plotted by professional surveyors and incorporated into a topographic map of the project area (Fig. 7).
lh8

All field notes, maps, and photographs generated in connection to the project will be reposited at Aki Sinoto Consulting in Honolulu. No physical samples or portable artifacts were collected.

SURVEY RESULTS

No significant surface cultural remains were located during the walk-through survey of the project area. Subsurface testing was conducted to determine the presence or absence of buried evidence of past human activities such as cultural deposits, features, and burials. Thirteen backhoe trenches were excavated in selected localities of the project area.

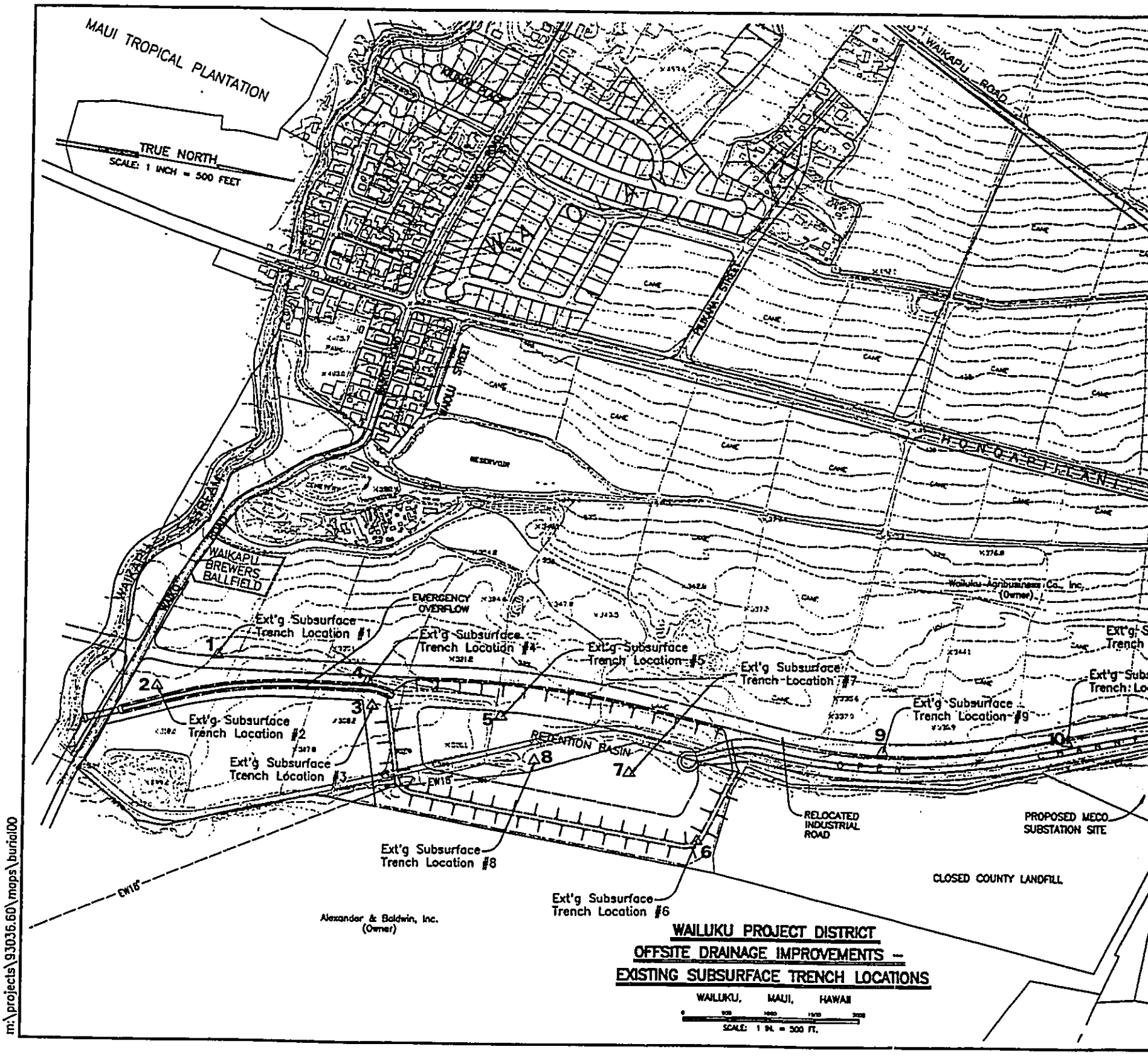
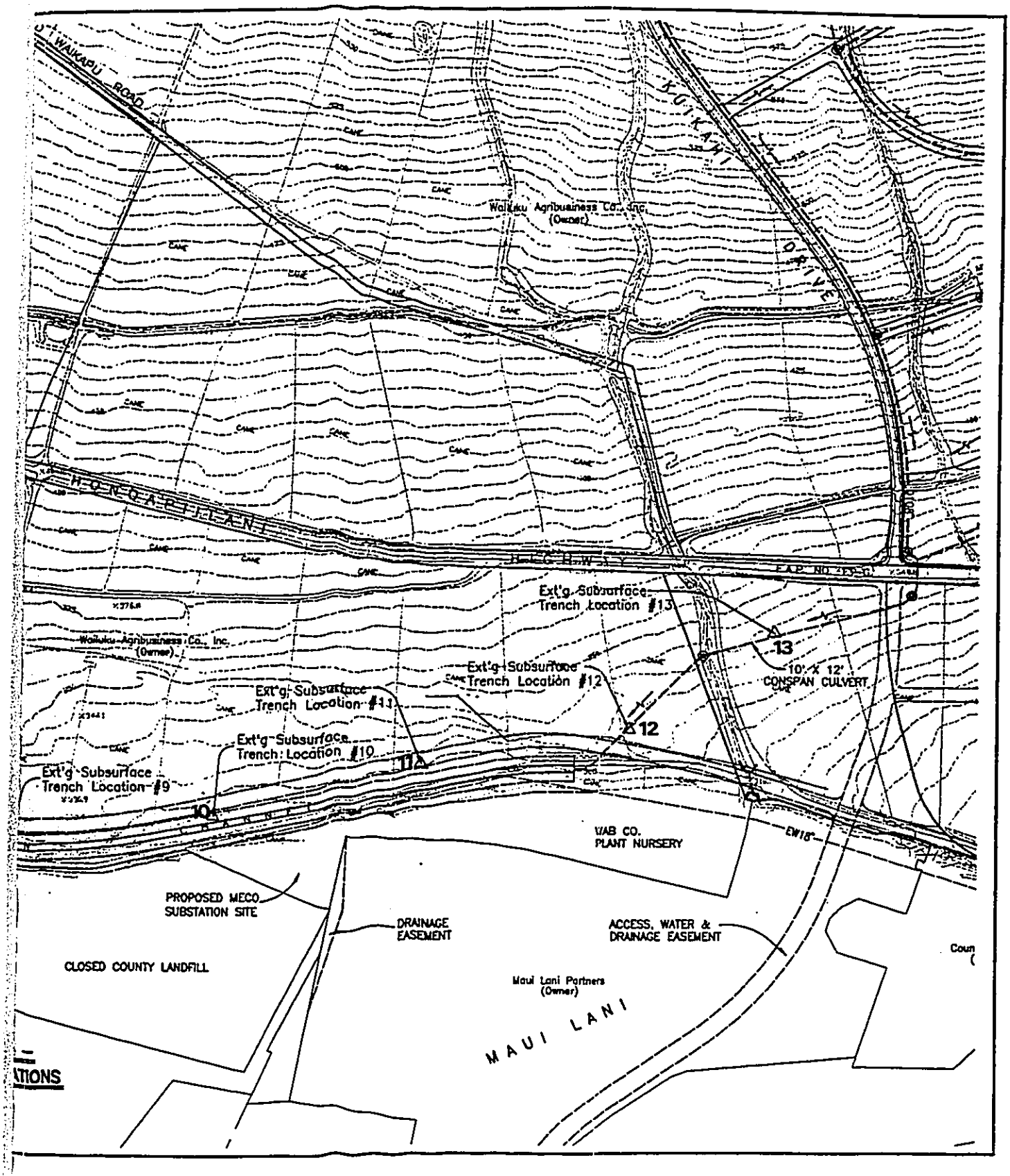


Figure 7. Backhoe Trench Locations on Topographic Map (By Unemori Engineering).


WAIKAPU ROAD
KUIKAHI
Wailuku Agribusiness Co., Inc.
(Owner)
HONOAPIILANI
HWY
F.A.P. NO.
Ext'g. Subsurface
Trench Location #13
13
10' X 12'
CONSPAN CULVERT
Wailuku Agribusiness Co., Inc.
(Owner)
Ext'g Subsurface
Trench Location #12
12
Ext'g Subsurface
Trench Location #11
Ext'g Subsurface
Trench Location #10
11
Ext'g Subsurface
Trench Location #9
10
VAB CO.
PLANT NURSERY
EW18"
PROPOSED MECO
SUBSTATION SITE
DRAINAGE
EASEMENT
ACCESS, WATER &
DRAINAGE EASEMENT
CLOSED COUNTY LANDFILL
Maui Lani Partners
(Owner)
MAUI LANI

During the backhoe testing procedures, no significant subsurface cultural remains were encountered in the trenches. Although no evidence of cultural activities were manifested, the stratigraphic record from each trench may contribute some understanding of the nature of depositional events in the formative geology of the project area. The following discussion provides a brief summary of the salient stratigraphic characteristics of each trench. The numbering of the trenches reflects the order in which they were excavated. The project area map depicts the position of each trench within the southern, central, and northern segments (see Fig. 2).

TRENCH 1

Trench 1 is located in the southern segment of the project area approximately 90 meters north of Waiko Road, approximately 250 meters northwest of Power Pole #53 at the intersection of Waiko Road and the Waiale Road extension, on a magnetic bearing of 315 degrees. Old berms of sugarcane refuse occur in this area which is now dominated by *haole koa* and various grasses. Trench 1 is 10 meters long, 1 meter wide, and excavated to a depth of 1.55 meters. Three distinctive stratigraphic zones were defined (Fig. 8). From the surface, extending to a depth of 60cm is a till zone stratum comprised of a loose, medium to fine-grained, dark brown (10YR 3/3) loam with about 10% medium to small, water-worn basalt cobbles and roots from surface grasses penetrating the uppermost 40cm. Underlying this zone is a 30cm stratum of compact, medium to fine-grained, reddish brown (10YR 4/4) loam with about 50% medium to small, water-worn basalt cobbles. Underlying this stratum and continuing to a depth of 155cm is a zone of tightly-bedded, moderately coarse alluvium consisting of approximately 90% large to small, water-worn basalt cobbles in a compact matrix of medium to fine-grained, yellow brown (10YR 5/4) loam.

TRENCH 2

Trench 2 is located in the southern segment of the project area about 20 meters north of Waiko Road, approximately 125 meters southeast of Trench 1, on a magnetic bearing of 145 degrees. This is the southernmost trench in the project and occupies an area about 100 meters north of Waikapu Stream that was previously cultivated in sugarcane, evidenced by berms of cane refuse. A low cover of *koa haole* and grasses now dominate the surface. Trench 2 is 10 meters long, 2 meters wide, and was excavated to a depth of 2.7 meters. Four distinctive stratigraphic zones were encountered (Fig. 9). From the surface, extending to a depth of 30cm is a stratum of till zone composed of approximately 50% medium to small, water-worn basalt cobbles in a loose matrix of medium to fine-grained, dark brown loam (10YR 4/2) with roots. Underlying this stratum and continuing to a depth of 160cm is a

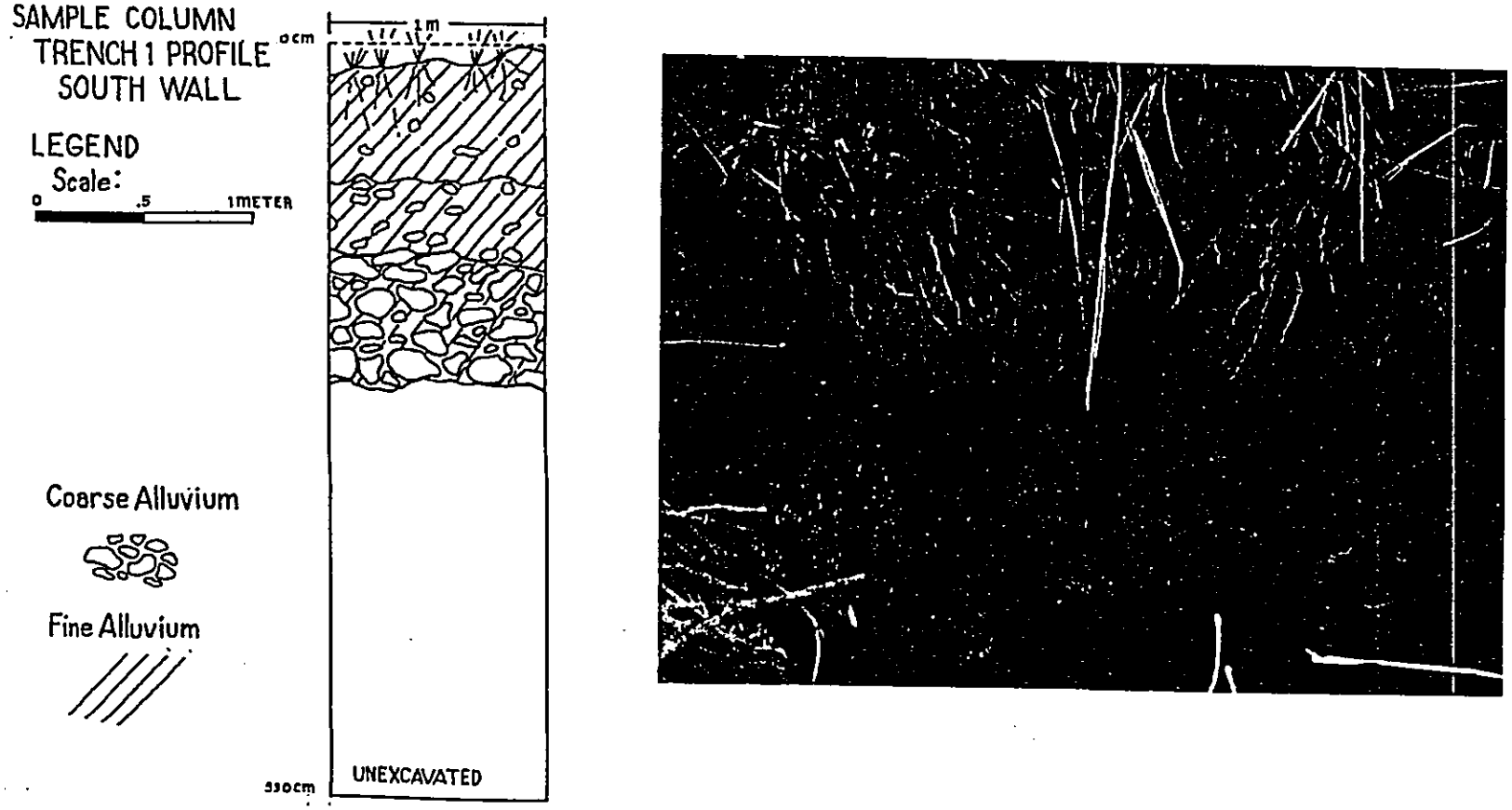
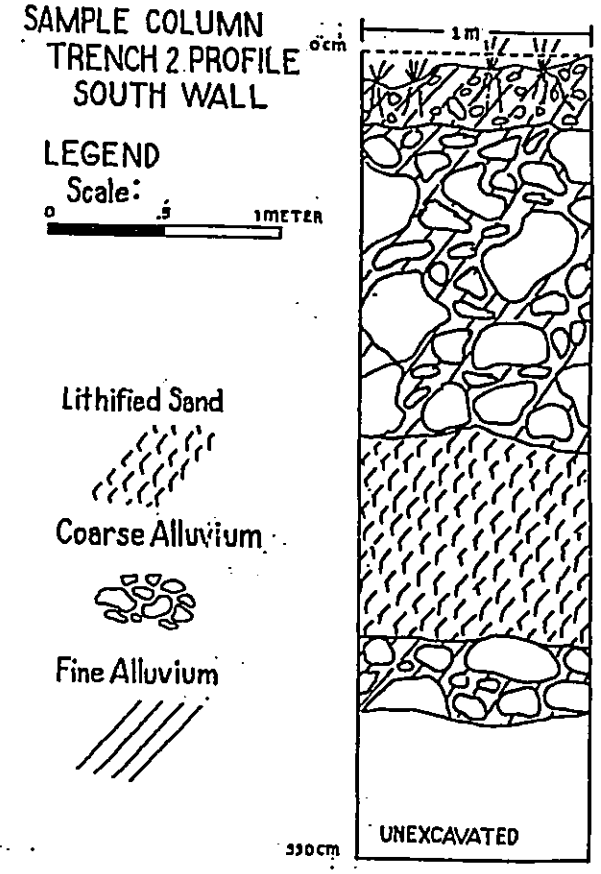


Figure 8. South Wall of Trench 1, Stratigraphic Column and Photo.



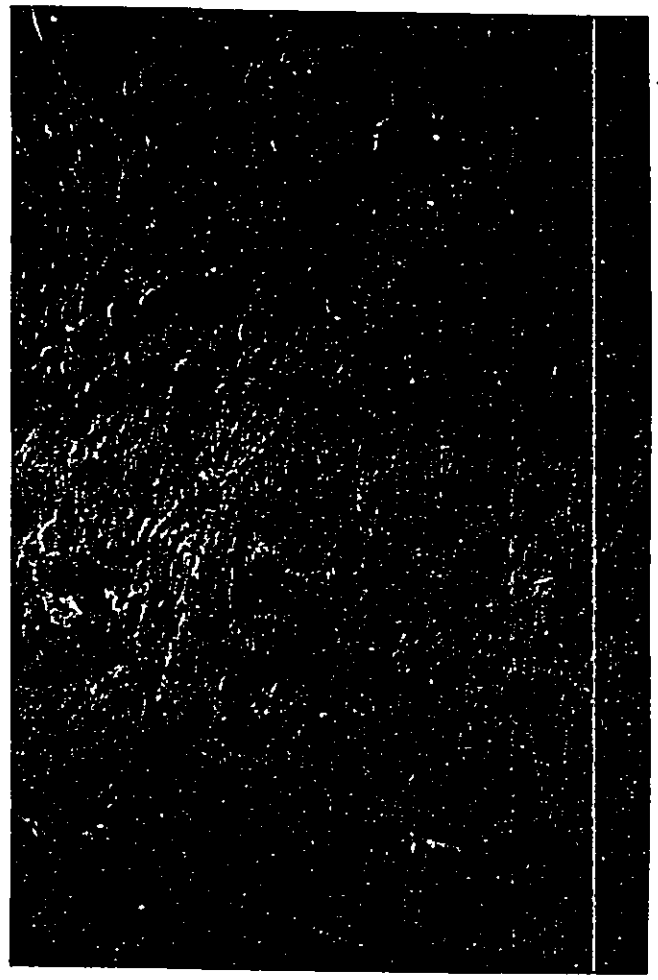


Figure 9. South Wall of Trench 2, Stratigraphic Column and Photo.

zone of fairly coarse, tightly-bedded alluvium consisting of about 90% water-worn basalt ranging from small boulders to small cobbles in a stiff matrix of medium to fine- grained, dark brown (10YR 4/3) loam. Underlying this is an 80cm thick stratum of very compact, partially lithified, coarse to fine grained, orange tan (7.5YR 6/6) sand. Underlying this stratum and continuing to a depth of 270cm, coarse alluvium consisting of about 90% water-worn basalt ranging from small boulders to small cobbles in a stiff matrix of medium to fine-grained, dark brown (10YR 4/3) loam is again encountered.

TRENCH 3

Trench 3 is located in the southern segment of the project area, approximately 325 meters north of Trench 2, on a magnetic bearing of 345 degrees. This trench occupies an area of former sand mining activity and much of the original surface appears to have been removed. Vegetation is limited to *koa haole* and various grasses. Trench 3 is 9 meters long, 1.5 meters wide, and was excavated to a depth of 2.9 meters. Five distinctive stratigraphic zones were observed (Fig. 10). From the surface, extending to a depth of 40cm is a stratum consisting of a loose, light tan (10YR 3/2) loamy sand with roots from surface grasses. Underlying this stratum, and continuing to a depth of 240cm, is a zone of coarse to fine-grained, compact (or minimally lithified), orange tan (7.5YR 6/8) sand. This zone is interrupted at a depth of 240cm by a narrow, 3cm thick stratum of fine-grained, red brown (7.5YR 4/4) loam. The overlying sand stratum resumes and continues to a depth of 260cm, where a stratum of tightly bedded alluvium is encountered which continues to a depth of 290cm where excavation was terminated. This alluvial stratum consists of about 90% large to small, water-worn basalt cobbles in a matrix of medium to fine-grained, dark red brown (7.5YR 4/4) loam.

TRENCH 4

Trench 4, in the southern segment of the project area, is located west of the Waiale Road extension, approximately 35 meters southwest of Trench 3 on a magnetic bearing of 222 degrees. Located in a former sand mining area, it is on a remnant ridge created by the removal of about 3 meters of sand from either side. This area was probably not mined due to the degree of sand lithification (eolianite). Trench 4 is 7 meters long, 1 meter wide, and was excavated to a depth of only 1.6 meters because of the hardness of the lithified sand. Two distinctive stratigraphic zones were present (Fig. 11). The uppermost stratum, from the surface to a depth of 25cm, consists of a loose, coarse to fine-grained, light tan (10YR 7/6) loamy sand with roots from surface grasses. Below this stratum and continuing to a depth of 160cm is a zone of lithified, coarse to fine-grained, orange tan (7.5YR 7/6) sand.

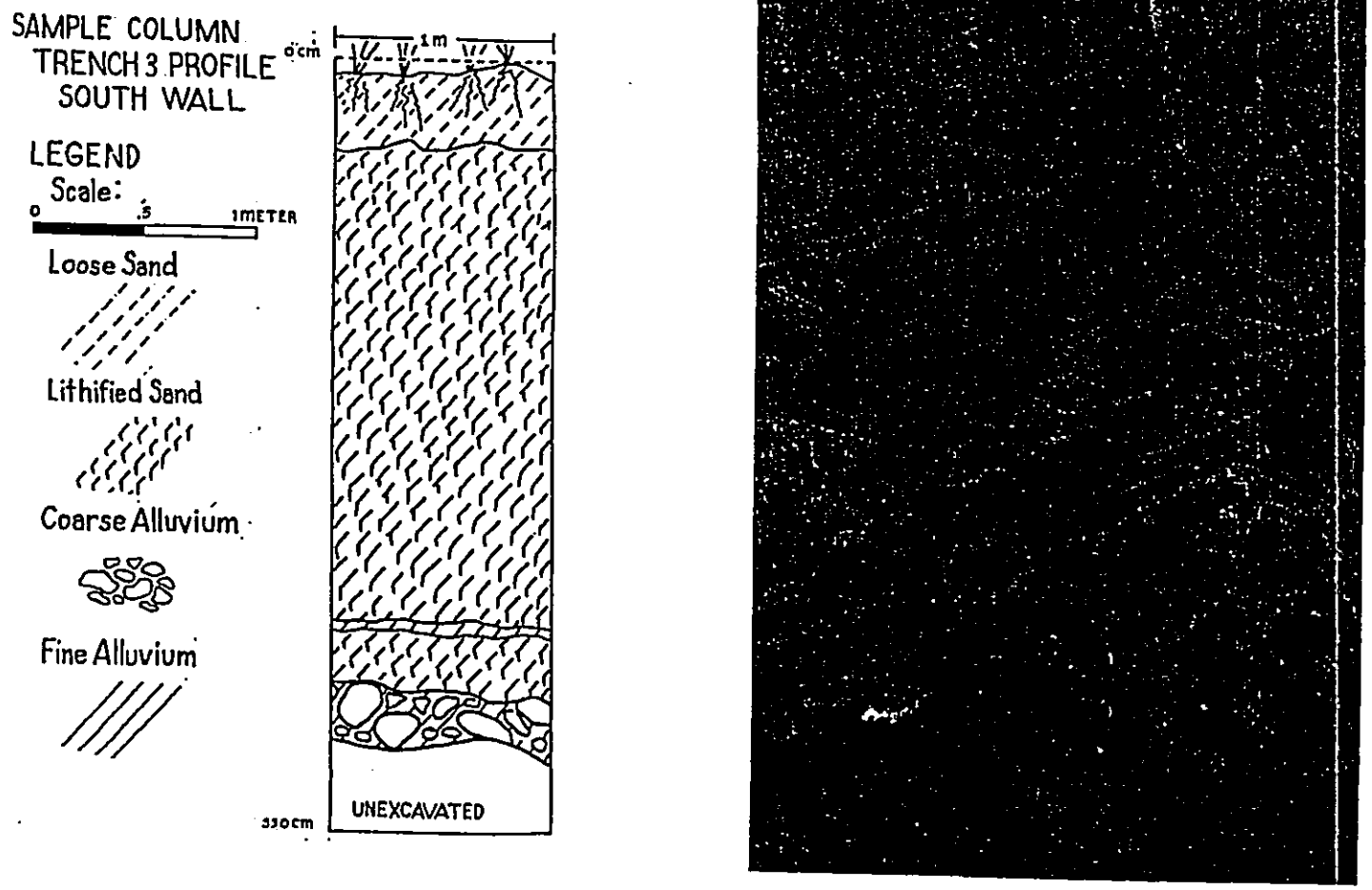


Figure 10. South Wall of Trench 3, Stratigraphic Column and Photo.

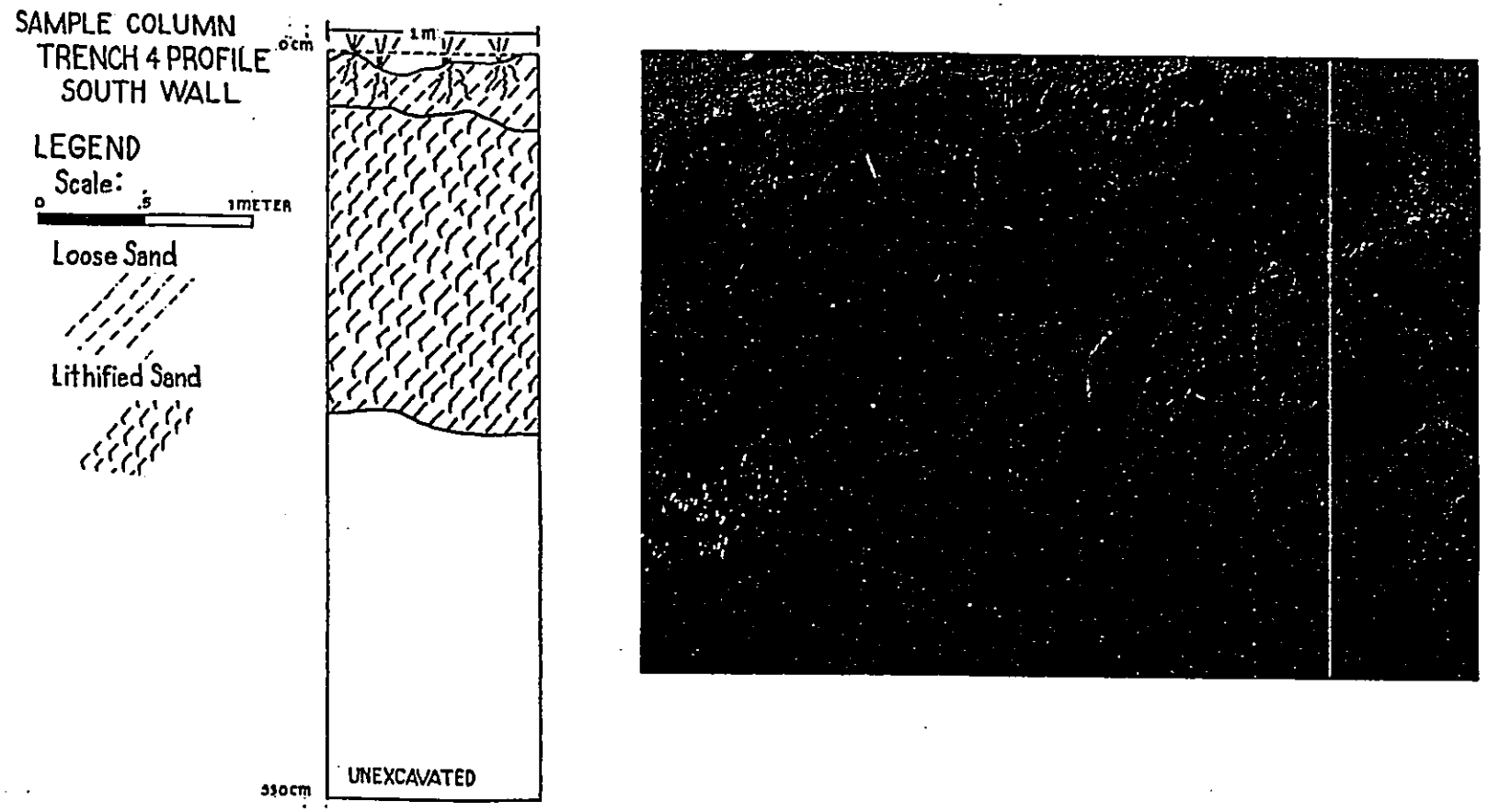


Figure 11. South Wall of Trench 4, Stratigraphic Column and Photo.

TRENCH 5

Trench 5, in the central segment of the project area, is located approximately 190 meters north of Trench 4, on a magnetic bearing of 25 degrees. This trench lies just east of the Waiale Road extension, and occupies a narrow (40 meter) margin separating former sand mining activities to the south and a recently cleared pineapple field to the north. Vegetation in this margin is dominated by *koa haole* and various grasses. Trench 5 is 8 meters long and 1.5 meters wide, and was excavated to a depth of 1.9 meters. Two stratigraphic zones identified indicate that this is an area of recently imported fill, probably surface scrapes from adjacent areas (Fig 12). A relatively narrow stratum, extending from the surface to 15cm, consisted of a loose, coarse to fine-grained, light tan (10YR 4/6) loamy sand with roots from surface grasses. Underlying this stratum and continuing to a depth of 190cm, is a zone of compact, but not lithified, coarse to fine-grained, tan (7.5YR 6/6) sand. Included in this matrix is approximately 10% medium to small, water-worn basalt cobbles, 10% angular, cobble-size, chunks of sandstone (eolianite), and about 10% by volume comprises buried stumps and branches of what appeared to be *kiawe* trees.

TRENCH 6

Trench 6, in the central segment of the project area in the northeast corner of a small field, is located east of the Waiale Drive extension and north of an existing nursery, approximately 350 meters north of Trench 5 on a magnetic bearing of 15 degrees. The surface of this former sugarcane field is now dominated by tall grasses. Trench 6 is 8 meters long, 2 meters wide, and was excavated to a depth of 3.1 meters. Three distinct stratigraphic zones were observed (Fig. 13). From the surface, extending to a depth of 50cm is a stratum of loose, coarse to fine-grained, light brown (5YR 3/2) loam containing about 10% large to small, water-worn basalt cobbles and roots from surface grasses. Underlying this zone is a 200cm stratum of compact, very fine-grained, greenish tan (10YR 4/5) silty loam with considerable root penetration from the overlying stratum. At 250cm, and continuing to the limit of excavation at 310cm, a stratum of partially lithified, coarse to fine-grained, orange tan (7.5YR 6/6) sand was encountered.

TRENCH 7

Trench 7, in the central segment of the project area, is located east of the Waiale Road extension in a small field immediately north of an existing nursery, approximately 125 meters southeast of Trench 6 on a magnetic bearing of 230 degrees. Sugarcane refuse indicates previous cultivation in an area now dominated by tall grasses. This trench is 9 meters long, 1.5 meters wide, and was excavated to a depth of 3 meters. Three distinct

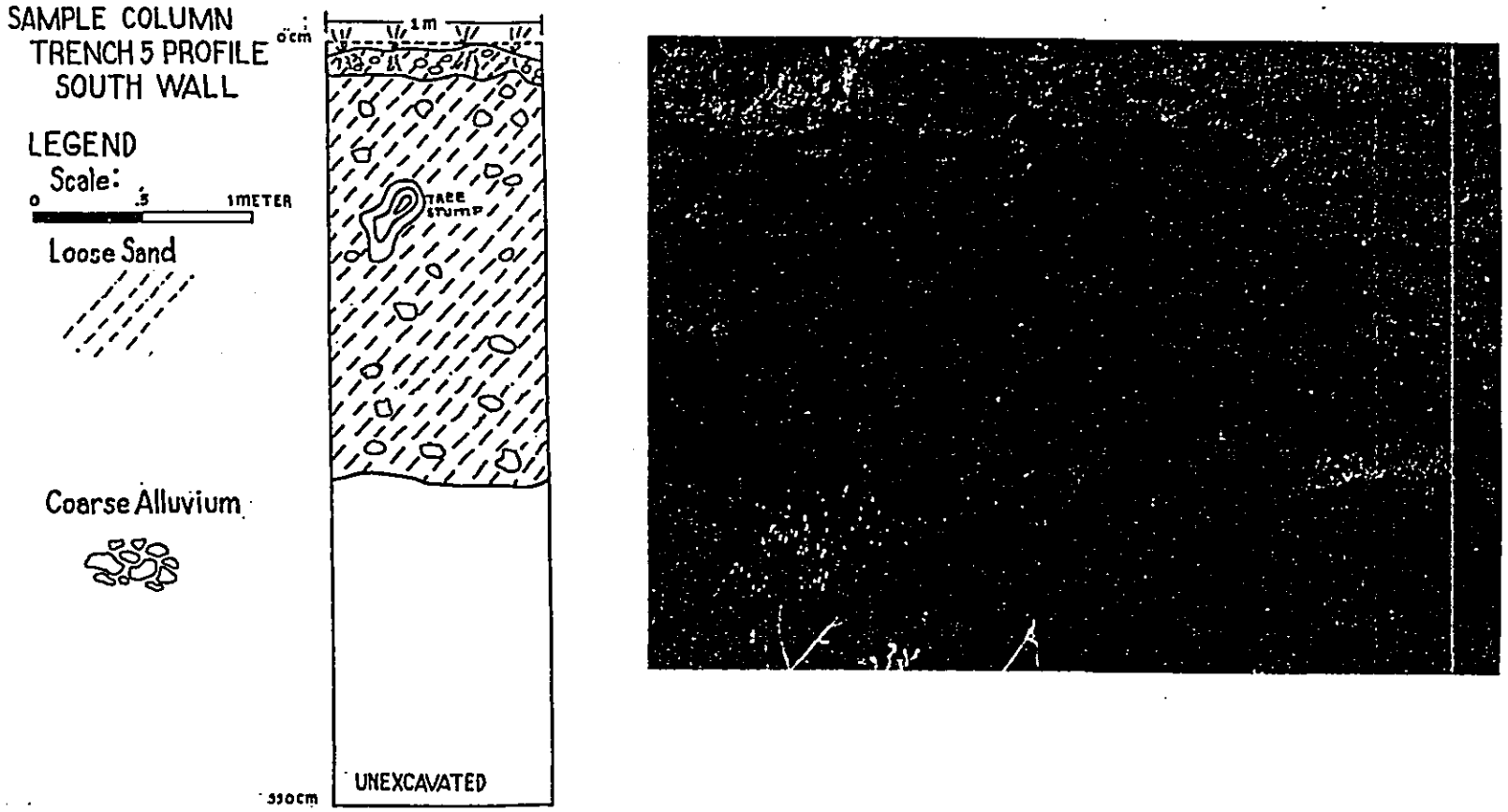
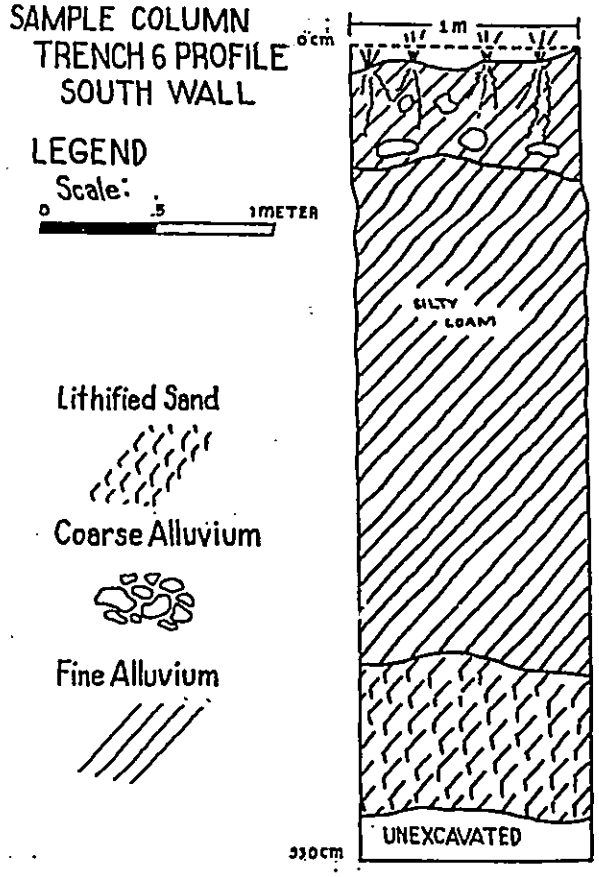


Figure 12. South Wall of Trench 5, Stratigraphic Column and Photo.



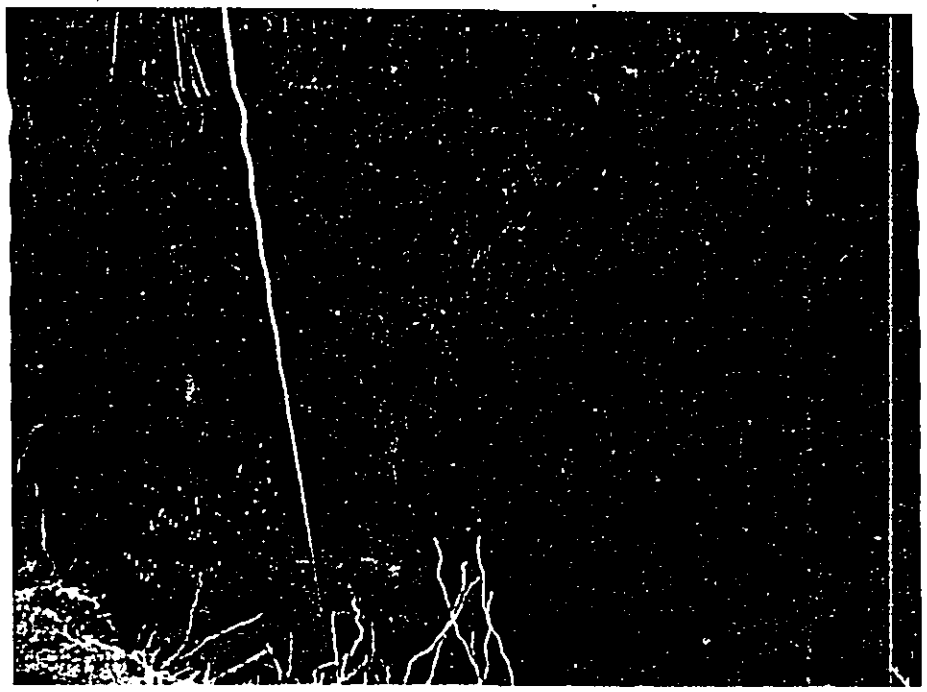


Figure 13. South Wall of Trench 6, Stratigraphic Column and Photo.

stratigraphic zones were recorded (Fig. 14). From the surface extending to a depth of 55cm, there appears to be a till zone of imported topsoil consisting of about 10% medium to small, water-worn basalt cobbles in a loose, medium to fine-grained dark brown (10YR 3/2) loam with roots from surface grasses. Underlying this stratum and extending to a depth of 210cm, is a zone of compact, medium to fine-grained, light tan (7.5YR 6/4) sand. Underlying this zone, through the termination of excavation at 3 meters, is a stratum of compact, fine-grained, reddish brown (5YR 3/4) loamy clay.

TRENCH 8

Trench 8, located in the central segment of the project area, is 30 meters east of the Waiale Road extension, approximately 250 meters south of Trench 7, on a magnetic bearing of 170 degrees. This area can be characterized as a disturbed shoulder of the adjacent road. *Koa haole* and grasses are the dominant ground cover and a bulldozed berm lies immediately east of the trench. This trench is 8 meters long, 1.5 meters wide, and was excavated to a depth of 3.15 meters. Five stratigraphic zones were identified (Fig. 15). From the surface, extending to a depth of 45cm is a stratum of loose, coarse to fine-grained, light brown (10YR 6/3) loamy sand with roots from surface grasses. Underlying this zone, and extending to a depth of 125cm is an homogeneous stratum composed of unconsolidated, coarse to fine-grained, tan (10YR 5/3) sand. Underlying this stratum is a 125cm zone of loosely-bedded, fairly coarse alluvium consisting of approximately 75% water-worn basalt ranging from small boulders through large to small cobbles in a matrix of coarse to fine-grained, reddish brown (10YR 4/4) loam. Underlying this alluvial zone is a 40cm stratum of compact, coarse to fine-grained, tan (7.5YR 4/6) sand. Underlying this and extending to the terminal depth of 315cm, is a stratum of compact, coarse-grained, gray (7.5YR 6/2) sand.

TRENCH 9

Trench 9, in the northern segment of the project area, on the margin of a recently cleared pineapple field, is approximately 490 meters north of Trench 8, on a magnetic bearing of 345 degrees. This trench is 9 meters long, 1.5 meters wide, and excavated to a depth of 2.9 meters. A single stratigraphic zone was recorded which appeared to be recently deposited fill material (Fig. 16). This layer was made up of loose, coarse to fine-grained, tan (10YR 4/4) loamy sand intermixed with about 10% medium to small, water-worn basalt cobbles and similar-sized angular pieces of sandstone. Pieces of black plastic irrigation hose appear randomly throughout the column, indicating recent deposition. Roots from surface grasses penetrate the upper 30cm of this stratum.

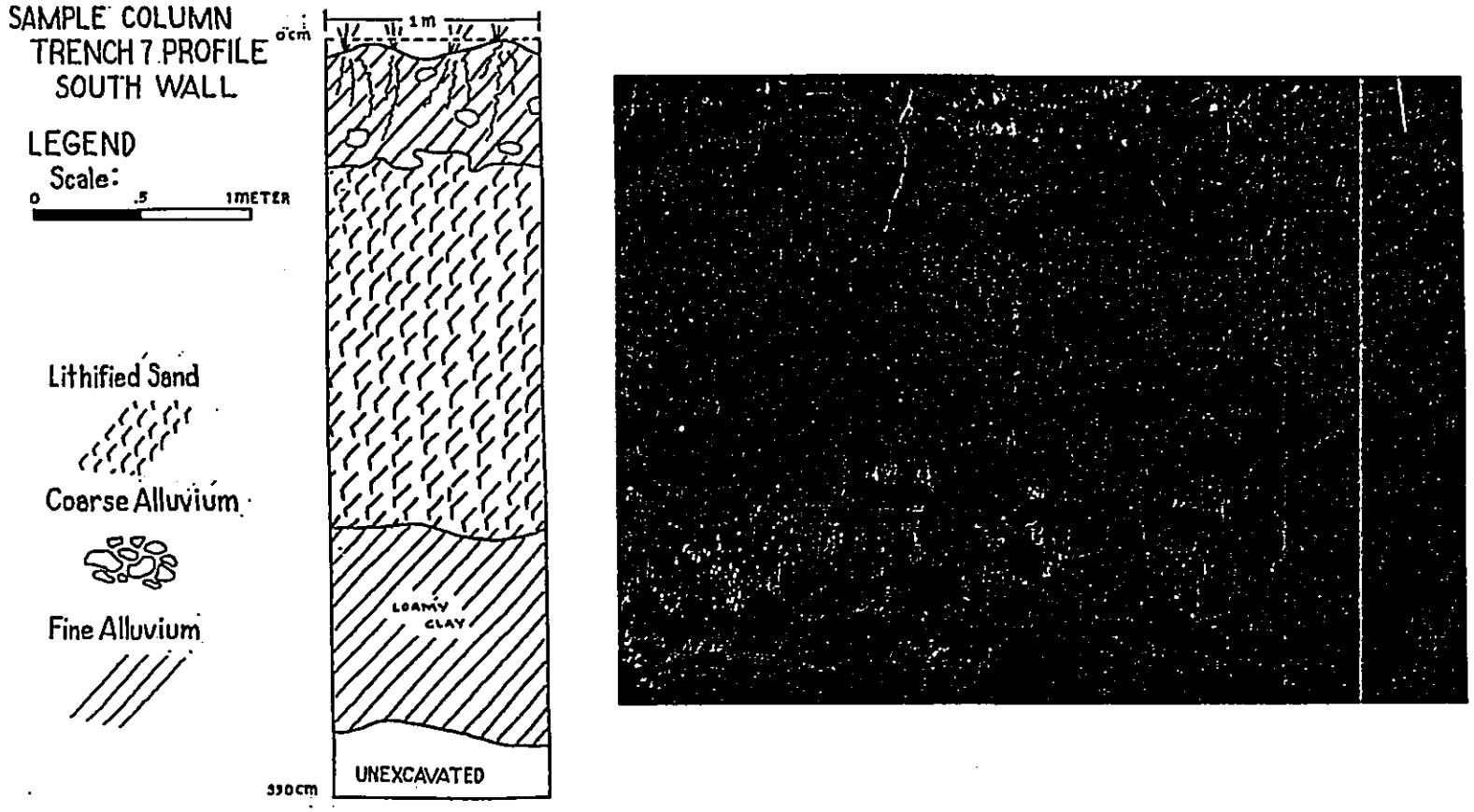
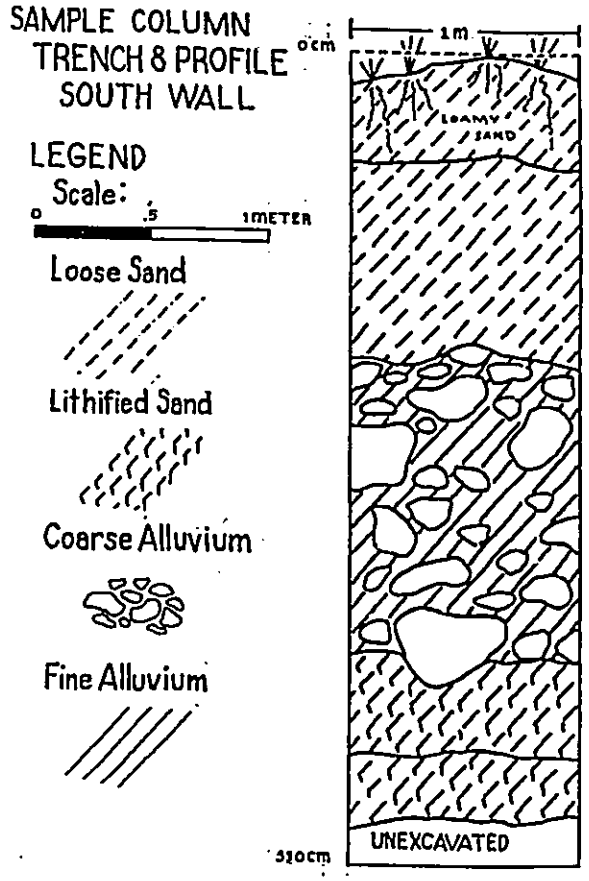


Figure 14. South Wall of Trench 7, Stratigraphic Column and Photo.



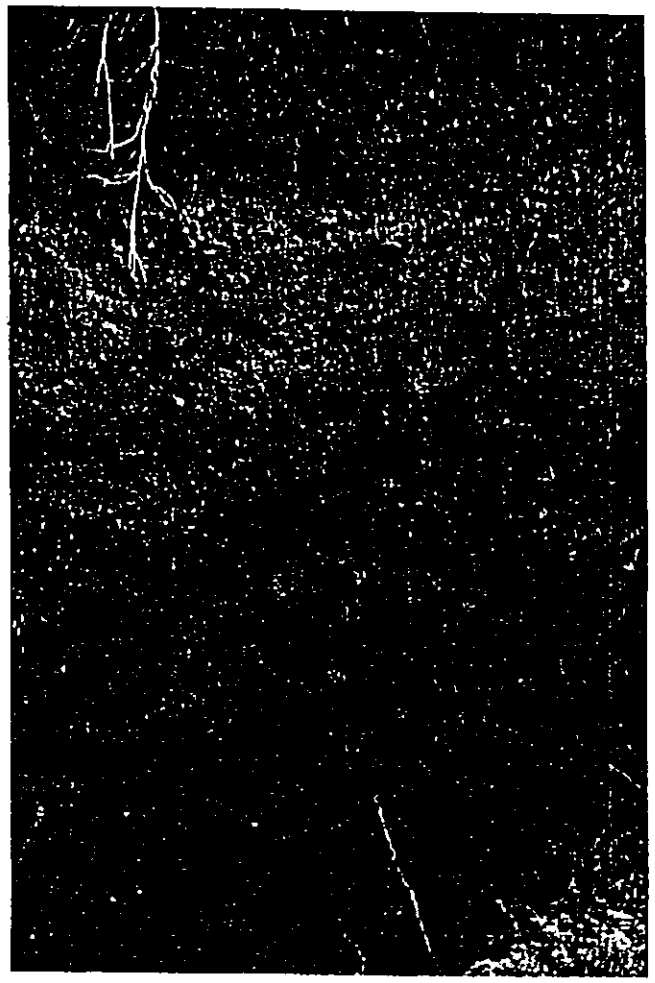


Figure 15. South Wall of Trench 8, Stratigraphic Column and Photo.

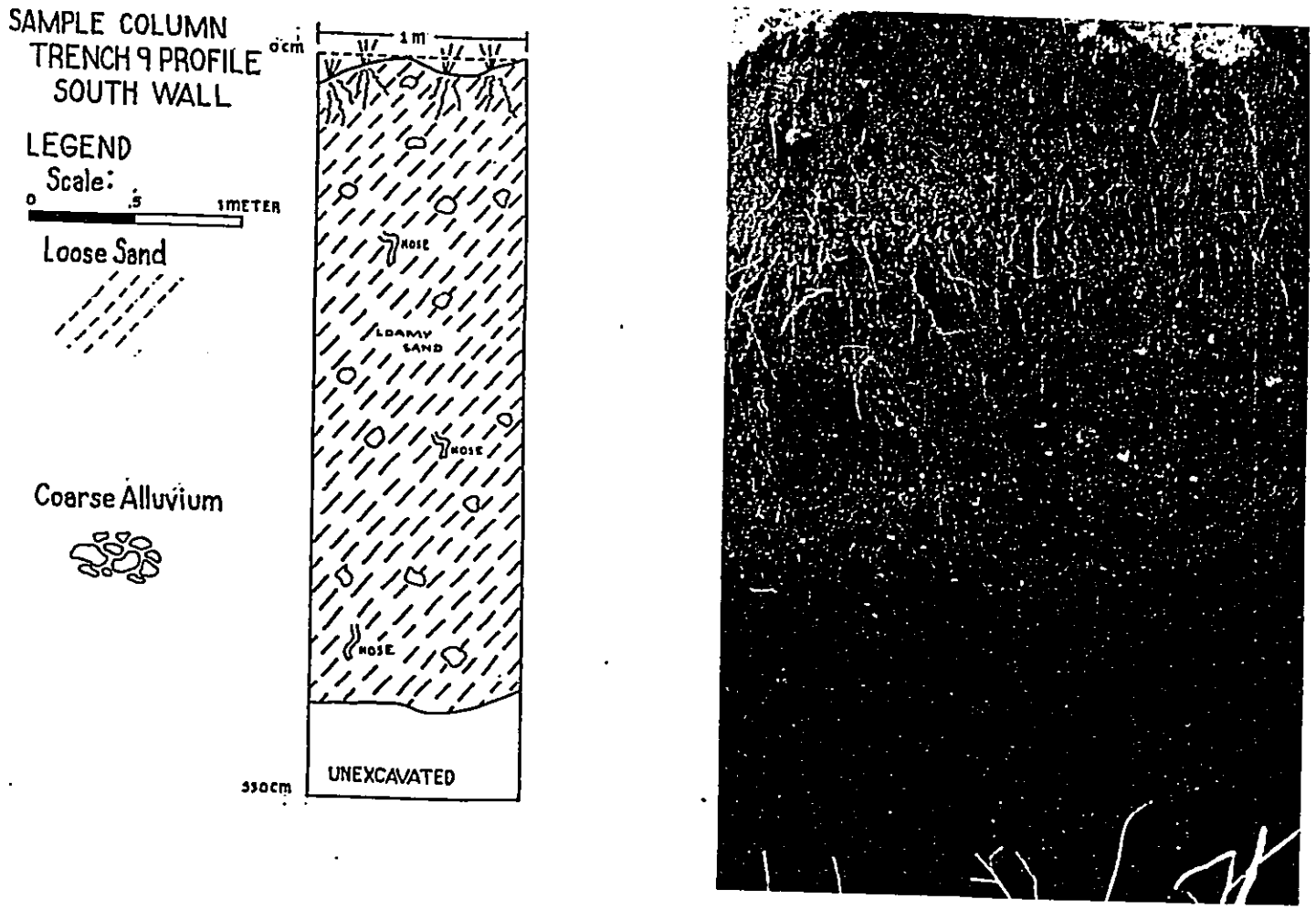


Figure 16. South Wall of Trench 9, Stratigraphic Column and Photo.

TRENCH 10

Trench 10, located in the northern segment of the project area, is approximately 300 meters north of Trench 9, on a magnetic bearing of 350 degrees, in a recently cleared pineapple field. This trench is 8 meters long, 1.5 meters wide, and excavated to a depth of 2.8 meters. Two distinct stratigraphic zones were encountered (Fig.17). From the surface, extending to a depth of 40cm, is a layer of medium to fine-grained, dark brown (10YR 3/4) loam, containing about 10% large to small, water-worn basalt cobbles. Black plastic sheeting and pineapple refuse also occur in this zone, which has the characteristics of an imported topsoil. Underlying this stratum, and extending to a depth of 280cm, is an homogeneous zone of loosely consolidated, coarse to fine-grained, light tan (10YR, 7/6) sand.

TRENCH 11

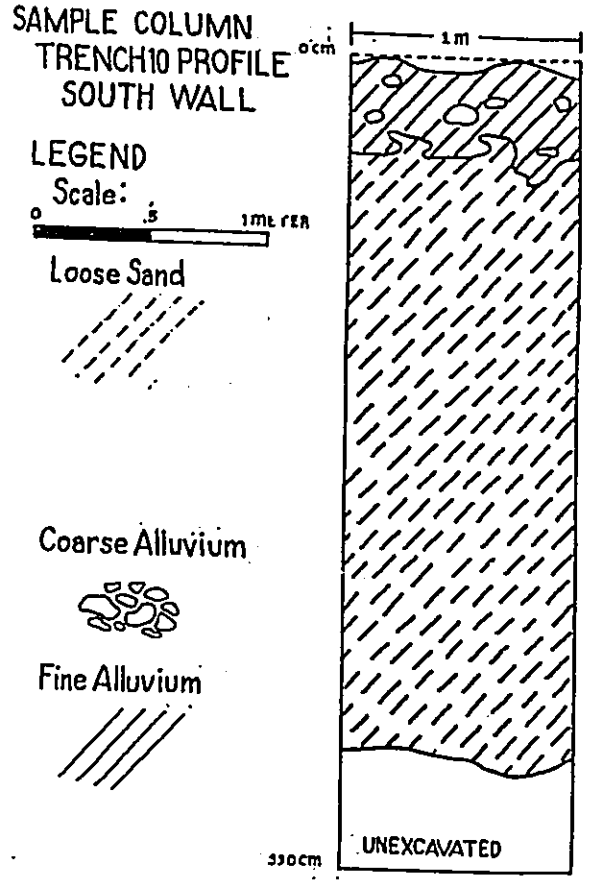
Trench 11, located in the northern segment of the project area, is approximately 340 meters northeast of Trench 10 on a magnetic bearing of 335 degrees. Trench 11 is located in a cleared pineapple field. This trench is 8 meters in length, 1.5 meters in width, and was excavated to a depth of 3.30 meters. Two discrete strata were encountered (Fig. 18). An homogeneous layer of coarse to fine-grained, dark brown (10YR 3/4) loam extends from the surface to a depth of 280cm. This stratum includes about 10% large to small, water-worn, basalt cobbles. Pineapple refuse and black plastic occur in the uppermost 30cm, but no till zone was evident. Underlying this stratum and extending to a depth of 330cm, is a stratum of loosely consolidated coarse to fine-grained, tan (10YR,5/4) sand. Excavation was terminated at 330cm, the depth of the sand stratum remains unknown.

TRENCH 12

Trench 12, located in the northern segment of the project area, is approximately 225 meters northeast of Trench 11 on a magnetic bearing of 342 degrees. This trench is located in a cleared field, previously cultivated in pineapple. Trench 12 is 14 meters in length, 2 meters wide, and was excavated to a depth of 3.25 meters. This trench revealed a single stratigraphic zone, extending from the surface to a depth of 325cm, composed of a coarse to fine-grained, dark brown (10YR 3/2) loam containing less than 5% large to small water-worn basalt cobbles (Fig. 19).

TRENCH 13

Trench 13, the northernmost trench in the project area, is located approximately 150 meters southeast of the intersection of Hono-a-Pi'ilani Highway and Kuikahi Drive on a magnetic bearing of 145 degrees. It is 260 meters northwest of Trench 12 on a magnetic bearing of 315 degrees. Trench 13 is located in a recently plowed, former pineapple field.



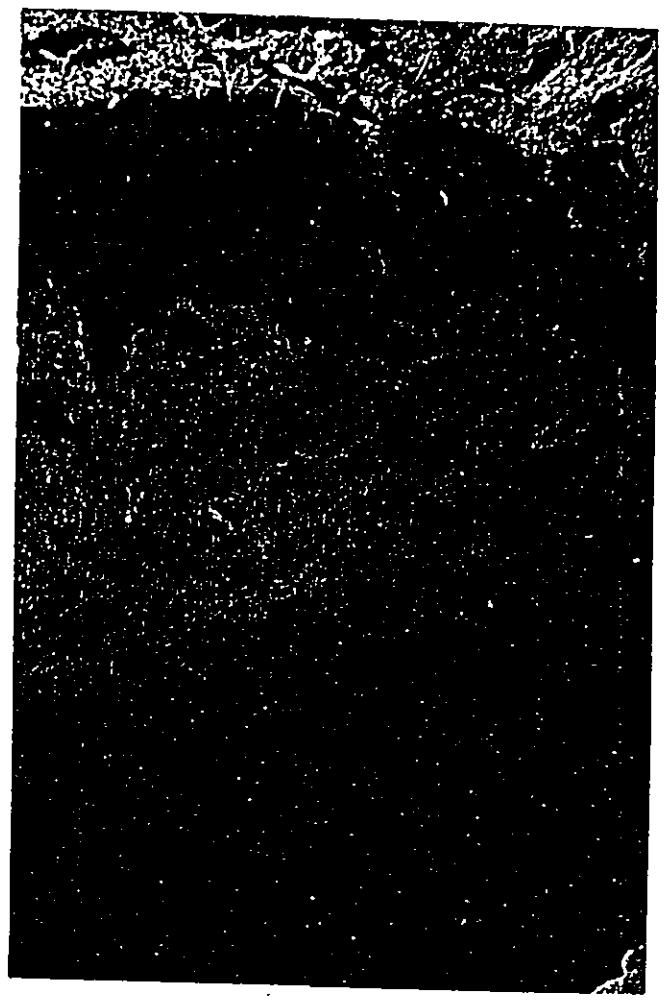
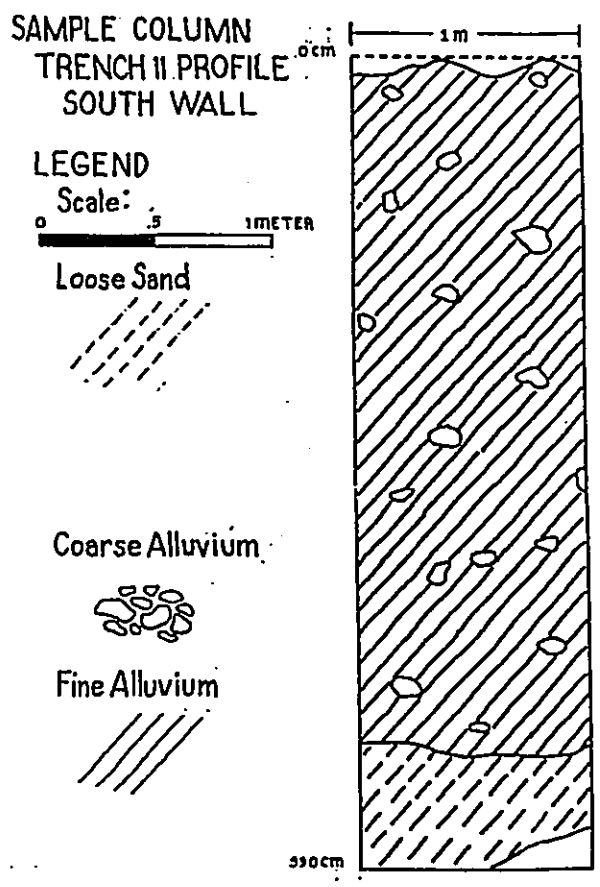


Figure 17. South Wall of Trench 10, Stratigraphic Column and Photo



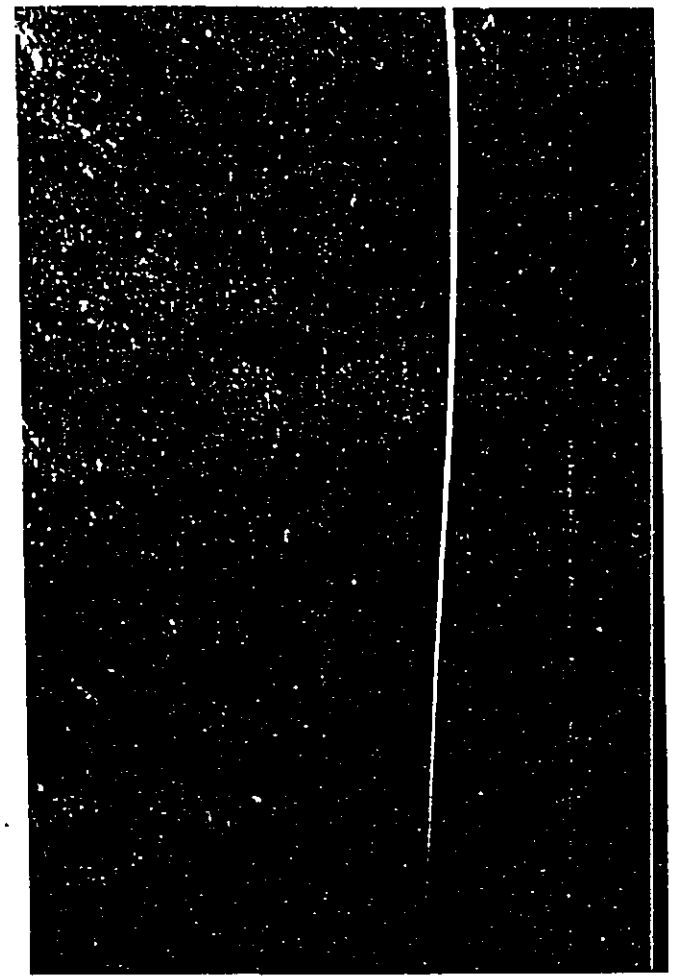
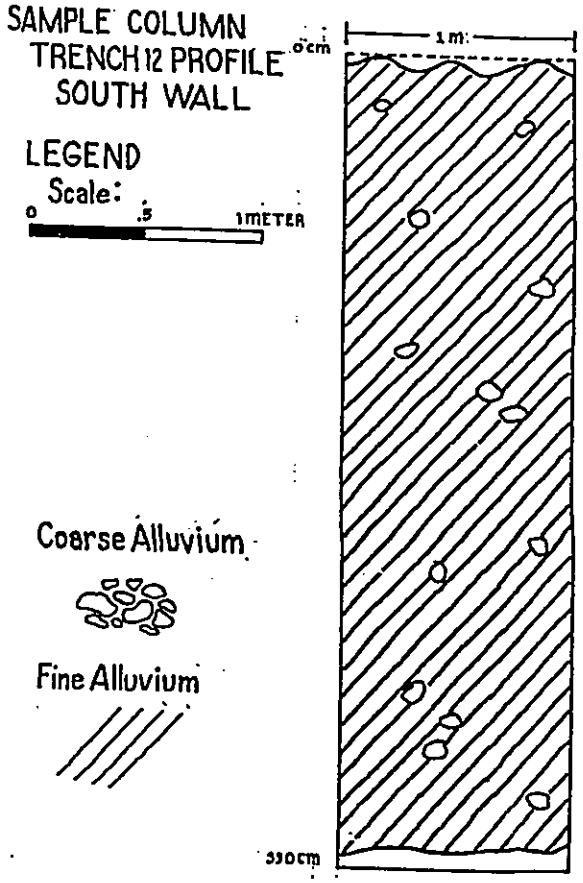


Figure 18. South Wall of Trench 11, Stratigraphic Column and Photo.



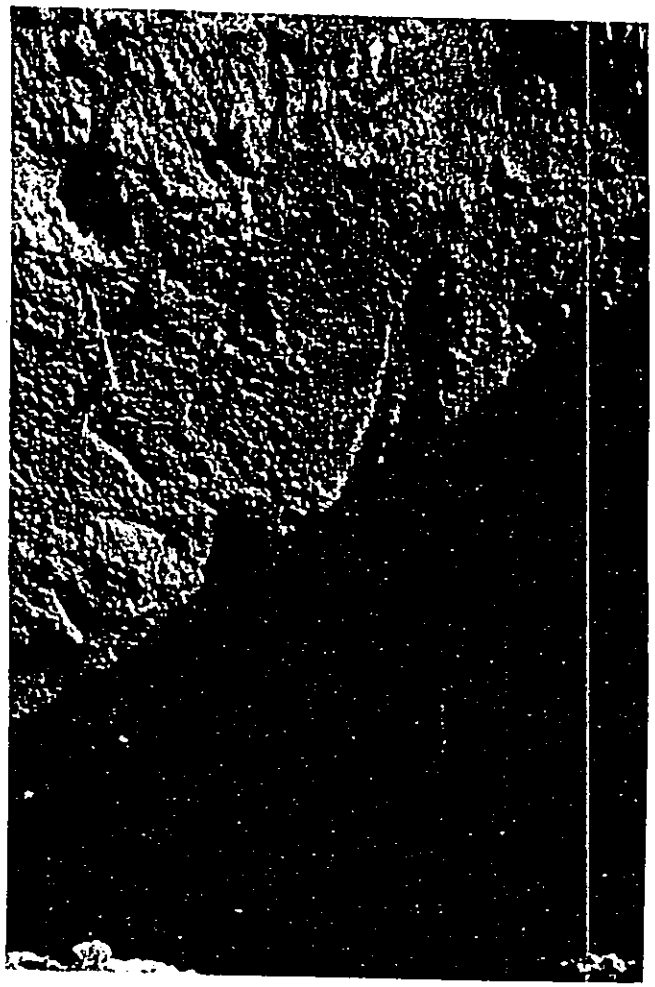


Figure 19. South Wall of Trench 12, Stratigraphic Column and Photo.

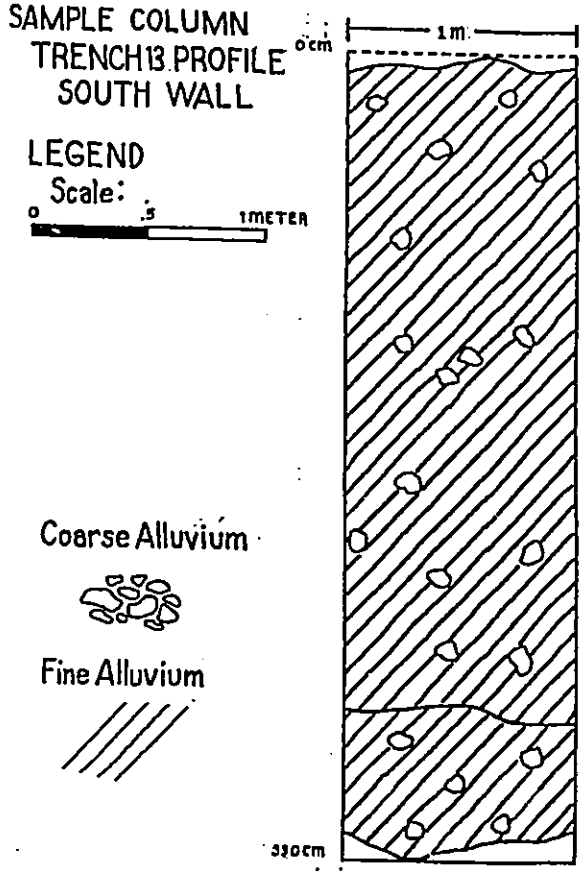
Trench 13 is 15 meters in length, 2 meters wide, and was excavated to a depth of 3.3 meters. Two distinctive stratigraphic zones were recorded (Fig. 20). From the surface, continuing to a depth of 280cm, an homogeneous stratum of coarse to fine-grained, dark brown (10YR 2/2) loam was encountered which contained only about 10% large to small, water-worn basalt cobbles. Black plastic and irrigation tubing occur in the uppermost 30cm but no clearly defined till zone was evident. From 280cm to termination of excavation at 330cm, a slightly lighter, fine to medium-grained, reddish brown (7.5YR 3/2) loam was encountered. Contained within this matrix were decomposed (saprolitic), *in situ*, cobbles comprising about 10% of the total volume. Soils in both of these strata displayed some plasticity and retained water, but lacked the cohesion of clay.

DISCUSSION

No cultural remains were encountered during surface survey or subsequent subsurface testing. However, stratigraphic analysis of the 13 backhoe trenches revealed a diversity of depositional data which provide some insight into the formative geology of the study area. The stratigraphic profiles described in the previous section contain various combinations of two primary depositional events: sand derived from coral and sea shells and alluvium derived from the basalts of the West Maui volcano. For the purposes of discussion, these two common matrices are further categorized into: loose and lithified sand, and coarse and fine alluvium. In the project area, these components are represented in various sequential combinations, but always discretely. No mixing of the sand and alluvial components was observed. Specific areas of the project corridor, especially within the central segment, occupy an ecotone or the transition between two areas of divergent depositional histories resulting in the ecological differences apparent even today.

The Wailuku Sand Hills represent a portion of the expansive consolidated calcareous sand dune formation, known as the Puuone, which rests on the broad alluvial fans near the shore between Kahului and Waihee, and extends inland along the western edge of the Kahului Isthmus. The dunes were formed by sand, derived from coral and sea shells, blowing inland from wide beaches exposed during periods of lower sea levels in the Pleistocene (MacDonald et al. 1970:388). A test boring, 2.5 kilometers north of the mouth of Wailuku River revealed that the dunes extend below present sea level. Less consolidated dunes are of a later date and are still forming (MacDonald et al. 1970:388).

In the project area, the dune complex rests on a broad alluvial fan emanating from the mouth of Waikapu Valley. The fan is composed of stream-eroded basaltic materials from



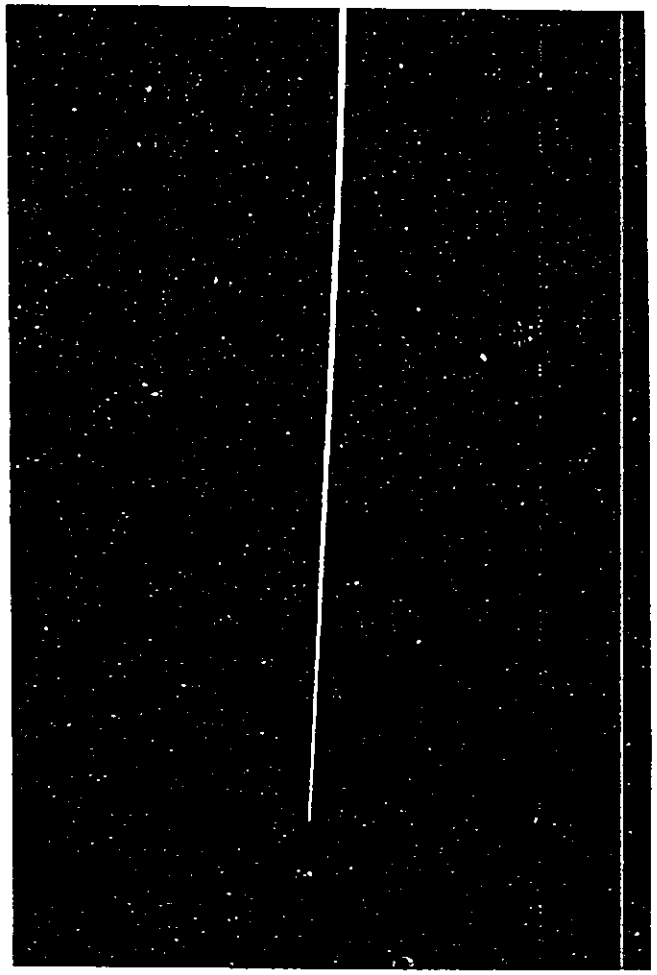


Figure 20. South Wall of Trench 13, Stratigraphic Column and Photo.

the West Maui volcano. As is common elsewhere in the Hawaiian Islands, the head of this canyon is choked with massive deposits of colluvium and alluvium being removed by Waikapu Stream. A well, drilled near the mouth of Waikapu Valley, penetrated 72 meters of alluvial gravel (MacDonald et al. 1970:387).

Although the removal, or other compounded disturbances, of the natural deposition throughout the project area renders stratigraphic analysis somewhat problematical, the examination of combined trench profiles permit several general observations concerning the project area. Based on the geological syntheses provided by Stearns (1946), Foote et al. (1972), and MacDonald et al. (1970), the stratigraphic sequences revealed in the test trenches are probably of relatively recent derivation and appear to be a consequence of, and so postdate, the sand dune formation which has been estimated to be about 500,000 years old. Apparently sometime after the sand dune complex was established on the old alluvial fan, depositional events combined to produce the variations in the project area.

Two depositional alluvial materials are separated in the central segment of the project area; gradual or periodic depositions in the northern project area: and rapid single event deposits in the southern segment. The earlier deposition appears to be the deep, relatively cobble-free, loamy clays which occur in the northern segment in Trenches 11, 12, and 13. This material appears to have gradually eroded from the surface of the original fan after the establishment of the dune. Relatively fine materials moving down-slope in a northeasterly direction from the peak of the fan at the mouth of Waikapu Valley were subsequently trapped or impounded by the sand hills at the dune margin which follows an almost level contour across the fan, forming a natural dam. At the point of intersection, drainage from the fan traveling in a northeasterly direction is deflected to the south along the very gradual contour of the dune margin. Further evidence that these deposits developed after the dune formation is suggested by the change in slope from the adjacent alluvial fan to the almost level terrace of the dune margin, and the underlying sand stratum encountered in Trench 10. These trenches correspond to the distribution of Iao Series soils developed in alluvium from basic igneous rocks (Foote et al. 1972).

In the southern area of the corridor and adjacent to the channel of Waikapu Stream, more vigorous depositional events are evidenced. Stearns (1946) delineates an area of "younger alluvium" originating at the mouth of Waikapu Valley, following the stream channel east, and abruptly turning to the south in the area of the dune margin. If older Iao Series soils previously existed on this area of the fan, they were probably removed from the surface by what appears to have been a single or perhaps several major events which deposited

material in a graded manner across the southern and central segments of the project area, inundating the dune complex and removing portions of the outer dune margin. Near the channel of Waikapu Stream, in Trenches 1 and 2, and extending into the central segment in Trench 8, a relatively thick, bedded stratum of coarse alluvium lies atop a leveled surface of lithified sand. Penetrating the dune margin in Trench 6, an homogeneous stratum of silty loam overlies lithified sand. Both the coarse and fine alluvial deposits appear to be of rapid origin because no layering is evidenced within these strata. Trenches 6 and 7 correspond to an isolated pocket of Pulehu Series soils surrounded by Puuone sand near the dune margin (Foote et al. 1972).

A general sorting of alluvial materials from coarse, in the southern part of the project area (Trenches 1, 2, and 8), to finer materials in the central (Trenches 6, and 7), and northern trenches (Trenches 11, 12, and 13) is apparent. Additionally, strata of loamy clay underlying lithified sand (Trench 7) and silty loam overlying lithified sand (Trench 6), provide some indication of alternate banking and possible ponding near the dune margin. Stearns (1946) indicates that younger alluvium may have been deflected by the dune formation in this area allowing the deposition of silts or clay. Deep loams in the northern segment of the project area may coincide to Stearns' (1946) region of older alluvial materials as indicated by cobbles decomposing in situ in Trench 13.

RECOMMENDATIONS

The results of the current archaeological inventory survey were negative. No surface remains or subsurface evidence of past human activities were encountered during the course of the undertaking. However, based on the general cultural sensitivity of sand dune areas associated with the Puuone, archaeological monitoring is recommended for those areas slated for construction-related excavation. A plan discussing the nature, scope, and duration of monitoring will be prepared and submitted for approval by SHPD/DLNR prior to commencement of any construction.

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Appendix A-1

Historic Preservation Review of an Archaeological Inventory Survey

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

May 8, 1996

LOG NO: 17162 ✓
DOC NO: 9605KD08

Mr. Aki Sinoto
Aki Sinoto Consulting
2333 Kapiolani Blvd. No. 2704
Honolulu, Hawaii 96826

Dear Mr. Sinoto:

SUBJECT: **Historic Preservation Review of A Draft Archaeological Inventory Survey Report - Wailuku Project District Retention Basin and Drainage System, Wailuku District, Maui TMK: 3-5-02: 01 and 3-5-01: 17**

Thank you for submitting a draft of the report entitled *Archaeological Inventory Survey of the Proposed Retention Basin and Adjoining Lands, Waikapu and Wailuku Ahupua'a, Wailuku District, Island of Maui* (P. Titchenal 1996). The report presents the findings of subsurface backhoe trench testing along a drainage corridor and retention basin area located in the Wailuku Sand Hill area. The project area consists of a corridor between Honoapiilani Highway at Kuikahi Drive, along the west side of Waiale Road to Waikapu Stream and Waiko Road. In general, the project area consists of former pineapple fields, sand borrow areas, and otherwise modified agricultural lands.

Thirteen backhoe trenches were excavated along the corridor, and no evidence of subsurface cultural deposits or features were identified. Soils encountered include alluvium with high boulder/cobble content, lithified and compacted sand, unconsolidated sand, homogenous silty loam, and loamy clay.

The report contains a good background section, providing adequate environmental and historic information for the project area. The presentation of findings is clear. and sufficient information is provided regarding the location, size, depth and stratigraphy of the trenches. The discussion of findings regarding soil deposition in the project area is good, and it contains comparative reference material regarding the general geomorphology of the isthmus region.

In conclusion, we find the report to be adequate and acceptable as a final inventory survey report.

We concur with the recommendation that monitoring occur during construction, due to the general location of the project area in relation to the Wailuku Sand Dune complex, which contains several known burial sites. However, it does not appear that the entire project area will require monitoring. Based on the findings of the survey, some sections of the project corridor consist of secondary fill to depths of over 2.9 m. In addition, some areas consist of thin sand layers between coarse alluvial gravel. These types of areas do not appear to require archaeological monitoring. The monitoring plan for this project should therefore identify those portions of the project area that would require monitoring, based on the information available from the backhoe testing.

Due to the fact that the location of the outlet channel under Waiko Road and into Waikapu Stream was not finalized at the time of the survey, we recommend that this area be included among the sections of the project to be monitored.

Please contact Ms. Theresa K. Donham at 243-5169 if you have any questions.

If you have not already done so, please send a copy of this report to the Honolulu office, care of Dr. Sara Collins.

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

KD:jen

Appendix A-2

Findings Regarding the Existence of Native Hawaiian Gathering Rights

Aki Sinoto Consulting - Cultural Resource Management
2333 Kapiolani Blvd. No. 2704, Honolulu, Hawaii 96826 Tel. (808)941-4538 Fax (808)942-1096

October 6, 1998

Mr. Avery Chumbley. President
Wailuku Agribusiness Co., Ltd.
255 East Waiko Road
Wailuku, Hawaii 96793

Dear Mr. Chumbley:

Subject: Cultural Impact Assessment for the Proposed Development of the Waiko Baseyard Subdivision, Waikapu, Wailuku, Maui Island (TMK 3-5-02: por. 01)

This letter presents the results of a cultural impact assessment of the subject area requested by the Wailuku Agribusiness Company, Ltd.. This procedure was undertaken to determine whether the proposed development posed any detrimental impacts to native Hawaiian cultural practices. The tasks performed included literature and documents review and informal oral interviews with native Hawaiian individuals familiar with the area and with expert resource persons.

An archaeological inventory survey of the subject area was completed in December 1995, by Paul Titchenal of Aki Sinoto Consulting. No significant prehistoric or traditional Hawaiian remains nor any historic period sites were found to be present in the project area. Following a review of this report, the State Historic Preservation Division (DLNR) of the Department of Land and Natural Resources concurred with the findings and recommendations presented in the report.

Although the absence of traditional Hawaiian sites was indicated by the survey, due to the possibility that some sites may have been destroyed by long term sugarcane and pineapple cultivation activities, literature and document searches were undertaken to research the pre-sugarcane era. Historic maps and other land-use documentation were reviewed at the Bishop Museum library and archives and the State Survey Office of the Department of Accounting and General Services. For previously recorded site information and other archaeological studies completed in the vicinity, the SHPD library and site files in Honolulu was consulted. No indications of the former presence of any prominent prehistoric or traditional sites were revealed through the map and document searches.

The absence of structural remains, as well as the lack of historic documentation of significant traditional sites, such as *heiau* and *koa*, in the subject area, largely preclude potential impacts to traditional religious and ceremonial practices. However, one potential aspect of such religious and ceremonial practices still exists due to the probability of human burials in the subject area. This is based on the recorded occurrence of a number of burial complexes both within the Wailuku sand dunes and along the peripheral areas of the dune. Such findings have been made recently within the immediate neighboring properties so the potential exists for also encountering burials in the subject area during the course of construction. The nature, location(s), and final disposition of such burials, should there be any, can only be established following proper protocol in coordination with SHPD and the Maui/Lana'i Islands Burial Council (MLIBC).

Following these findings, the focus of research was concentrated on potential resource gathering and access concerns. However, based on the negative results of the inventory survey and the lack of original integrity of the current landscape due to an extended period of compounded disturbance; the paucity of natural resources, in the form of native fauna and flora, within the project area had already been established. Ecologically, the subject area occupies the intermediate zone between the coastal and inland forest zones and portions of an inland dune system also occur within the area. It incorporates the transition zone between the lower slopes of the West Maui mountains and the flat plateau of the central Maui isthmus. With the exception of the southern end of the subject area near Waikapu Stream, no other drainages occur in the rest of the area and a limited variety of flora appears to have been present. During the historic period, water had to be diverted from outside areas with the advent of large scale sugarcane and pineapple cultivation.

The absence of permanent habitation, traditional agriculture, or specialized resource exploitation site types, such as lithic quarries and workshops, is another indication that the area was probably not densely settled or intensively utilized. Although not observed during the survey and most likely extirpated from the area by the encroachment of hardy exotic species such as *kiawe* (*Prosopis pallida*) and *koa haole* (*Leucaena glauca*) that predominate today, *pili* grass (*Heteropogon contortus*), used for thatching and other medicinal herbs may have been the most likely exploited floral resources from this zone.

A literature review was undertaken at the Bishop Museum Library and the State Historic Preservation Division Library. Pertinent previous archaeological reports and background historical research manuscripts were reviewed for any references to gathering or gathered resources. Several archaeological reports, ethnographic publications, and historical research manuscripts were closely reviewed for work done in the vicinity of the subject area (see attached bibliography), but no discussion of any gathering practices or gathered resources were included in these studies.

For the oral informant testimony, several persons with expertise regarding the subject area, native Hawaiian gathering issues, and also knowledgeable of other resource persons in the community were consulted. The people contacted included; Mrs. Dana Naone Hall, past Chair of MLIBC and current Maui representative for *Hui Malama I Na Kupuna O Hawaii Nei*; Mr. Charles Maxwell, Jr., current Chair of the MLIBC; Mr. Leslie Kuloloio, Vice-Chair of MLIBC; and Mr. Rene Sylva, well-known horticulturist from Paia who specializes in native Hawaiian plants.

In the course of similar assessments completed for other areas, *kumu hula* were found to be very knowledgeable of the resources of a given area, since they still actively gather in the practice of their traditional art form. The persons contacted had no knowledge of any gathering that took place within the subject area in the past or that take place today. All held similar opinions, that the area today was too extensively disturbed to permit traditional gathering practices. Mr. Maxwell, who is from the Waikapu area, stated that he did not have knowledge of such practices in the subject area, but rather in areas more *mauka*. Mrs. Hall also stated that she did not know of any contemporary gathering activities in the area, but recommended that Mr. Sylva be contacted for information on what kinds of resources may have been traditionally available. Mr. Kuloloio concurred with the others and also stated that the absence of such activities diminished the concern for access into the subject area. Never-the-less, Mr. Kuloloio felt that an adequate number of roadways that allow public access to the area and adjoining areas already exist. Mr. Sylva stated that from his extensive past experience in seeking out native and endemic plants, that the most pristine sand dune environment was present in the Waiehu area until the 1980s when a residential subdivision destroyed that particular ecosystem. He felt that

portions of the subject area were probably very similar in the past. The floral resources gathered were not of the variety for dietary consumption, but probably more for medicinal uses such as *Namo sandwicense* or for other uses such as *pili*. All of the persons interviewed asserted the potential for human burials in the subject area.

There still may be persons who are knowledgeable regarding traditional gathering activities in the general region and the variety of resources available for subsistence-related uses or other purposes besides *hula*. However, based on the range of currently available data, with special emphasis on the oral information from knowledgeable persons, the subject area does not appear to be a currently viable gathering location nor important in providing access to adjacent areas that are considered culturally significant. Thus, the implementation of the proposed development plans does not appear to pose any detrimental impacts to native Hawaiian cultural practices.

I hope that this assessment adequately addresses pertinent review comments on the Environmental Assessment. Should you have any questions or comments, please contact me at the above number by voice or facsimile.

Sincerely,

Aki Sinoto
Consulting Archaeologist

fxc: Glenn Tadaki, Munekiyo, Arakawa & Hiraga, Inc.

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Appendix B

Preliminary Engineering Report

PRELIMINARY ENGINEERING REPORT

FOR

WAIKO BASEYARD SUBDIVISION

WAILUKU, MAUI, HAWAII

Prepared For:

Wailuku Agribusiness Company, Inc.
Wailuku, Hawaii

Prepared By:

Warren S. Unemori Engineering, Inc.
Civil and Structural Engineers - Land Surveyors
Wells Street Professional Center, Suite 403
2145 Wells Street
Wailuku, Maui, Hawaii 96793

April, 1996
Revised July, 1998

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Preliminary Engineering Report
for
Waiko Baseyard Subdivision

1.0 INTRODUCTION

This report provides a brief description of existing water, drainage, sewer, electrical and telecommunication facilities in the project vicinity. It also provides an insight to probable infrastructural improvements required to support the project.

2.0 EXISTING INFRASTRUCTURE

2.1 WATER

2.1.1 Source

Most of the water for Waikapu comes from the Mokuhau wells. This source is supplemented by water from the Iao Tunnel and Wailuku shaft. These sources feed into the 3.0 MG storage tank located east of Waiale Road.

2.1.2 Transmission System

Water for Waikapu is pumped from the 3.0 MG storage tank below Waiale Road to a 0.30 MG storage tank in Wailuku Heights through an 8 inch transmission line. Water is then conveyed by gravity by means of the distribution system for Wailuku Heights to the 0.30 MG storage tank for Waikapu situated at elevation 764 feet above sea level. A series of 12 and 8 inch lines on Waiko Road that comprise the distribution system for Waikapu then convey the water

down to its intersection with Honoapiilani Highway. Below Honoapiilani Highway, the existing distribution system on Waiko Road reduces to a four inch line.

2.1.3 Storage

Storage for Waikapu Village is provided by the 0.30 MG storage tank in Upper Waikapu. C. Brewer Properties participated in the construction of this storage tank and portion of the transmission line on Waiko Road.

2.2 DRAINAGE

There is no drainage system in the vicinity of the project site. Runoff from the offsite areas above the project site as well as from the site itself currently sheet flows onto adjacent undeveloped lands below.

Current runoff from the project site for a 50-year 1 hour recurrent interval rainfall is estimated to be 17.25 cfs.

2.3 SEWER SYSTEM

The closest County sewerline in Waikapu is located on Waiko Road on the makai edge of Waikapu Village. This gravity sewer interceptor is located 2,000 feet west and mauka of the project site. It is also approximately 80 feet higher in elevation than the project site. This interceptor connects to the gravity system on Waiale Road. A new 18 inch gravity interceptor was recently installed on Waiale Road down to the Kaahumanu overpass by C. Brewer Homes, Inc. (CBHI).

North of the Kaahumanu overpass, sewage is conveyed to the Wailuku pump station located east of Waiehu Beach Road by a series of 12, 15, and 18 inch sewer lines on Lower Main Street. This station then pumps all the wastewater collected from Wailuku, Waiehu, and portions of Kahului to the Kahului Wastewater Reclamation Facility via an 18 inch force main for final treatment and disposal.

The Kahului Wastewater Reclamation Facility was recently expanded, increasing its capacity from 6.0 MGD to 7.9 MGD. Therefore it has adequate capacity to treat and dispose wastewater generated by the Waiko Baseyard Subdivision project.

2.4 ELECTRICAL, TELEPHONE, AND CATV

Overhead power and telephone lines are available along the existing agricultural road that runs through the project site. These feeder lines will be relocated in conjunction with the development of the project site.

3.0 PROBABLE INFRASTRUCTURAL IMPROVEMENTS

3.1 WATER

3.1.1 Projected Water Demand (Ave. Daily)

- At 6000 gpAd = 12.25 x 6000 = 73,500 gpd
- At 140 gpd/1000 s.f. x 0.60 x 12.25 x 43560 = 44,820 gpd

Average water demand for the project is expected to range between 45,000 and 73,500 gpd. Actual consumption will depend on the ultimate land use of each lot in the subdivision.

3.1.2 Source

Applicant's prorata contribution for new source development will be by means of meter fees as prescribed in the Rules and Regulations of the Department of Water Supply.

3.1.3 Storage

Storage for the project will be provided by the new 0.30 MG storage reservoir in Upper Waikapu. Storage assessment for the project will be paid as part of the meter fee.

3.1.4 Transmission System

The existing 12 inch transmission line presently ends at Honoapiilani Highway. Approximately 2900 feet of new 12 inch line will have to be installed along Waiko Road from the end of this line on Honoapiilani Highway to the project site.

3.1.5 Distribution System

A 12 inch diameter distribution system capable of delivering a fire flow of 2000 gpm will be extended into the project from Waiko Road. Fire hydrants will be spaced at maximum intervals of 250 feet along the subdivision streets. Each lot will be metered separately.

3.2 DRAINAGE

Post development runoff from the project site for a 50-year 1-hour recurrent interval storm is estimated to total 53 cfs. This translates to an increase of approximately 36 cfs over current runoff.

As part of the subdivision improvements, new curb-inlet catch basins will be installed within the subdivision streets. Additional runoff attributable to the development will be intercepted by these catch basins and directed into the storm drain system for conveyance to a retention basin located (offsite) north of the project site. The retention basin will be sized to handle all additional runoff generated by the development in accordance with "Title MC-15, Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui."

3.3 SEWER SYSTEM

At a rate of 2000 gpAd the project is projected to generate about (12.25 Ac. x 2000 gpAd) 24,500 gpd of wastewater.

A gravity sewer system located within the subdivision streets will be designed to receive wastewater from each lot and convey it to a sewer lift station at the northeast corner of the project. This lift station will then pump the wastewater collected to the existing gravity interceptor located below Waikapu Village through 3600 feet of force main.

3.4 ELECTRICAL, TELEPHONE, AND CATV

The distribution system for power and telecommunication services will be placed underground along the shoulders of the subdivision streets in accordance with the provisions of the subdivision ordinance and County standards. Each lot will be provided with service laterals for these facilities.

APPENDIX A
Preliminary Drainage and Soil Erosion Control Report

PRELIMINARY DRAINAGE AND SOIL EROSION CONTROL REPORT

FOR

WAIKO BASEYARD SUBDIVISION

Waikapu, Wailuku, Maui, Hawaii

TMK: 3-5-02:Portion of 01

DEVELOPER: Wailuku Agribusiness Co., Inc.
ADDRESS: Wailuku, Maui, Hawaii

Prepared By:

Warren S. Unemori Engineering, Inc.
Civil and Structural Engineers - Land Surveyors
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2145 Wells Street
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March, 1996
Revised July, 1998

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Preliminary Drainage and Soil Erosion Control Report
for
Waiko Baseyard Subdivision

I. INTRODUCTION

This report has been prepared to evaluate both the existing site drainage conditions and proposed drainage plan for subject development.

An investigation to determine the potential movement of soil due to rainfall and surface runoff during construction of the project in accordance with Chapter 20.08 of the Maui County Codes is also included.

II. PROPOSED PROJECT

A. Site Location:

The project site is located in Waikapu, on the island of Maui, and in the State of Hawaii. It is situated immediately north of Waiko Road, approximately 2,500 feet east of Waiko Road-Honoapiilani Highway intersection and 4,200 feet west of Waiko Road/Kuihelani Highway intersection (see Exhibit 1).

The project site encompasses an area of approximately 14.4 acres.

B. Project Description:

The proposed development plan for Waiko Baseyard Subdivision is to ultimately develop the project site into an industrial park consisting of nineteen (19) industrial lots. Future roadway improvements will include asphalt paved roadways, concrete sidewalks, concrete curb and gutters, and landscaping. Future utility improvements will consist of

underground drainage, sewer, water, electrical, and telephone distribution systems.

III. EXISTING CONDITIONS:

A. Topography and Soil Conditions:

Approximately 5.5 acres of the project site is currently being used as the baseyard for Wailuku Agribusiness Company, Inc. Office, storage and dormitory buildings, as well as parking and support facilities and Brewer Environmental Industries commercial operations are contained on the site. The remaining portion of the project site is presently undeveloped and not being used for any particular purpose. Natural vegetation includes but is not limited to bermuda grass, bristly foxtail, finger grass, kiawe, lantana, koa haole, sandbur, and a variety of weeds and shrubs native to the area.

The existing ground slopes from an elevation of (+) 318± feet M.S.L. to (+) 303± feet M.S.L. with an average slope of 2.0%.

According to the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (August, 1972)", prepared by the United States Department of Agriculture, Soil Conservation Service, there are three (3) types of soil that exist on the project site (see Exhibit 2). They are classified as follows: Jaucas Series, sand, 0 to 15 percent slopes (JaC), Pulehu Series, clay loam, 0 to 3 percent slopes (PsA), and Puuone Series, sand 7 to 30 percent slopes (PZUE).

The predominant Pulehu clay loam is characterized as having moderate permeability, slow runoff and no more than slight erosion hazard.

The Jaucas Sand is characterized as having rapid permeability and very slow to slow runoff. The hazard of water erosion is slight, but the wind erosion hazard is severe where vegetation has been removed.

Characteristics of the Puuone Sand is rapid permeability above the cemented layer, slow runoff and moderate to severe wind erosion hazard.

B. Drainage:

According to our calculations, approximately 17.3 cfs of onsite surface runoff is presently generated by the project site (see Appendix A). This surface runoff volume is presently sheet flowing off the project site in an easterly direction into the adjacent downstream properties.

Offsite surface runoff from the area mauka (west) of the project site is expected to be intercepted by a drainage channel running along the entire mauka (westerly) boundary of the project site. This drainage channel will be constructed as part of the Wailuku Project District Offsite Drainage Improvements.

C. Flood and Tsunami Zone:

According to Panel Number 150003 0190D of the Flood Insurance Rate Map, March 16, 1995, prepared by the United States Federal Emergency Management Agency, the entire project site is located within

Zone C, which is designated as areas subject to minimal flooding (see Exhibit 3).

IV. DRAINAGE PLAN

A. General:

According to our calculations, the post development onsite surface runoff volume generated by the project site during a 50 year recurrent interval storm will be approximately 53.0 cfs. Accordingly, there will be a net increase of approximately 35.7 cfs due to the proposed development (see Appendix A).

As part of the subdivision improvements, new curb-inlet type catch basins and an underground drainage system will be installed within the proposed subdivision roadways to intercept and convey the onsite surface runoff. The intercepted onsite surface runoff will be discharged into a retention basin which will be located offsite north of the project site. The retention basin will be designed to store all additional onsite surface runoff generated by the proposed development in accordance with the "Rules for the Design of Storm Drainage Facilities in the County of Maui, Title MC-15, Chapter 4".

B. Hydrologic Calculations:

The hydrologic calculations are based on the "Rules for the Design of Storm Drainage Facilities in the County of Maui, Title MC-15, Chapter 4", "Drainage Master Plan for the County of Maui", and the "Rainfall Frequency Atlas of the Hawaiian Islands", Technical Paper No. 43, U. S. Department of Commerce, Weather Bureau.

Rational Formula used:

$$Q = CIA$$

Where Q = Rate of Flow (cfs)

C = Rainfall Coefficient

I = Rainfall Intensity (inches/hour)

A = Area (Acres)

The hydrologic calculations for this project may be found in Appendix A.

C. Conclusion:

According to our calculations, the proposed Waiko Baseyard Subdivision will generate an additional onsite surface runoff volume of approximately 35.7 cfs (see Appendix A). The onsite surface runoff generated by the project will be intercepted by new curb-inlet type catch basins and conveyed by means of a new underground drainage system to a retention basin located offsite north of the project site. This basin will be sized to retain all additional runoff generated by the proposed

development. Accordingly, there will be no net increase of surface runoff flowing into downstream properties. Therefore, it is our professional opinion that the proposed Waiko Baseyard Subdivision project will not adversely affect the adjoining and downstream properties.

V. SOIL EROSION CONTROL PLAN

A. General:

Grading work for the proposed project will be less than the allowable fifteen (15) acres. Upon completion of the grading, all exposed areas will be grassed as required.

B. Soil Erosion Control Plan:

The following measures will be taken to control erosion during the site development period (estimated 12 months).

1. Minimize time of construction.
2. Retain existing ground cover until latest date to complete construction.
3. Early construction of drainage control features.
4. Use temporary area sprinklers in non-active construction area when ground cover is removed.
5. Station water truck on site during construction period to provide for immediate sprinkling, as needed, in active construction zones (weekends and holidays included).

6. Use temporary berms, filter berms, and cut-off ditches, where needed, for control of erosion.

7. Graded areas shall be thoroughly watered after construction activity has ceased for the day and on weekends.

8. All cut and fill slopes shall be sodded or planted immediately after grading work has been completed.

VI. CONCLUSION

Although the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, (August, 1972)", characterizes the soil at the project site as having a severe erosion hazard, our calculations indicate that the sedimentation hazard to coastal waters and downstream properties for the proposed development are minimal (see Appendix B). The soil loss per unit area and severity rating computed for the proposed development are well within the tolerable limits and additional erosion control measures are not required.

Report Prepared By:

Lance S. Nakamura

Report Checked By:

Reed M. Ariyoshi

VII. REFERENCES

1. *Rules for the Design of Storm Drainage Facilities in the County of Maui, Title MC-15, Chapter 4.* November, 1995. Department of Public Works and Waste Management, County of Maui

2. *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii.* August 1972. United States Department of Agriculture, Soil Conservation Service.

2. *Flood Insurance Rate Map, Maui County, Hawaii.* Community-Panel Number 150003 0190D. March 16, 1995. Federal Emergency Management Agency, Federal Insurance Administration.

3. *Drainage Master Plan for the County of Maui, State of Hawaii.* October 1971. R.M. Towill Corporation.

4. *Rainfall Frequency Atlas of the Hawaiian Islands, Technical Paper No. 43.* 1962. U.S. Department of Commerce, Weather Bureau.

5. *Storm Drainage Standards.* March 1986. Department of Public Works, City and County of Honolulu.

EXHIBITS

1. Location Map
2. Soil Survey Map
3. Flood Insurance Rate Map

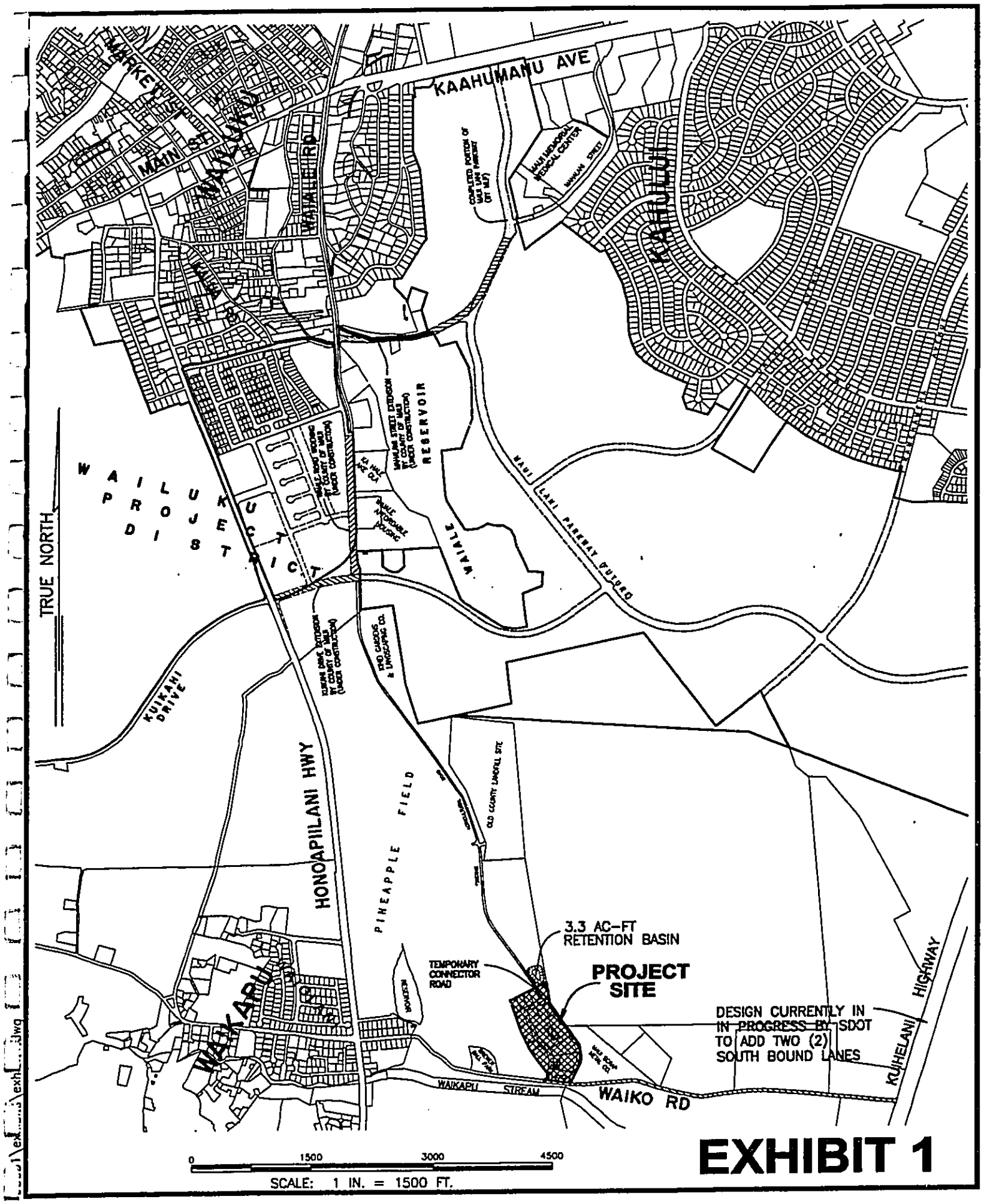
KAAHUMANU AVE
MARKET ST
MAIN ST
WAIALE RD
WAILUKU
KAHULUI
WAILUKU PROJECT DISTRICT
RESERVOIR
WAILE
KUIKAHI DRIVE
HONOAPIILANI HWY
PINEAPPLE FIELD
OLD COUNTY LANDFILL SITE
3.3 AC-FT RETENTION BASIN
TEMPORARY CONNECTOR ROAD
PROJECT SITE
DESIGN CURRENTLY IN IN PROGRESS BY SDOT TO ADD TWO (2) SOUTH BOUND LANES
KUIHELANI HIGHWAY
WAIKAPU STREAM
WAIKO RD
TRUE NORTH
0
1500
3000
4500
SCALE: 1 IN. = 1500 FT.

EXHIBIT 1

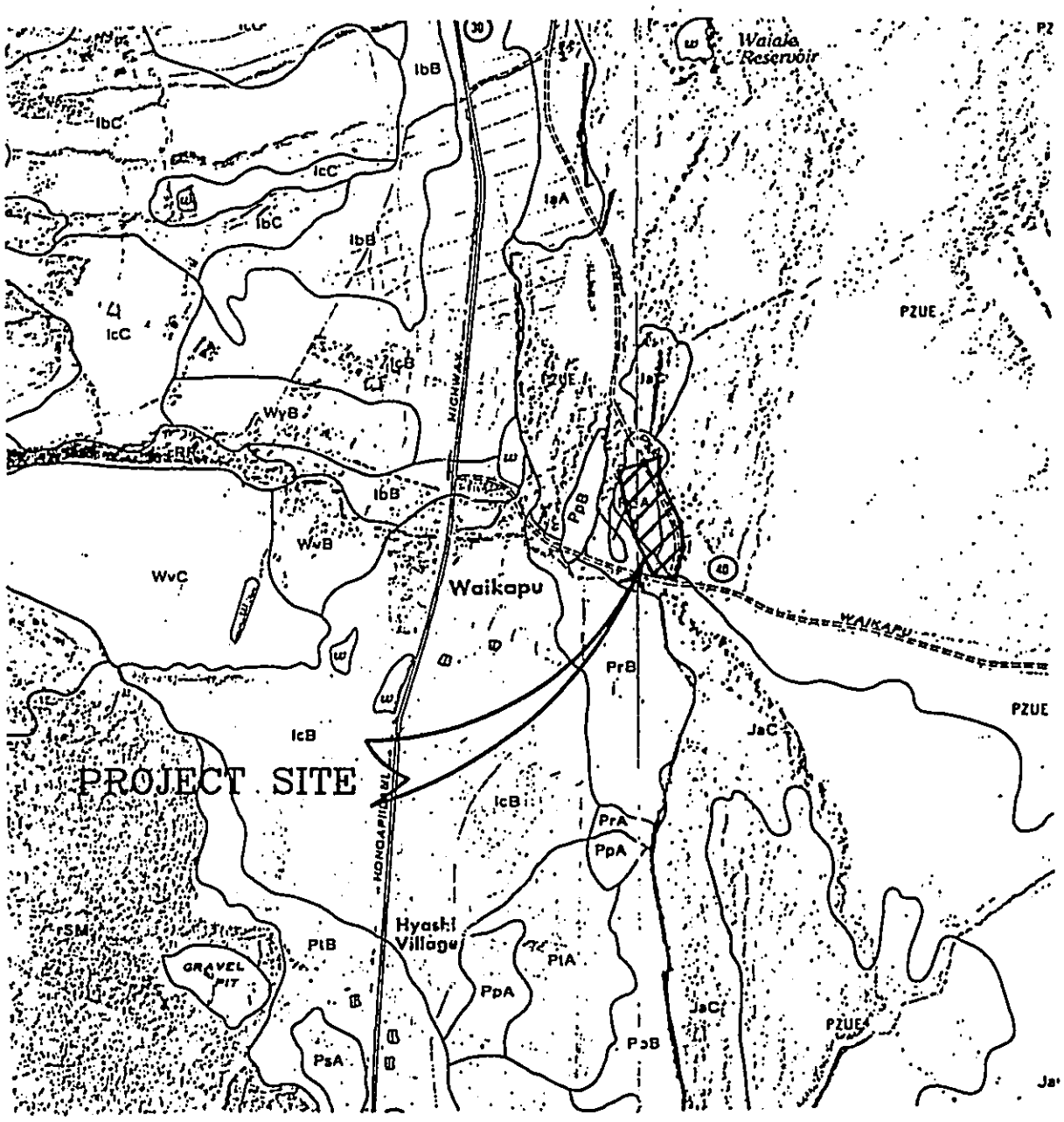

EXHIBIT 2

SOIL SURVEY MAP

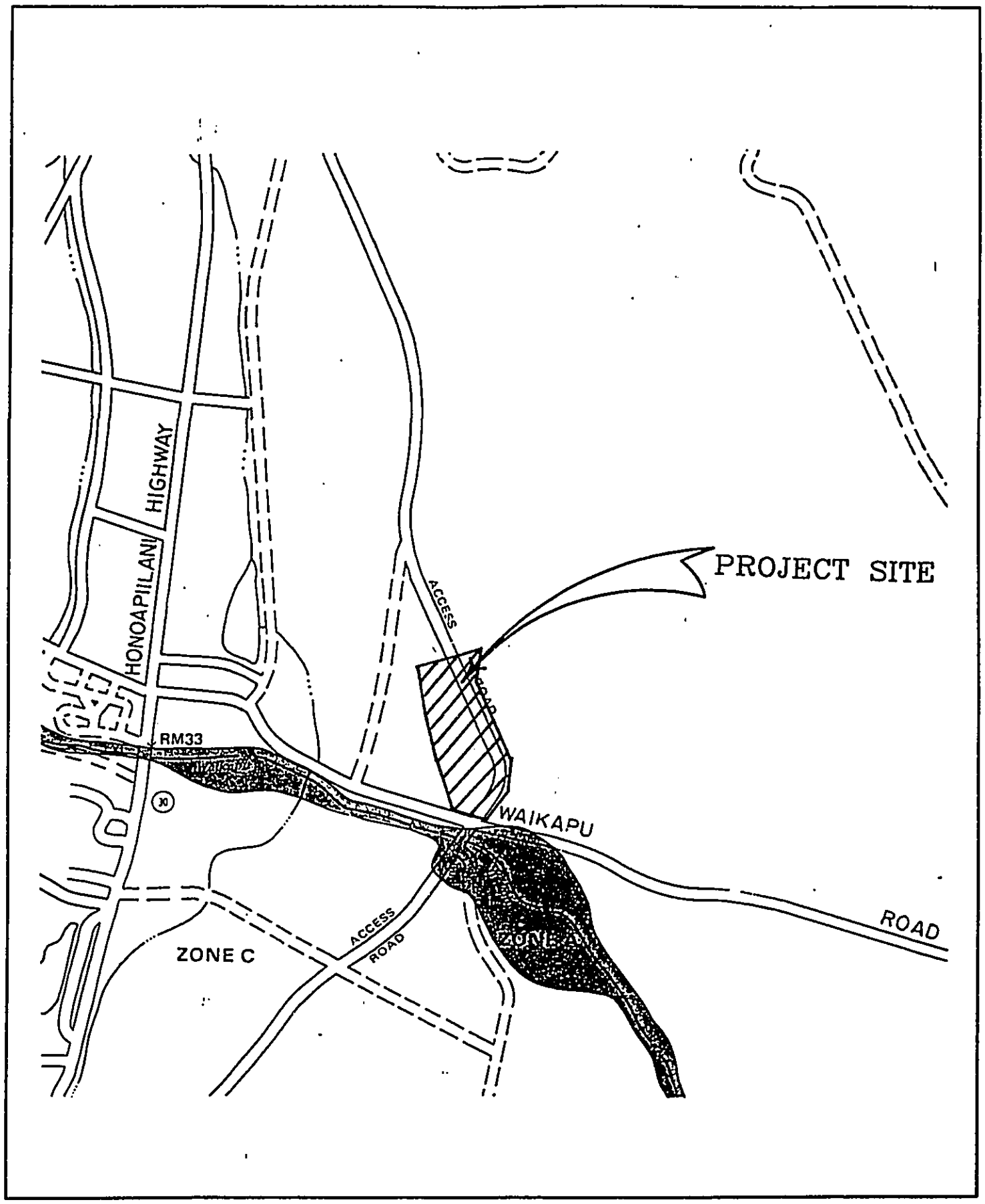

EXHIBIT 3
FLOOD INSURANCE
RATE MAP

APPENDIX A

HYDROLOGIC CALCULATIONS

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2145 Wells Street Suite 403
Wailuku, Maui, Hawaii 96793

BY: LANCE NAKAMURA
DATE: August 8, 1998

HYDROLOGIC STUDY
FOR
WAIKO BASEYARD SUBDIVISION

WAIKAPU, WAILUKU, MAUI, HAWAII

PRE-DEVELOPMENT SURFACE RUNOFF

RECURRENCE INTERVAL:	50 years	HYDRAULIC LENGTH:	740.0 ft.
ONE-HOUR RAINFALL:	2.50 inches	ELEV'N. DIFFERENTIAL:	15.00 ft.
		HYDRAULIC SLOPE:	0.020 ft./ft.
WEIGHTED RUNOFF COEFFICIENT, C:	0.33	TIME OF CONCENTRATION:	28.0 min.
INTENSITY, I:	3.60 inches		
AREA, A:	14.40 acres	SUB BASINS CONSIDERED:	2

Q = C*I*A = 17.25 cfs

COMMENTS:

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Wailuku, Maui, Hawaii 96793

BY: LANCE NAKAMURA
DATE: August 8, 1998

WAIKO BASEYARD SUBDIVISION
[continued]

TABULATION OF RUNOFF COEFFICIENTS & AREAS:

SUB-BASIN 1 OF 2 : UNDEVELOPED AREA

INFILTRATION:	High	0.00	
RELIEF:	Flat (0-5%)	0.00	>>> COMPOSITE C = 0.180
VEGETAL COVER:	Good (10-50%)	0.03	>>> AREA = 8.900 acres
DEVELOPMENT:	Agricultural	0.15	

SUB-BASIN 2 OF 2 : DEVELOPED AREA

INFILTRATION:	High	0.00	
RELIEF:	Flat (0-5%)	0.00	>>> COMPOSITE C = 0.580
VEGETAL COVER:	Good (10-50%)	0.03	>>> AREA = 5.500 acres
DEVELOPMENT:	Industrial / Business	0.55	

W.S. UNEMORI ENGINEERING, INC.
2145 Wells Street Suite 403
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BY: LANCE NAKAMURA
DATE: August 8, 1998

HYDROLOGIC STUDY
FOR
WAIKO BASEYARD SUBDIVISION

WAIKAPU, WAILUKU, MAUI, HAWAII

POST DEVELOPMENT SURFACE RUNOFF

RECURRENCE INTERVAL:	50 years	HYDRAULIC LENGTH:	1790.0 ft.
ONE-HOUR RAINFALL:	2.50 inches	ELEV'N. DIFFERENTIAL:	17.90 ft.
		HYDRAULIC SLOPE:	0.010 ft./ft.
WEIGHTED RUNOFF COEFFICIENT, C:	0.80	TIME OF CONCENTRATION:	15.0 min.
INTENSITY, I:	4.60 inches		
AREA, A:	14.40 acres	SUB BASINS CONSIDERED:	1

Q = C*I*A = 52.99 cfs

COMMENTS:

W.S. UNEMORI ENGINEERING, INC.
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Wailuku, Maui, Hawaii 96793

BY: LANCE NAKAMURA
DATE: August 8, 1998

WAIKO BASEYARD SUBDIVISION
[continued]

TABULATION OF RUNOFF COEFFICIENTS & AREAS:

SUB-BASIN 1 OF 1 : DEVELOPED AREA

INFILTRATION:	Negligible	0.20	
RELIEF:	Flat (0-5%)	0.00	>>> COMPOSITE C = 0.800
VEGETAL COVER:	Poor (<10%)	0.05	>>> AREA = 14.400 acres
DEVELOPMENT:	Industrial / Business	0.55	

W.S. Unemori Engineering, Inc.
Wailuku, Hawaii
AUGUST 8, 1998

HYDROLOGIC REPORT FOR

WAIKO BASEYARD SUBDIVISION

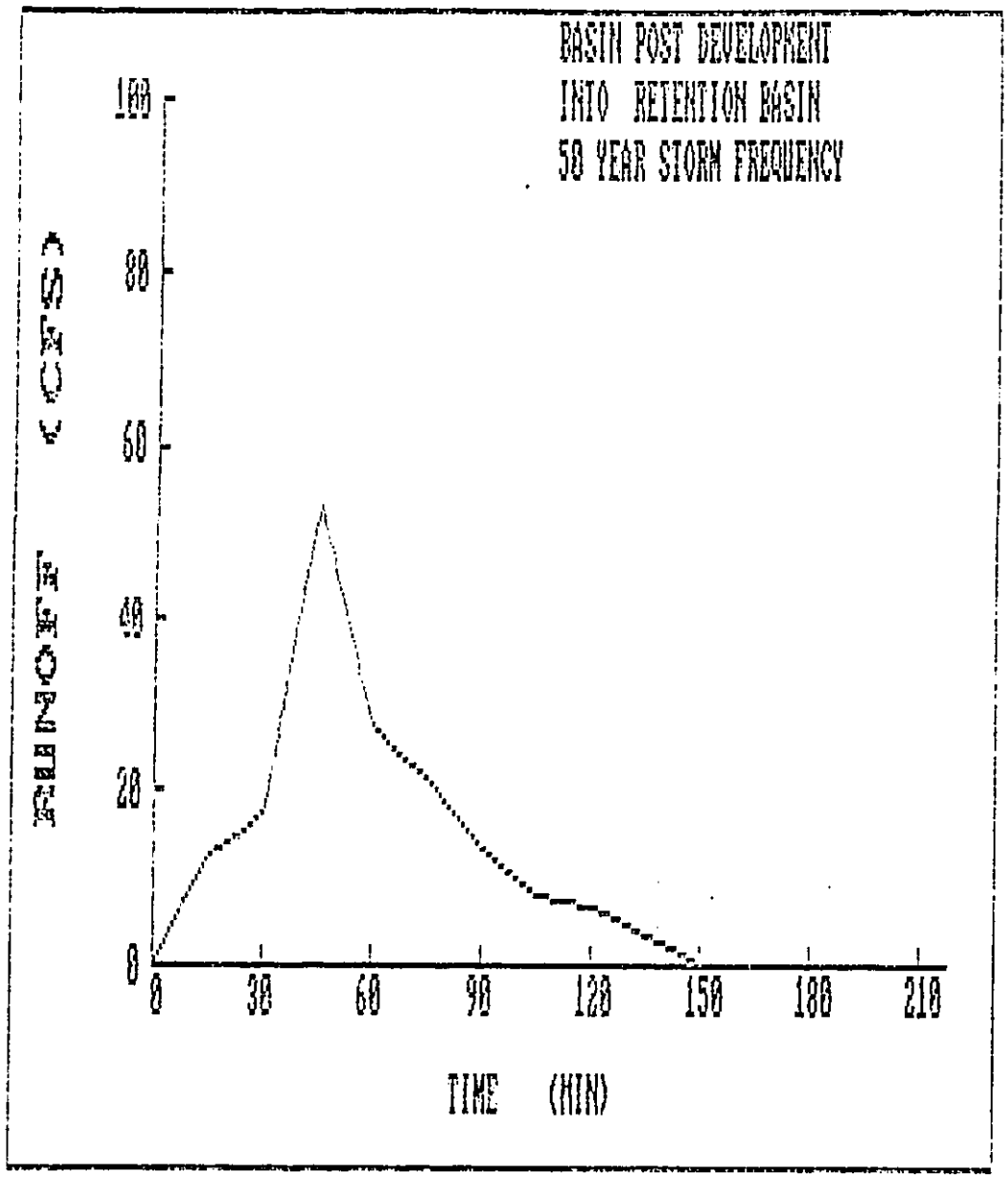
UNIVERSAL RATIONAL HYDROGRAPH

Q(PEAK) = C*I*A
50 YEAR STORM FREQUENCY

BASIN IDENTIFIER POST DEVELOPMENT
DISCHARGES INTO RETENTION BASIN

BASIN AREA	=	14.40	ACRES
RUNOFF COEFF.	=	0.80	
RAINFALL INT.	=	4.60	IN/HR
TIME OF CONC.	=	15.00	MINUTES
VOLUME	=	146966.39	CUBIC FEET

TIME (MIN)	RUNOFF (C.F.S.)
0.0	0.0
7.5	6.3
15.0	12.7
22.5	15.0
30.0	17.3
37.5	35.1
45.0	53.0
52.5	40.3
60.0	27.6
67.5	24.5
75.0	21.3
82.5	17.3
90.0	13.2
97.5	10.7
105.0	8.1
112.5	7.3
120.0	6.6
127.5	5.0
135.0	3.5
142.5	1.7
150.0	0.0
157.5	0.0
165.0	0.0
172.5	0.0
180.0	0.0
187.5	0.0
195.0	0.0
202.5	0.0
210.0	0.0
217.5	0.0


BASIN POST DEVELOPMENT
INTO RETENTION BASIN
50 YEAR STORM FREQUENCY
FLOW (CFS)
100
80
60
40
20
0
0
30
60
90
120
150
180
210
TIME (MIN)

W.S. UNEMORI ENGINEERING, INC.
2145 Wells Street Suite 403
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BY: LANCE NAKAMURA
DATE: August 8, 1998

H.E.S.L.
FOR
WAIKO BASEYARD SUBDIVISION

WAIKAPU, WAILUKU, MAUI, HAWAII

1. HESL EQUATION: E = R*K*LS*C*P

WHERE:
E = Soil Loss (tons/acre/year)
R = Average Annual Rainfall Factor for Erosion
K = Soil Erodibility Factor
L = Horizontal Slope Length (feet)
S = Average Slope (%)
LS = Slope Factor (function of L and S)
C = Cover and Management Factor
P = Erosion Control Practice Factor

R = 170.0 tons/acre/year
(Soil Erosion & Sediment Control Guide for Hawaii; Appendix A: Average Annual Values of Rainfall Factor)

K = 0.10 Soil Series: PUUONE
(Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii; Soil Type Plates & Table 4; Soil Properties Related to Erosion & Sedimentation ....)

L = 740.0 feet
δ = 15.0 feet
(Soil Erosion & Sediment Control Guide for Hawaii; Table 16)

S = (δ/L)
= 2.0 %

LS= 0.371

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WAIKO BASEYARD SUBDIVISION
[Continued]

C = 1.00
(Soil Erosion & Sediment Control Guide for Hawaii Tables 17-22, Pages 59-61; C=1.00 for Bare Soil)

P = 1.00
(Soil Erosion & Sediment Control Guide for Hawaii; the Universal Soil Loss Equation in Hawaii)'

E = R*K*LS*C*P
= 6.3 tons/acre/year

2. SEVERITY RATING NUMBER EQUATION: H=[(2*F*T)+(3*D)]*A*E

WHERE: H = Severity rating number
T = Duration of land-disturbing activity (years)
A = Area subject to disturbance (acres)
E = Rate of soil loss under disturbed conditions (tons/acre/year)
F = Downslope-downstream rating factor (rating points/ton)
D = Coastal water rating factor (rating points/ton)

T = 1.00 years

A = 14.40 acres

E = R*K*LS*C*P
= 6.3 tons/acre/year

F = 4 (Downslope-downstream detriment: Major)

D = 2 (Coastal water rating factor: Class A)

H = [(2*F*T)+(3*D)]*A*E
= 1,270.6

Standard severity rating (allowable): 50,000 ≥ 1,270.6 =>OK

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BY: LANCE NAKAMURA
DATE: August 8, 1998

WAIKO BASEYARD SUBDIVISION
[Continued]

3. MAXIMUM ALLOWABLE SOIL LOSS: E max = H max/(2FT+3D)A

E max = H max/(2FT+3D)A, Hmax = 50,000
= 248.0 tons/acre/year ≥ 6.3 tons/acre/year =>OK

Coastal Hazard: Class A waters are approximately 18,000 feet from the site.

CONCLUSION: Sedimentation hazard to coastal waters and downstream properties is minimal. Erosion rate computed for this project site is well within the tolerable limits and additional control measures are not required.

4. REFERENCES:

1. Soil Conservation Service (USDA); 'Guidelines For Use of the Universal Soil Loss Equation in Hawaii,' Technical Notes, March 1975. (Revised Draft)

2. County of Maui; (Ord No. 816), 'Chapter 24, Soil Erosion and Sedimentation Control,' June 13, 1975.

3. Soil Conservation Service (USDA); 'Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai; State of Hawaii, August 1972.

4. Hawaii Environmental Simulation Laboratory; 'Guidelines for Data Preparation, Part 1: Universal Soil Loss Equation; Undated (Draft).

Appendix C

Traffic Impact Analysis

TRAFFIC IMPACT ANALYSIS

WAIKO BASEYARD LIGHT INDUSTRIAL SUBDIVISION

WAIKAPU, MAUI, HAWAII

September 1998

PB 100 YEARS
PARSONS BRINCKERHOFF

Over a Century of Engineering Excellence

TRAFFIC IMPACT ANALYSIS

WAIKO BASEYARD LIGHT INDUSTRIAL SUBDIVISION

Waikapu, Maui, Hawaii

September 1998

Prepared For:
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Wailuku, Hawaii 96793

Prepared By:
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PBQD Reference Number:

16284A

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Figures

Tables

Appendices

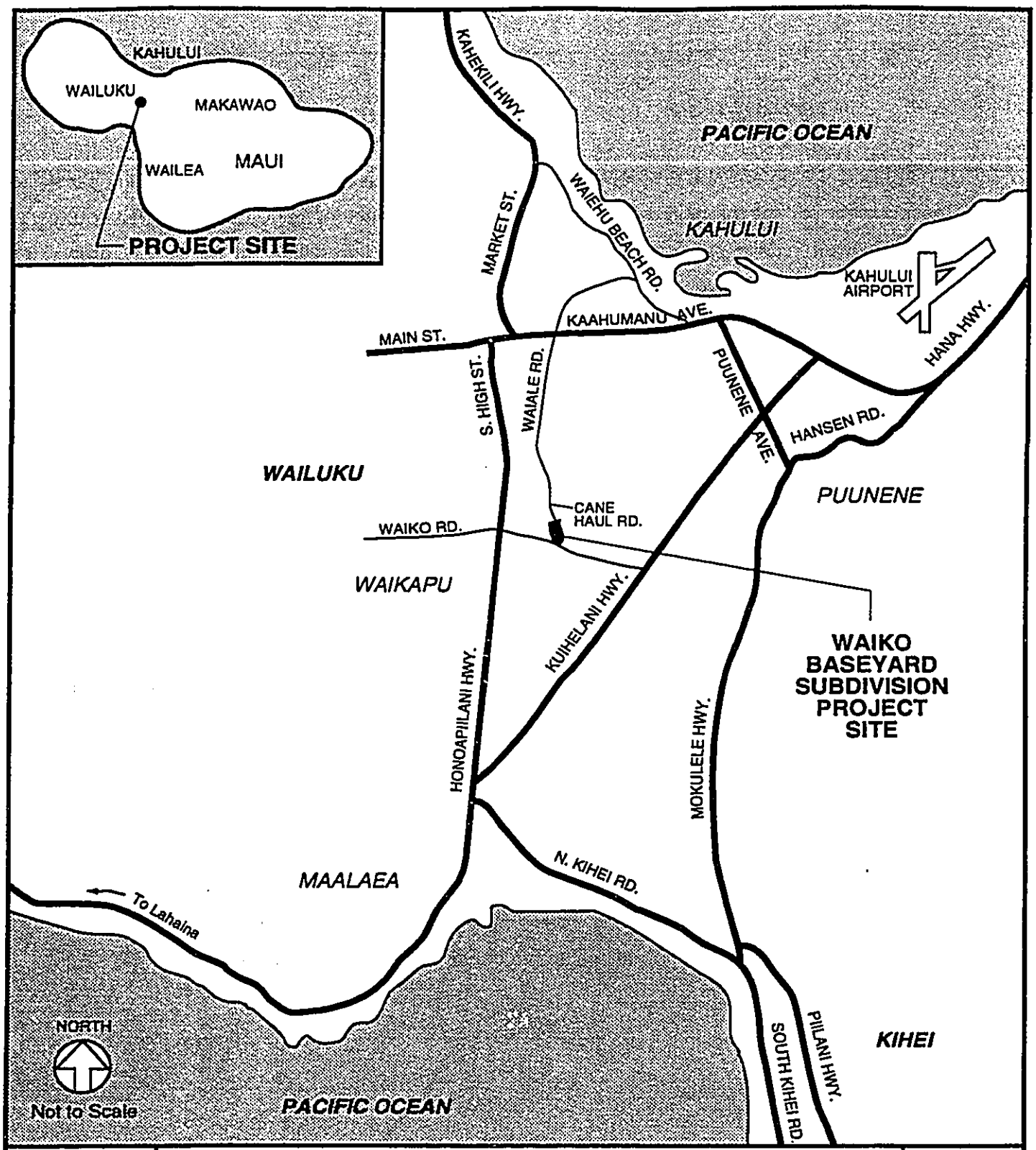
I. INTRODUCTION

This report documents the assumptions and methodology used to conduct a traffic impact assessment for the proposed Waiko Baseyard Light Industrial Subdivision in Waikapu, Maui, Hawaii. Existing and projected Year 2004 traffic conditions at key study area intersections were evaluated. As shown in Figure 1, the proposed subdivision is north of Waiko Road between Honoapiilani Highway and Kuihelani Highway.

Wailuku Agribusiness Company, Inc., proposes to develop approximately 14.4 acres as a light industrial subdivision. The land would be divided into twenty-two lots with primary access along Waiko Road. As shown in Figure 2, Lots 16 and 19 currently house the Wailuku Agribusiness Company, Inc. office building and Brewer Environmental Industries facility, which are planned to remain in the future. Lots 21 and 22 are proposed access roadways, and Lot 20 is proposed to house a private sewer pump station. The seventeen remaining lots would be developed for light industrial uses.

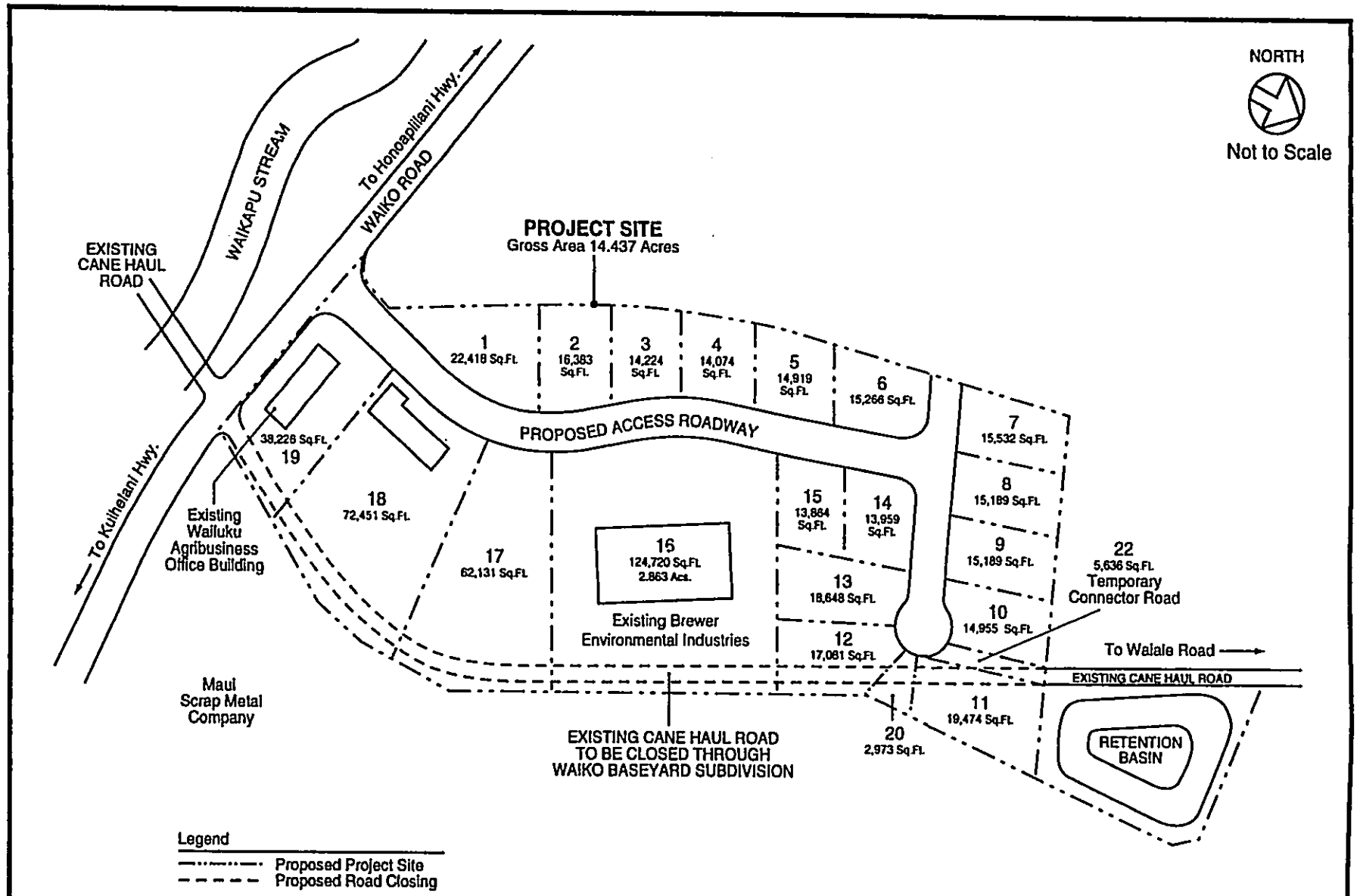
As part of the subdivision process, a State Land Use Development and Boundary Amendment (SLUDBA) petition is being submitted to change the land use designation from agricultural to urban. The subdivision would also require a Community Plan Amendment and Change in Zoning from agricultural to light industrial. This report provides the traffic impact assessment to support these land redesignations.

Future traffic operations were estimated for the proposed conceptual development plan shown in Figure 2. This report identifies the existing and Year 2004 operational characteristics of key intersections within the study area. Recommendations are made regarding access, lane configurations, traffic control, and signing and striping.



VICINITY MAP

Figure 1



CONCEPTUAL DEVELOPEMENT PLAN

Figure **2**

II. EXISTING CONDITIONS

A. LAND USES

Waiko Baseyard Light Industrial Subdivision includes the current site of the Wailuku Agribusiness Company, Inc. office building, which houses Wailuku Agribusiness Company, Inc. and C. Brewer Homes offices, and the Brewer Environmental Industries facility. As shown in Figure 2, these land uses constitute Lots 16 and 19, respectively. Lot 18 contains three buildings that are currently vacant. In the past, the largest building was a dormitory for seasonal pineapple workers, and the two smaller buildings provided general storage.

The Maui Scrap Metal Company is located east of the proposed Waiko Baseyard Light Industrial Subdivision and accesses Waiko Road directly. The Brewer Ball Park is located west of the proposed Waiko Baseyard Light Industrial Subdivision adjacent to Waiko Road. The Waikapu Community Center and Waikapu residential area are located further to the west near the intersection of Honoapiilani Highway and Waiko Road. Pineapple and cane fields are west and south of the development on both sides of Waikapu Stream.

B. TRAFFIC DATA COLLECTED

Traffic-related data were collected for each of the following study intersections along Waiko Road:

- Honoapiilani Highway,
- Kuihelani Highway, and
- Wailuku Agribusiness Company, Inc./Brewer Environmental Industries Access Road.

Traffic turning movement volumes, field observations of intersection operations, and general intersection characteristics were noted. Intersection geometry inventory included the following:

- Number of lanes,
- Sidewalk and crosswalk locations,
- Entrance and driveway locations, and

- Posted speed limits.

These data were used as inputs into the intersection analyses. The existing roadway lane configurations are shown in Figure 3.

C. EXISTING ROADWAYS

1. Roadway System

Honoapiilani Highway

Honoapiilani Highway is a major arterial which connects the town of Wailuku to west and south Maui. In the vicinity of the project, Honoapiilani Highway is a two-lane roadway with a posted speed limit of 30 miles per hour.

Kuihelani Highway

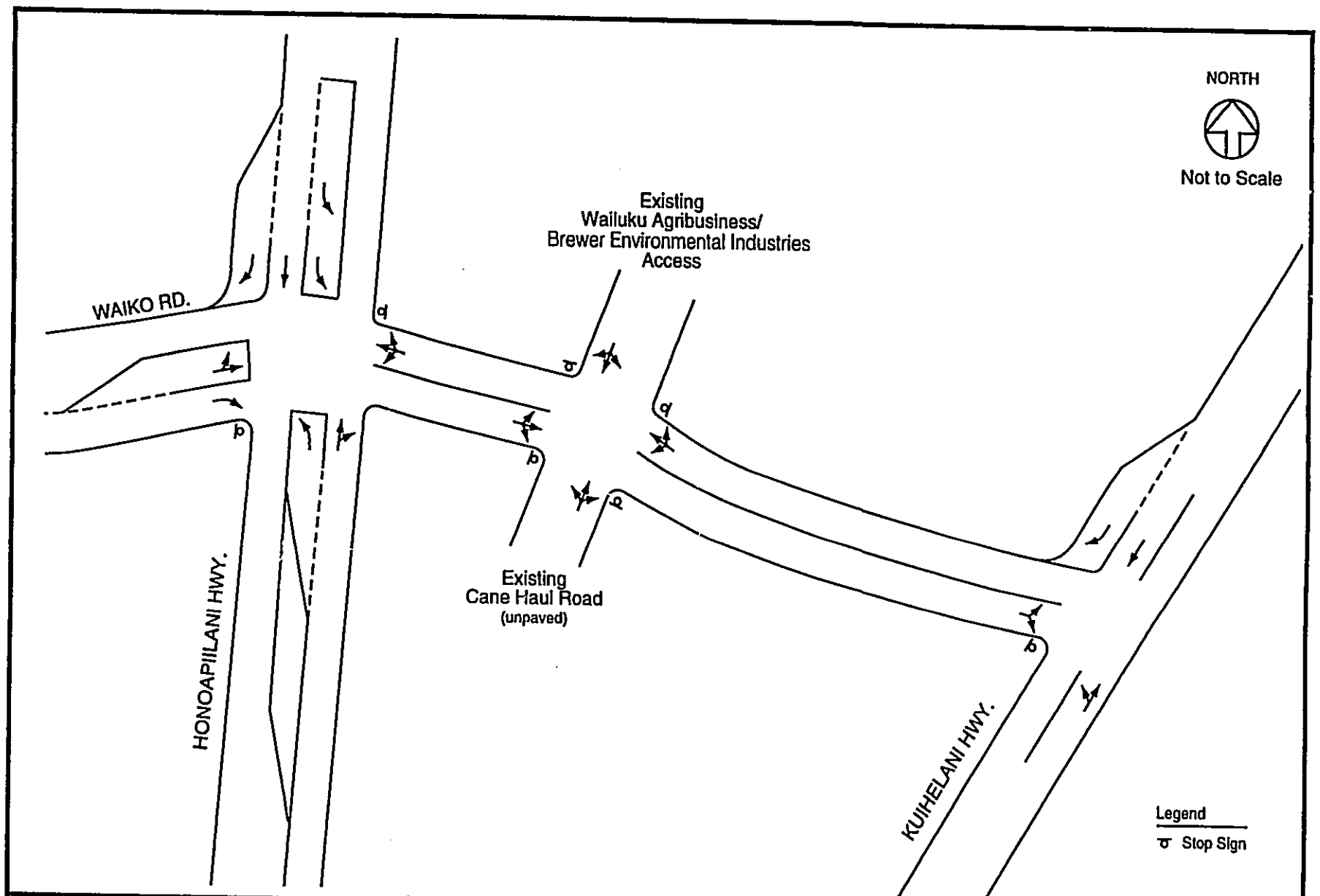
Kuihelani Highway is a major arterial roadway which connects Kahului to south and west Maui. The roadway terminates at a signalized intersection with Honoapiilani Highway south of the project site. Kuihelani Highway is a two-lane roadway with a posted speed limit of 55 miles per hour. A design-build project to widen Kuihelani Highway to a four-lane roadway is expected to be initiated in the near future.

Waiko Road

Waiko Road is a two-lane, east-west collector roadway that connects Honoapiilani Highway to Kuihelani Highway. Waiko Road intersects Honoapiilani Highway at an unsignalized four-legged intersection with the Waiko Road approaches being STOP-sign controlled. Waiko Road intersects Kuihelani Highway as an unsignalized T-intersection with STOP-sign control on the Waiko Road approach. The posted speed limit on Waiko Road is 20 miles per hour.

Wailuku Agribusiness Company, Inc./Brewer Environmental Industries Access Road

Access to the existing Wailuku Agribusiness Company, Inc. office building and the Brewer Environmental Industries facility is provided by a private roadway that intersects Waiko



PB 100 YEARS

EXISTING LANE CONFIGURATIONS

Figure
3

Road at an all-way stop intersection. The private road connects to Waiale Drive in Wailuku to the north and terminates at Waiko Road. An unpaved cane haul road located opposite the private access roadway continues south of Waiko Road.

2. Intersection Geometry and Field Observations

The existing lane configurations are shown in Figure 3. Intersections along Waiko Road are described in this section.

Honoapiilani Highway

At the intersection of Honoapiilani Highway and Waiko Road, exclusive left-turn lanes are provided for the southbound and northbound Honoapiilani Highway approaches, and an exclusive right-turn lane is provided for the southbound approach. On Waiko Road, a shared through/left-turn lane and an exclusive right-turn lane are provided on the eastbound approach, while the westbound approach has one shared lane for all traffic movements.

Kuihelani Highway

As shown in Figure 3, Kuihelani Highway provides an exclusive southbound right-turn lane at the intersection with Waiko Road. The northbound left-turn movement is shared with the through movement. Waiko Road provides a shared right/left-turn lane at the T-intersection.

Existing Wailuku Agribusiness Company, Inc./Brewer Environmental Industries Access Road

All approaches to the existing Wailuku Agribusiness Company, Inc./Brewer Environmental Industries Access Road along Waiko Road are single lanes with shared left/through/right movements. As illustrated in Figure 3, the unpaved cane haul road intersects Waiko Road opposite the Wailuku Agribusiness Company, Inc./Brewer Environmental Industries Access Road, forming a four-legged intersection.

D. EXISTING TRAFFIC VOLUMES

Manual traffic counts were conducted on Wednesday and Thursday, November 8 and 9, 1995, during the commuter peak periods of 6:30 AM to 8:30 AM and 3:30 PM to 5:30 PM. The count data is included in Appendix A. The counts indicated that the morning peak hour occurred between 7:00 and 8:00 AM, and the afternoon peak hour occurred between 4:00 and 5:00 PM.

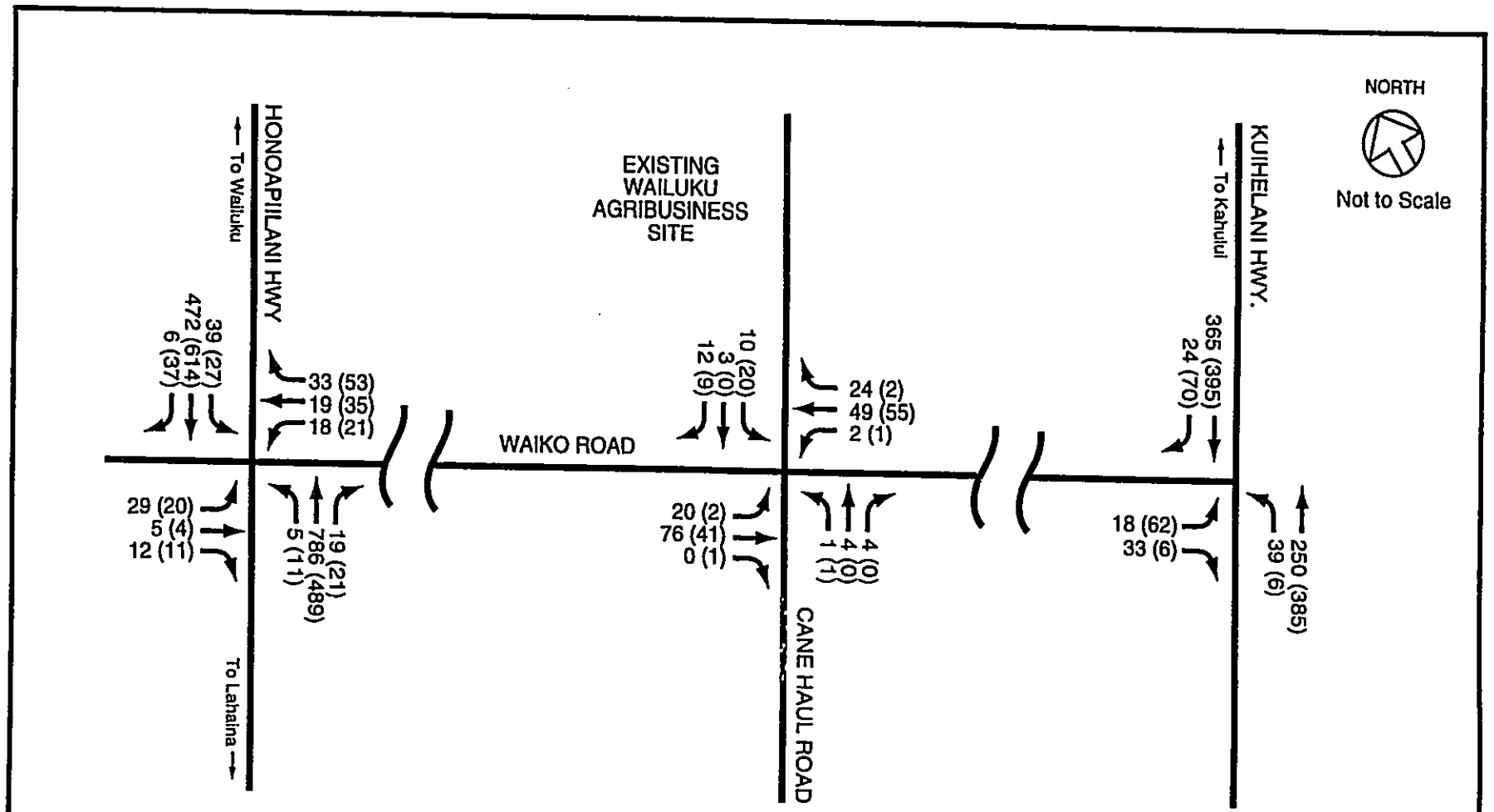
The 1997 *State of Hawaii Department of Transportation (SDOT) Traffic Count Data* was referenced to update the 1995 data as applicable. SDOT Station 10-B at the Honoapiilani Highway/Kuihelani Highway intersection was used to check the magnitude of through volumes along both highways. Volumes along Honoapiilani Highway decreased between 1995 and 1997; therefore, the volumes were conservatively assumed to remain the same as existing 1995 data.

Volumes along Kuihelani Highway slightly increased between 1995 and 1997. SDOT Station C-2-K (Kuihelani Highway 0.33 miles north of Waikapu Bridge) indicated that growth along Kuihelani Highway was approximately three percent per year. The SDOT 1996 *Maui Long Range Land Transportation Plan* indicated a similar growth factor (2.5%). Based on this information, a three percent annual growth rate was applied to the mainline volumes along Kuihelani Highway.

Turning movement volumes were assumed to remain the same as the 1995 data due to the minimal growth and development in the project area expected within the time frame of this study. The resulting existing peak hour traffic volumes are shown in Figure 4.

E. EXISTING INTERSECTION OPERATIONS

Operations of the each study intersection were analyzed to identify existing intersection operational characteristics. The intersections were analyzed using the methodologies for unsignalized intersections outlined in the *1994 Highway Capacity Manual (HCM).* Operating conditions at an intersection are expressed as a qualitative measure known as Level of Service (LOS) ranging from A to F. LOS A represents free-flow operating conditions, while LOS F represents congested conditions. The overall intersection LOS is a



Legend

(###) - AM (PM) Peak Hour Volumes
AM Peak Hour - (7:00-8:00 AM)
PM Peak Hour - (4:00-5:00 PM)

Source: Manual Traffic Counts taken on Wednesday, Nov. 8, 1995 and Thursday, Nov. 9, 1995; Volumes factored to update data to 1997.

PB 100 YEARS

EXISTING PEAK HOUR TRAFFIC VOLUMES

Figure **4**

weighted average of the LOS of individual traffic movement groups. Appendix B has more detailed definitions of intersection LOS. Table 1 displays the existing conditions LOS for each intersection. Figure 5 shows these intersection LOS with existing lane configurations, and Appendix C includes all of the existing analysis worksheets.

Table 1

Existing Conditions Level of Service Summary

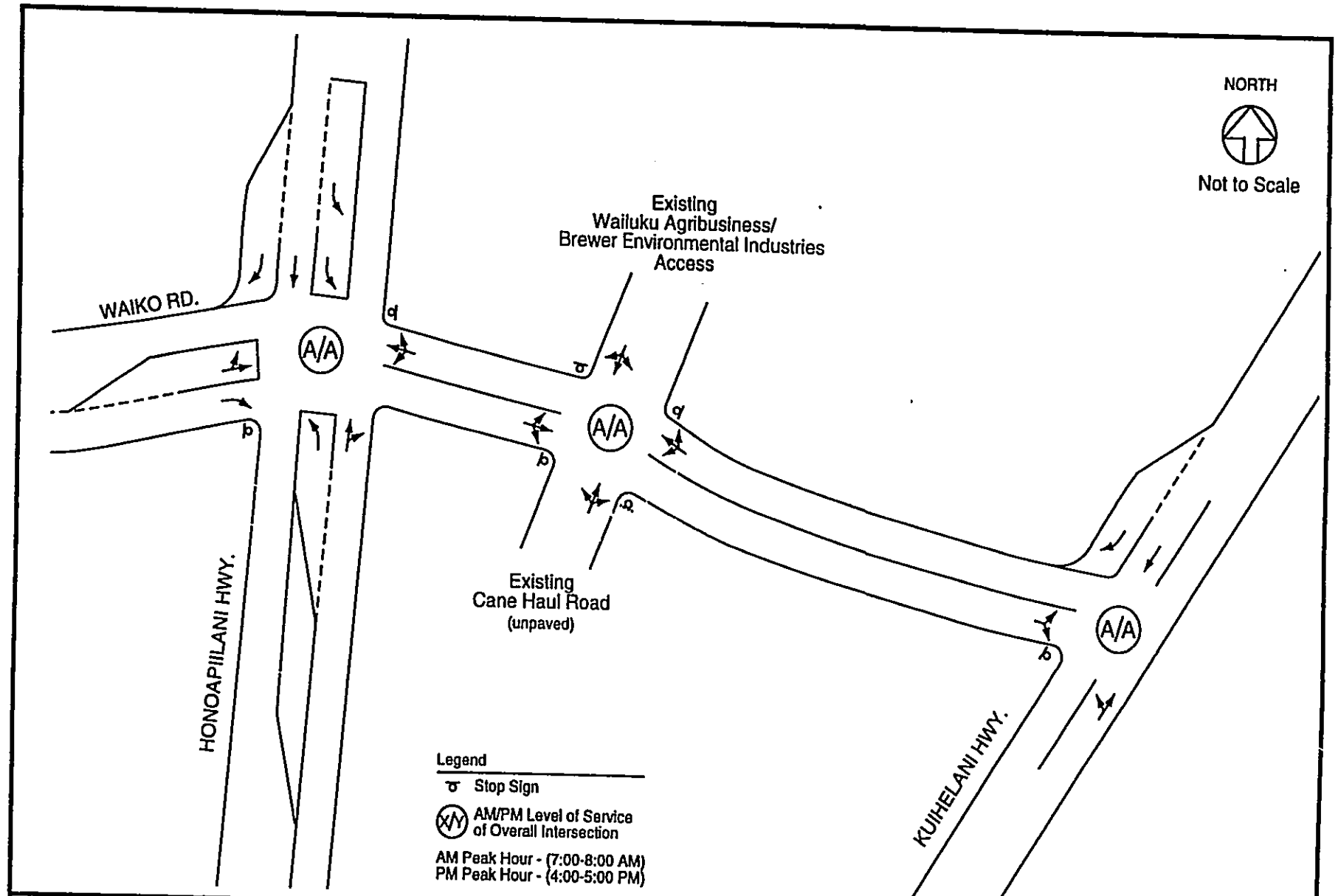
Intersection	AM Peak Hour		PM Peak Hour	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Honoapiilani Hwy / Waiko Rd	**A**	**2.1**	**A**	**2.1**
EB Left/Through	E	37.8	D	27.9
EB Right	A	4.7	B	5.6
WB Left/Through/Right	D	21.6	C	17.7
NB Left	A	3.7	A	4.5
SB Left	B	5.7	A	3.9
Wailuku Ag/C. Brewer Access/ Waiko Rd	**A**	**1.5**	**A**	**1.5**
NB Approach	A	1.2	A	1.1
SB Approach	A	1.4	A	1.9
EB Approach	A	1.5	A	1.3
WB Approach	A	1.5	A	1.4
Kuihelani Hwy / Waiko Rd	**A**	**0.6**	**A**	**1.0**
EB Left/Right	B	6.5	C	13.2
NB Left	A	3.4	A	3.6

Note: NB- northbound, SB-southbound, EB- eastbound, WB- westbound

F. ANALYSIS RESULTS

All analyzed intersections operate well with an overall LOS A. The delays of most movements are minimal.

At the intersection of Honoapiilani Highway and Waiko Road, the northbound and southbound left movements operate well with LOS B or better during both peak hours. The eastbound left/through movement operates at LOS E and D in the AM and PM peak hours,



PB 100 YEARS

EXISTING INTERSECTION LEVELS OF SERVICE

Figure
5

respectively. The westbound approach experiences delays resulting in LOS D and C in the AM and PM peak hours, respectively. The delays currently experienced at the Honoapiilani Highway/Waiko Road intersection by Waiko Road traffic are indicative of the magnitude of traffic using Honoapiilani Highway during the peak hours. The traffic on Waiko Road is fairly light: less than 35 vehicles in both peak hours for the eastbound left/through movement and less than 110 vehicles in both peak hours for the westbound approach. The relatively large traffic volumes along Honoapiilani Highway during both peak hours cause some side street delays as they wait for an acceptable gap in the traffic flow.

At the intersection of Waiko Road and the existing Wailuku Agribusiness/Brewer Environmental Industries Access Road, all of the approaches operate very well at LOS A. The approach delays are less than two seconds per vehicle.

The intersection of Kuihelani Highway and Waiko Road operates well overall at LOS A, and the northbound left movement along Kuihelani Highway operates well with delays less than four seconds per vehicle. The eastbound left/right movement operates acceptably at LOS B and C in the AM and PM peak hours, respectively.

G. ANALYSIS SUMMARY

The existing conditions intersection level of service analysis shows that the intersections in the project vicinity operate well overall.

Although the eastbound and westbound approaches at Honoapiilani Highway/Waiko Road intersection experience delays, the Waiko Road traffic volumes are low, and, therefore, queuing is not an issue. Additionally, it appears that even though there are significant distances between Waiko Road and the nearest adjacent signalized intersections, flow on Honoapiilani Highway appears to be platooned, creating more gaps in traffic than the analysis procedure predicts. Therefore, traffic operations are observed to be better than indicated by the LOS results.

III. FUTURE TRAFFIC CONDITIONS

The proposed Waiko Baseyard Subdivision is assumed to be completed within six years, and the Year 2004 was chosen as the analysis year for future traffic analyses.

A. FUTURE ROADWAYS

Access to Waiko Road from the proposed Waiko Baseyard Light Industrial Subdivision will be modified. As shown in Figure 2, the proposed site access would form a T-intersection with Waiko Road west of the existing Wailuku Agribusiness Access Road/cane haul road intersection. The existing Wailuku Agribusiness Access Road would be closed, north of Waiko Road. South of Waiko Road, the existing cane haul road would remain, thereby changing the configuration of this intersection from a four-legged intersection to a T-intersection with Waiko Road. Both the new Waiko Baseyard Subdivision Access Road and the existing south cane haul road would be STOP-sign controlled, and the existing all-way stop control on Waiko Road would be eliminated.

North of Waiko Road, the existing Wailuku Agribusiness Access Road would be closed between Waiko Road and the northern boundary of the proposed Waiko Baseyard Light Industrial Subdivision. The southern endpoint of this road will be redirected into the proposed Waiko Baseyard Light Industrial Subdivision between Lots 10 and 11. Future tenants of the proposed Waiko Baseyard Light Industrial Subdivision will be issued permits to use this private road (see Figure 2). This road continues north from the project boundary and joins Waiale Road at a point just south of the Maui Community Correctional Center. This action is designed to provide an alternate route for trucks traveling between the proposed Waiko Baseyard Light Industrial Subdivision and the Wailuku area. This would minimize truck traffic on Waiko Road through the Waikapu area just east of Honoapiilani Highway.

A design-build project to widen Kuihelani Highway from its current two-lane cross-section to a four-lane, divided roadway is expected to be initiated by the State of Hawaii Department of Transportation (SDOT) in the near future. Therefore, the northbound and southbound approaches of Kuihelani Highway/Waiko Road were assumed to have two

through lanes. Standard highway design practices would include exclusive turn lanes for left and right-turn movements, and these are assumed for the future Waiko Road/Kuihelani Highway intersection configuration.

Waiko Road was assumed to have separate right and left-turn lanes at its approach to Kuihelani Highway.

The intersection of Honoapiilani Highway and Waiko Road was assumed to remain in its *present configuration.*

B. TRIP GENERATION

The Institute of Transportation Engineers (ITE) *Trip Generation, 6th Edition* (1997) was used to estimate the number of trips generated by future uses identified for the Waiko Baseyard Subdivision. The trips generated are general light industrial uses planned for Lots 1-15, 17, and 18 as shown in the conceptual development plan (see Figure 2). The trips produced by these lots are shown in Table 2.

Table 2

Trip Generation

Description	Land Use	ITE Code	Intensity	AM Peak Hour		PM Peak Hour	
				Enter	Exit	Enter	Exit
Lots 1-15, 17-18	General Light Industrial	110	8.86 acres (max.)	55	11	14	50

Source: *Trip Generation, 6th edition,* Institute of Transportation Engineers (ITE), 1997

Lots 20 through 22 are non-traffic generating lots that define a sewer pump station, and roadway parcels. Lots 16 and 19 are currently occupied by the existing Wailuku Agribusiness office building and the Brewer Environmental Industries facility, and the vehicular trips produced by these uses are already included in the background traffic quantified through the traffic counts.

C. TRIP DISTRIBUTION AND ASSIGNMENT

The Year 2004 site generated traffic was directionally distributed, and then the distributed traffic was assigned to the future roadway network.

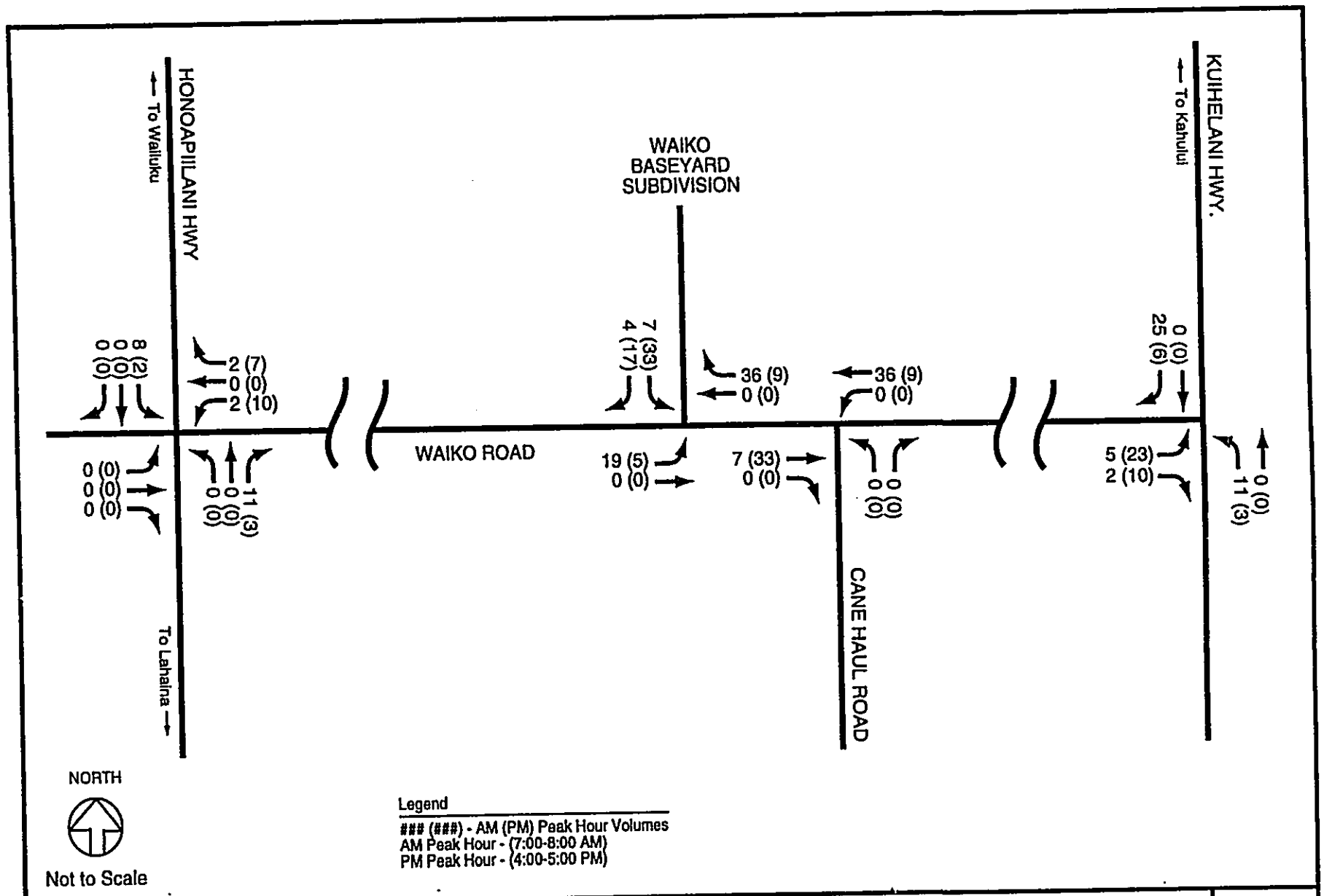
The trip distribution was based on the population and employee distributions documented in the 1996 Hawaii State Department of Transportation (SDOT) *Maui Long Range Land Transportation Plan.* The assumed trip distribution was fifteen percent north along Honoapiilani Highway, twenty percent south along Honoapiilani Highway, forty-five percent north along Kuihelani Highway, and twenty percent south along Kuihelani Highway. Although employees and trucks originating from Lahaina will be instructed to use Kuihelani Highway instead of Honoapiilani Highway, twenty percent was conservatively distributed to south Honoapiilani Highway because some traffic is expected to use the highway.

These distributions were applied to the trips generated. The Year 2004 site generated peak hour traffic volumes are shown in Figure 6.

D. BACKGROUND TRAFFIC

The Year 2004 background traffic volumes present the future scenario without the proposed Waiko Baseyard Light Industrial Subdivision. The existing Wailuku Agribusiness Company, Inc. office building and the Brewer Environmental Industries facility are located within the proposed Waiko Baseyard Light Industrial Subdivision, but the traffic from these existing facilities was included in the background traffic.

It is expected that selected elements of the existing traffic volumes would grow over time due to increases in development elsewhere. The 1997 *State of Hawaii Department of Transportation (SDOT) Traffic Count Data* was referenced to determine appropriate growth rates to factor existing traffic up to the Year 2004 background traffic volumes. As previously described in Chapter II - Existing Condition of this report, traffic volumes along Honoapiilani Highway decreased between 1995 and 1997. This reflects the emphasis that SDOT is putting on increasing the importance of Kuihelani Highway as the primary regional



PB 100 YEARS

YEAR 2004 SITE GENERATED PEAK HOUR TRAFFIC VOLUMES

Figure **6**

facility in this area. Rather than indicate a decrease for the future, however, it was assumed that traffic on Honoapiilani Highway will remain stable between 1998 and 2004.

SDOT count data and future volume projections documented in the SDOT 1996 *Maui Long Range Land Transportation Plan*, also discussed in Chapter II - Existing Conditions in this report, indicate that a 3 percent annual growth rate for Kuihelani Highway would be appropriate. Based on this information, a 3 percent annual growth rate was applied to 1998 mainline volumes along Kuihelani Highway to forecast the year 2004 traffic volumes.

Turning movements from and to Waiko Road were assumed to remain the same as existing conditions.

The projected Year 2004 background traffic volumes are shown in Figure 7 of this report.

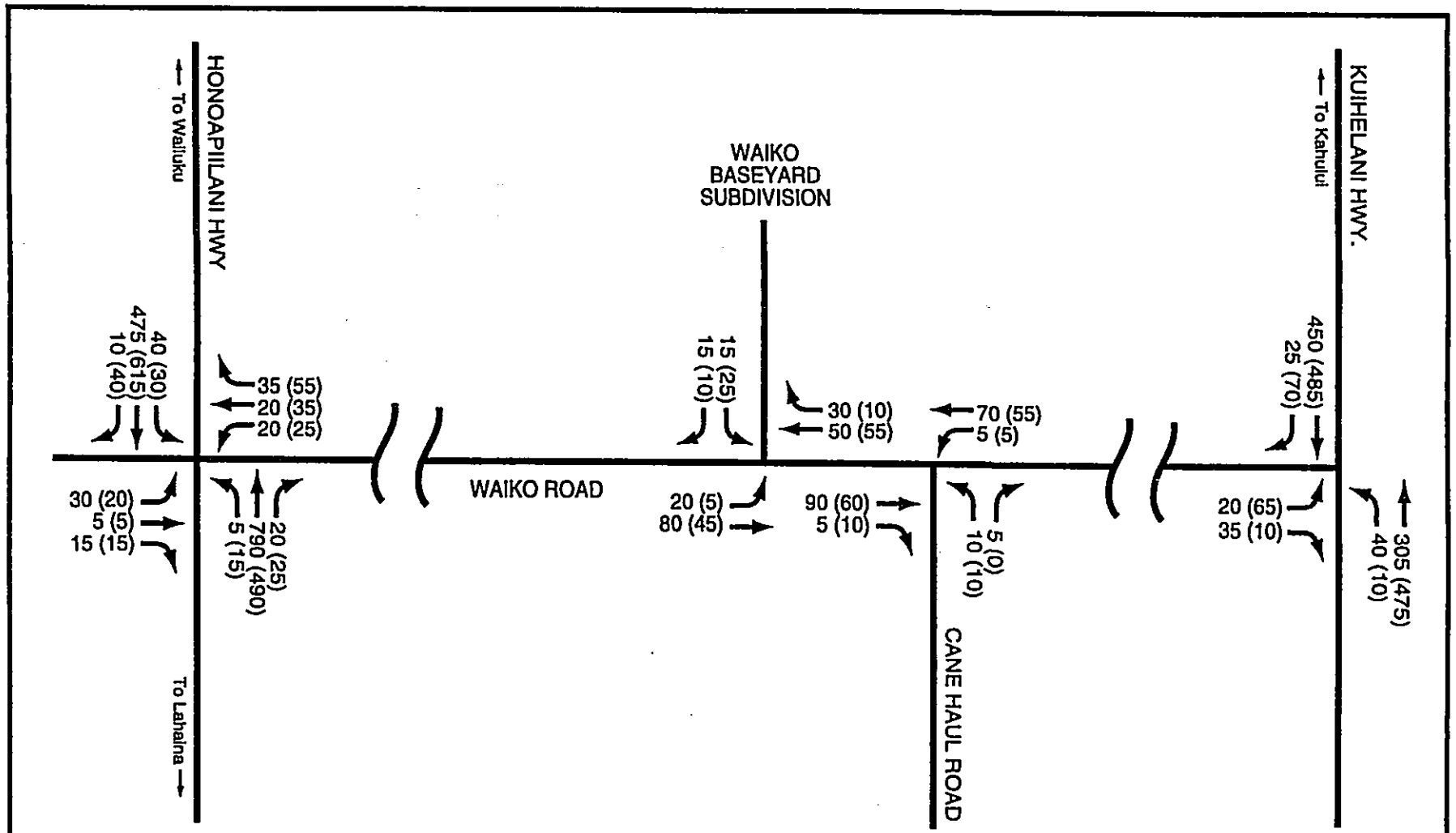
E. TOTAL TRAFFIC

The traffic generated by the proposed Waiko Baseyard Subdivision was added to the projected Year 2004 background traffic to obtain the projected Year 2004 total peak hour traffic volumes as shown in Figure 8.

F. INTERSECTION OPERATIONS ANALYSIS RESULTS

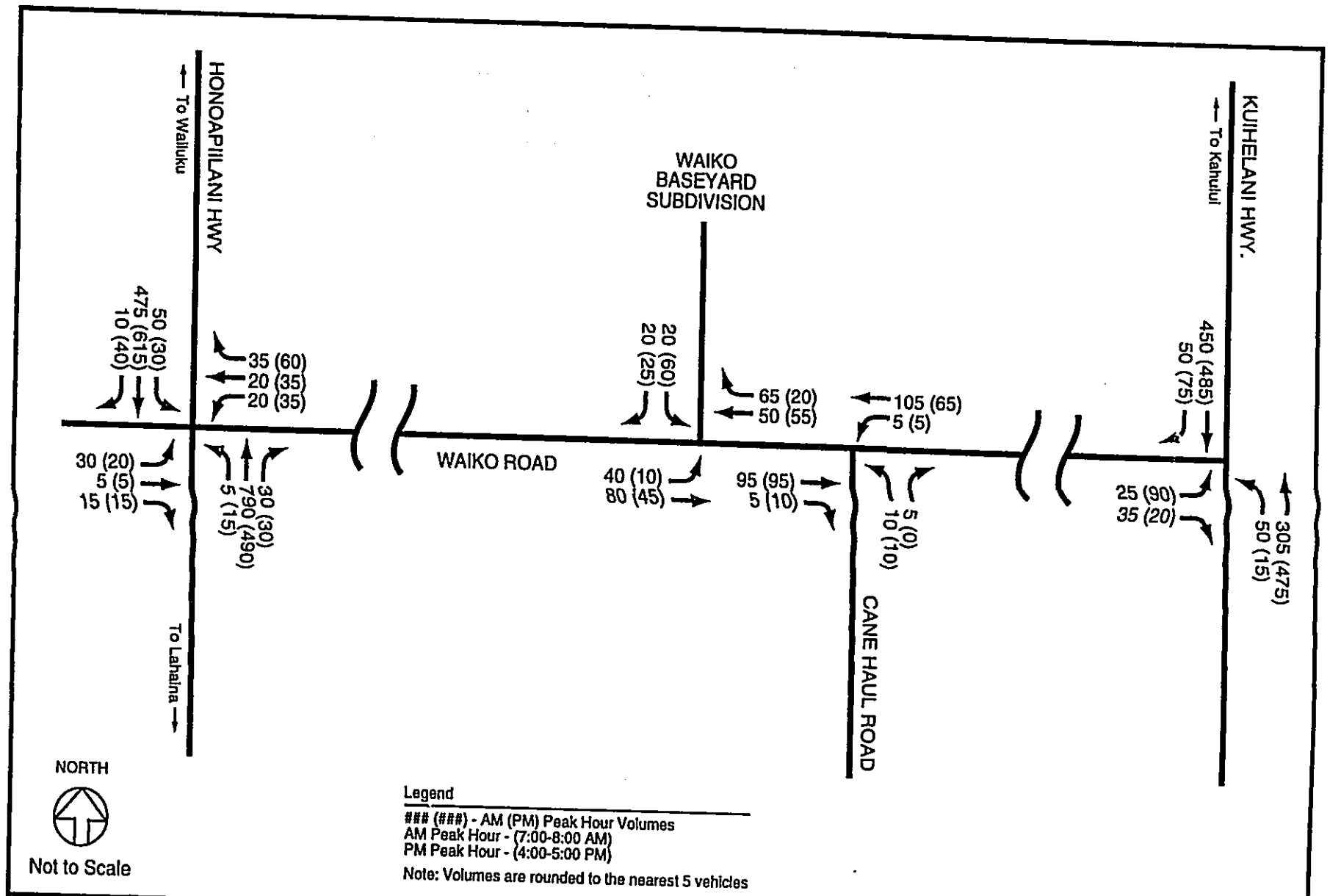
Key intersections were analyzed using the methodologies for unsignalized intersections outlined in the *1994 Highway Capacity Manual (HCM)*. Operating conditions at an intersection are expressed as qualitative measures known as Level of Service (LOS) ranging from A to F. LOS A represents free-flow operating conditions, while LOS F represents congested conditions. The overall intersection LOS is a weighted average of the LOS of individual traffic movement groups. Appendix B has detailed definitions of intersection LOS.

In addition to traffic volumes, intersection analyses included data such as peak hour factors, truck percentages, and roadway grades. The results of the analysis with and without the project are shown in Table 3, and the analysis worksheets are provided in Appendix C.



YEAR 2004 BACKGROUND PEAK HOUR TRAFFIC VOLUMES

Figure 7



YEAR 2004 PEAK HOUR TRAFFIC VOLUMES (WITH PROJECT)

Figure **8**

Table 3

Year 2004 Level of Service Summary

Intersection	Year 2004 Without Project				Year 2004 With Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay sec/veh	LOS	Delay sec/veh	LOS	Delay sec/veh	LOS	Delay sec/veh
Honoapiilani Highway/ Waiko Road	**A**	**2.4**	**A**	**2.4**	**A**	**2.5**	**A**	**2.9**
EB Left/Through	E	39.9	D	28.8	E	42.2	D	29.2
EB Right	A	4.8	B	5.7	A	4.8	B	5.7
WB Left/Through/Right	D	23.2	C	19.9	D	24.4	D	23.7
NB Left	A	3.7	A	4.6	A	3.7	A	4.6
SB Left	B	5.8	A	4.0	B	5.9	A	4.0
Waiko Baseyard Subdivision/ Waiko Rd	**A**	**0.8**	**A**	**1.0**	**A**	**0.9**	**A**	**1.7**
SB Left/Right	A	3.7	A	3.8	A	4.0	A	4.1
EB Left	A	2.3	A	2.3	A	2.5	A	2.3
Existing Cane Haul Road/ Waiko Road	**A**	**0.4**	**A**	**0.4**	**A**	**0.3**	**A**	**0.3**
NB Left/Right	A	3.9	A	4.1	A	4.1	A	4.4
WB Left	A	2.4	A	2.3	A	2.4	A	2.4
Kuihelani Highway/ Waiko Road	**A**	**0.8**	**A**	**1.1**	**A**	**0.9**	**A**	**1.6**
EB Left	B	8.2	B	9.4	B	8.8	C	10.4
EB Right	A	3.6	A	3.5	A	3.6	A	3.6
NB Left	A	4.1	A	4.4	A	4.3	A	4.4

Note: NB- northbound, SB-southbound, EB- eastbound, WB- westbound

G. INTERSECTION OPERATIONS ANALYSIS SUMMARY

In the future, the analyzed intersections are projected to operate well overall during both peak hours with and without the proposed Waiko Baseyard Subdivision. Each intersection is expected to operate at an overall LOS A.

Waiko Baseyard Light Industrial Subdivision Access Road and Cane Haul Road Intersections along Waiko Road

The Waiko Road intersections with the Waiko Baseyard Light Industrial Subdivision Access Road and existing cane haul road operate very well at LOS A. Each movement operates at LOS A with minimal delays. Given the small volumes along the cane haul road, no impacts are projected to occur from the intersection modifications. With or without the project, the proposed access to the Waiko Baseyard Subdivision operates well.

Honoapiilani Highway/Waiko Road Intersection

The intersection is projected to operate well overall with little change from existing conditions. As in the existing conditions, the eastbound left/through movement at the Honoapiilani Highway/Waiko Road intersection is projected to experience delay due to the magnitude of peak hour traffic volumes on Honoapiilani Highway. It is projected to operate at LOS E in the AM peak hour and LOS D during the PM peak hour, the same LOS's as in the existing condition.

The westbound approach is also projected to operate acceptably with or without the proposed Waiko Baseyard Light Industrial Subdivision. The approach is projected to operate at LOS D during the AM and PM peak hours with or without the proposed development. This is also the same LOS as the existing condition. During the PM peak hour, the westbound approach delay increases slightly with the project, resulting in a change in LOS from C to D which is still acceptable for peak hour conditions. As described in Chapter II - Existing Conditions of this report, the actual LOS appears better than the calculated value because the traffic on Honoapiilani Highway appears somewhat platooned instead of exhibiting completely random flow.

Kuihelani Highway/Waiko Road Intersection

The Kuihelani Highway/Waiko Road intersection operates at an overall LOS A during both peak hours for both scenarios. The eastbound left-turn movement operates well at LOS B during the AM peak hour with and without the project. During the PM peak hour, the

eastbound left-turn delay slightly increases with the Waiko Baseyard Subdivision, but the movement continues to operate well at LOS C.

IV. RECOMMENDATIONS AND CONCLUSION

The results of the analysis showed that intersection operations along Waiko Road would be similar without and with the Waiko Baseyard Light Industrial Subdivision. The intersections operate well overall.

Implementation of the proposed Waiko Baseyard Light Industrial Subdivision is projected to have minimal impacts on the operations of study area intersections. The following recommendations and observations were based on this outcome.

A. OBSERVATIONS AND RECOMMENDATIONS

Waiko Baseyard Light Industrial Subdivision/Waiko Road Intersection

As shown by the analysis worksheets for the Year 2004 Waiko Baseyard Light Industrial Subdivision Access Road/Waiko Road intersection, the intersection operates well with single-lane approaches and two-way STOP control. Other than constructing the new Waiko Baseyard Light Industrial Subdivision Access Road and closing the existing Wailuku Agribusiness Access Road no other geometrical improvements are recommended. Operationally, it is recommended to eliminate the STOP signs on Waiko Road at the existing Wailuku Agribusiness Access Road/Cane Haul Road intersection. The W3-1a Stop Ahead warning sign should also be removed from Waiko Road in the vicinity of the existing Wailuku Agribusiness Access Road/Cane Haul Road Intersection.

Honoapiilani Highway/Waiko Road Intersection

No intersection improvements are currently needed. Although some movements at the intersection of Honoapiilani Highway and Waiko Road experience delays, the intersection operates well overall. The Waiko Road approaches experience some delays which are typical of the minor approaches at unsignalized intersections. Currently, this is not a problem since Honoapiilani Highway traffic is expected to remain stable, and the existing situation is acceptable.

The existing and projected volumes, with or without the proposed Waiko Baseyard Light Industrial Subdivision, on Waiko Road are low in magnitude, and none of the traffic volume warrants as documented in the 1988 Federal Highway Administration (FHWA) *Manual on Uniform Traffic Control Devices* are satisfied.

Kuihelani Highway/Waiko Road Intersection

A major reconfiguration of Kuihelani Highway is assumed to be part of the widening project that is expected to be initiated by the State of Hawaii Department of Transportation in the near future.

Overall, the Kuihelani Highway/Waiko Road intersection operates well, and the individual movement delays are acceptable during both peak hours. It is recommended that separate right and left-turn lanes be provided on Waiko Road at Kuihelani Highway.

Truck Routes

Vehicles traveling along Waiko Road are also limited by the 10,000 pound gross vehicle weight capacity of a small bridge at the eastern extent of Waikapu Village. To minimize traffic impacts to the neighboring Waikapu community, it is recommended that tenants of the Waiko Baseyard Subdivision be instructed to use the Kuihelani Highway instead of Honoapiilani Highway as much as possible. This is especially true for truck traffic. The existing Brewer Environmental Industries and Wailuku Agribusiness Company, Inc. operations already do this. Other existing facilities along Waiko Road also cooperate.

Most destinations on Maui can be easily accessed using Kuihelani Highway. One area that would be more convenient using Honoapiilani Highway is Wailuku. Wailuku is still accessible using Kuihelani Highway, but to minimize the potential that trucks might view Honoapiilani Highway as a more direct route to Wailuku, Waiko Baseyard Light Industrial Subdivision tenants will be given permits to use an existing private road that continues north of the Waiko Baseyard Light Industrial Subdivision. This road joins Waiale Road just south of Maui Community Correctional Center which, in turn, provides excellent access to Wailuku town.

B. CONCLUSION

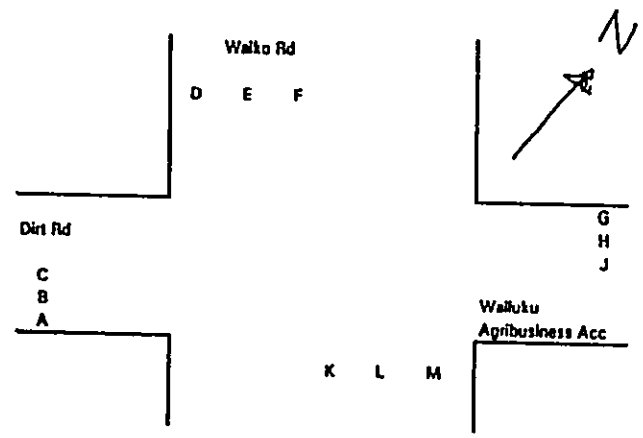
Based on the analysis of proposed intersections along Waiko Road, it was concluded that the future roadway system could accommodate the traffic generated by the proposed Waiko Baseyard Light Industrial Subdivision and that the proposed development is expected to have minimal traffic impacts on the study area.

APPENDICES

Appendix A Traffic Count Data

NAME: Walluku Agribusiness
LOCATION: Walko and Walluku Agribusiness
DATE: 11/8/95

File Name=I:\users\traffic\common\barto\analysis\ampmpeak.xls



COUNT READINGS

TIME	A	B	C	D	E	F	J	H	G	K	L	M
6:30-6:45 AM												
-7:00												
-7:15												
-7:30												
-7:45												
-8:00												
-8:15												
-8:30												

COUNT VOLUMES

TIME	A	B	C	D	E	F	J	H	G	K	L	M	TOTAL	TOT4
6:30-6:45 AM	0	0	0	0	7	2	0	1	3	0	4	5	22	
-7:00	0	0	0	0	21	4	8	0	2	0	13	6	54	
-7:15	1	3	0	0	20	3	2	0	6	1	6	3	45	
-7:30	1	0	1	0	17	6	1	1	1	1	13	3	45	166
-7:45	2	1	0	0	20	1	1	2	2	0	13	4	46	190
-8:00	0	0	0	0	15	4	6	0	3	0	17	3	52	188
-8:15	1	1	0	0	10	5	7	0	1	1	22	3	51	194
-8:30	0	0	0	0	17	4	4	0	4	0	12	1	42	191
6:30-8:30 TOTAL	5	5	1	0	131	29	29	4	22	3	100	28	357	
7:00-8:00 HOUR	4	4	1	0	76	14	10	3	12	2	49	13	188	

NAME: Wailuku Agribusiness
LOCATION:Walko and Kuihelani Hwy
DATE: 11/8/95

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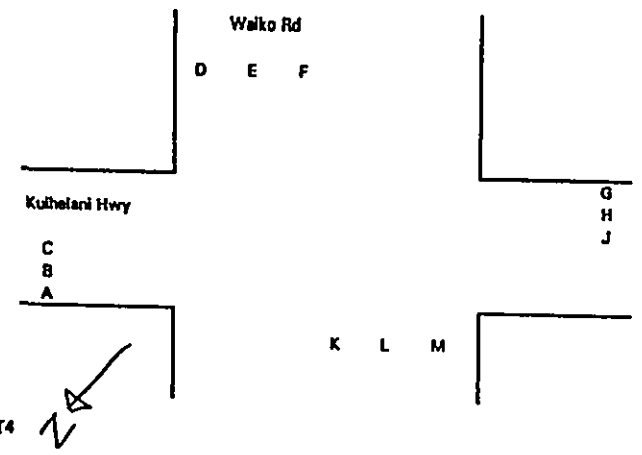


COUNT READINGS

TIME	A	B	C	D	E	F	J	H	G	K	L	M
6:30-6:45 AM	12						0			3		0
-7:00	31						5			16		2
-7:15	47						5			26		3
-7:30	64						6			40		5
-7:45	80						6			55		8
-8:00	93						7			71		8
-8:15	100						7			80		10
-8:30	123						7			102		13

COUNT VOLUMES

TIME	A	B	C	D	E	F	J	H	G	K	L	M	TOTAL	TOT4
6:30-6:45 AM	9	79	0	0	0	0	10	36	0	5	0	6	145	
-7:00	5	98	0	0	0	0	12	33	0	6	0	4	156	
-7:15	3	111	0	0	0	0	9	50	0	5	0	3	181	
-7:30	4	78	0	0	0	0	4	70	0	2	0	9	167	649
-7:45	4	83	0	0	0	0	10	57	0	8	0	10	172	676
-8:00	5	71	0	0	0	0	13	60	0	3	0	11	183	683
-8:15	7	70	0	0	0	0	12	82	0	8	0	10	189	691
-8:30	4	87	0	0	0	0	7	82	0	2	0	9	191	715
6:30-8:30 TOTAL	41	675	0	0	0	0	77	470	0	39	0	62	1384	
7:00-8:00 HOUR	16	343	0	0	0	0	36	237	0	18	0	33	683	

NAME: Wailuku Agribusiness
LOCATION: Waiko and Wailuku Agribusiness
DATE: 11/8/95

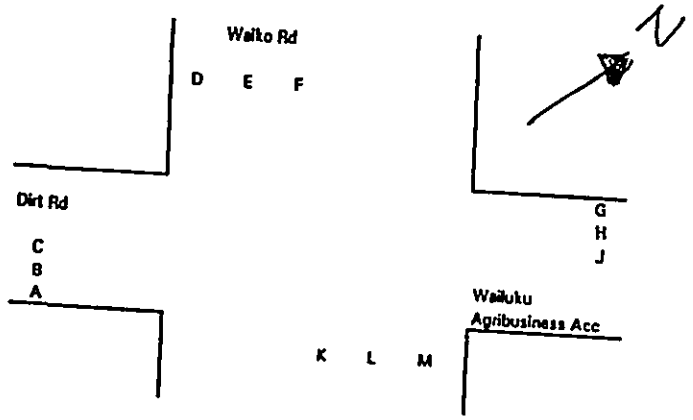
File Name:i:\users\traffic\common\barto\analysis\ampmpeak.xls

COUNT READINGS

TIME	A	B	C	D	E	F	J	H	G	K	L	M
3:30 - 3:45 PM												
-4:00												
-4:15												
-4:30												
-4:45												
-5:00												
-5:15												
-5:30												

COUNT VOLUMES

TIME	A	B	C	D	E	F	J	H	G	K	L	M	TOTAL	TOT4
3:30 - 3:45 PM	1	0	1	0	13	0	4	0	4	0	14	3	40	
-4:00	0	0	0	0	7	4	5	0	3	0	14	3	36	
-4:15	0	0	0	1	11	1	4	0	2	0	14	2	35	
-4:30	0	0	1	0	12	1	3	0	0	0	16	0	33	144
-4:45	0	0	0	0	7	0	1	0	1	0	16	0	25	129
-5:00	0	0	0	0	11	0	1	0	0	0	9	0	22	116
-5:15	1	0	0	0	7	1	3	0	0	0	13	2	27	107
-5:30	0	0	0	0	17	0	2	1	0	0	11	0	31	105
3:30 - 5:30 TOTAL	2	0	2	1	85	7	23	1	10	1	107	10	249	
4:00 - 5:00 HOUR	0	0	1	1	41	2	9	0	3	1	55	2	115	



NAME: Waiuku Agribusiness
LOCATION:Waiko and Honoapiilani Hwy
DATE: 11/8/95

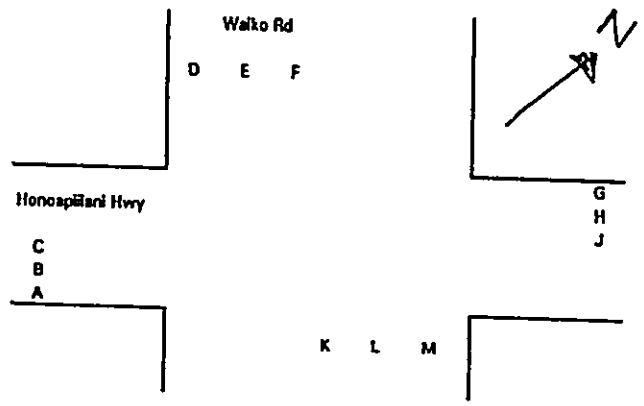
File Name:I:\users\traffic\common\barto\analysis\ampmpeak.xls

COUNT READINGS

TIME	A	B	C	D	E	F	J	H	G	K	L	M
3:30 - 3:45 PM												
-4:00												
-4:15												
-4:30												
-4:45												
-5:00												
-5:15												
-5:30												

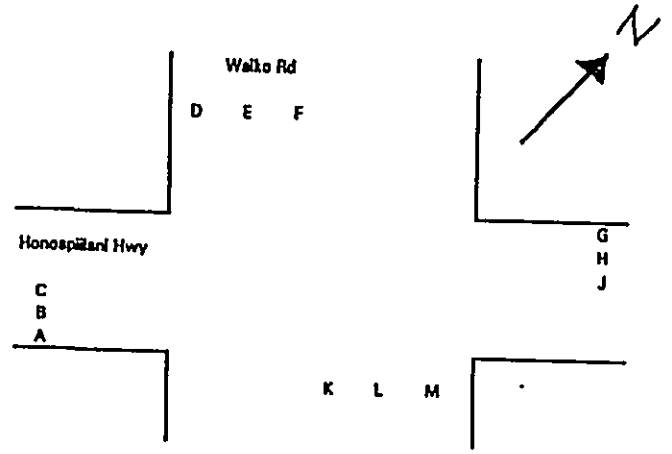
COUNT VOLUMES

TIME	A	B	C	D	E	F	J	H	G	K	L	M	TOTAL	TOT4
3:30 - 3:45 PM	6	129	2	4	0	3	6	147	5	6	10	8	326	
-4:00	2	124	1	0	3	3	3	133	5	4	17	3	298	
-4:15	4	131	3	1	2	3	2	163	8	2	18	10	347	
-4:30	3	118	1	4	0	5	8	126	7	6	1	16	295	1286
-4:45	8	127	5	1	2	6	5	192	11	5	5	14	381	1321
-5:00	6	113	2	5	0	6	12	133	11	6	11	10	314	1337
-5:15	8	130	5	3	0	6	8	130	9	9	0	11	319	1309
-5:30	4	94	2	3	4	7	9	128	11	4	12	8	288	1300
3:30 - 5:30 TOTAL	41	966	21	21	11	39	53	1152	67	41	74	80	2568	
4:00 - 5:00 HOUR	21	489	11	11	4	20	27	614	37	18	35	50	1337	



NAME: Waiuku Agribusiness
LOCATION:Waiko and Honospillani Hwy
DATE: 11/8/95

File Name:l:\users\traffic\common\barto\analysis\ampmpeak.xls



COUNT READINGS

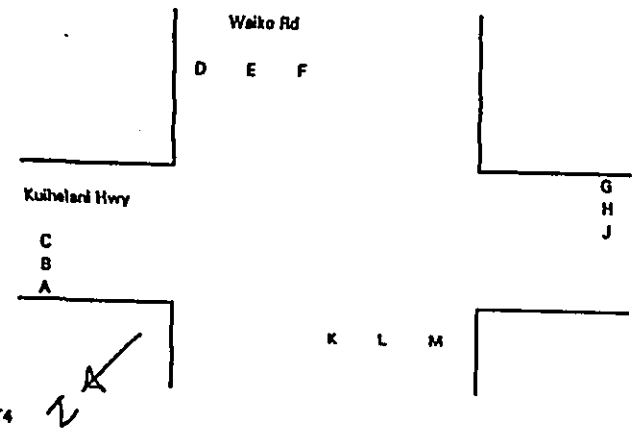
TIME	A	B	C	D	E	F	J	H	G	K	L	M
6:30-6:45 AM												
-7:00												
-7:15												
-7:30												
-7:45												
-8:00												
-8:15												
-8:30												

COUNT VOLUMES

TIME	A	B	C	D	E	F	J	H	G	K	L	M	TOTAL	TOT4
6:30-6:45 AM	9	101	2	5	0	10	10	86	2	5	5	6	242	
-7:00	5	103	3	3	2	8	12	88	0	6	3	4	237	
-7:15	3	173	1	2	0	4	9	123	2	5	5	3	330	
-7:30	4	224	2	3	0	11	4	134	2	2	9	9	404	1213
-7:45	4	217	1	4	0	10	10	117	0	8	0	10	381	1352
-8:00	5	172	1	3	5	4	13	98	2	3	5	11	322	1437
-8:15	7	119	1	2	3	8	12	83	4	8	0	10	257	1364
-8:30	4	111	0	5	4	8	7	92	2	2	11	9	265	1215
6:30-8:30 TOTAL	41	1220	11	27	14	63	77	821	14	39	39	62	2428	
7:00-8:00 HOUR	16	788	5	12	5	29	36	472	6	18	19	33	1437	

NAME: Wailuku Agribusiness
LOCATION:Waiko and Kuihelani Hwy
DATE: 11/8/95

File Name:I:\users\traffic\common\barto\analysis\ampmpeak.xls



COUNT READINGS

TIME	A	B	C	D	E	F	J	H	G	K	L	M
3:30 - 3:45 PM	20						3			16		7
-4:00	35						9			27		11
-4:15	60						14			35		13
-4:30	79						14			54		14
-4:45	80						15			68		14
-5:00	105						15			81		14
-5:15	115						16			80		14
-5:30	128						18			96		14

COUNT VOLUMES

TIME	A	B	C	D	E	F	J	H	G	K	L	M	TOTAL	TOT4
3:30 - 3:45 PM	20	117	0	0	0	0	3	80	0	16	0	7	253	
-4:00	15	131	0	0	0	0	6	69	0	11	0	4	236	
-4:15	25	97	0	0	0	0	5	76	0	8	0	2	213	
-4:30	19	86	0	0	0	0	0	81	0	19	0	1	206	808
-4:45	11	103	0	0	0	0	1	97	0	14	0	0	226	881
-5:00	15	88	0	0	0	0	0	111	0	13	0	0	227	872
-5:15	10	97	0	0	0	0	1	108	0	5	0	0	221	880
-5:30	13	69	0	0	0	0	2	79	0	10	0	0	173	847
3:30 - 5:30 TOTAL	128	788	0	0	0	0	18	711	0	96	0	14	1755	
4:00 - 5:00 HOUR	70	374	0	0	0	0	6	365	0	54	0	3	872	

Appendix B Levels of Service Definitions

The *Highway Capacity Manual* defines six Levels of Service (LOS), labeled A through F, *from best to worst conditions. Levels of Service for signalized and unsignalized* intersections are defined in terms of average user delays. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time.

For unsignalized intersections, the *Highway Capacity Manual* evaluates gaps in the major street traffic flow and calculates available gaps for left-turns across oncoming traffic and for the left and right-turns onto the major roadway from the minor street.

LEVEL-OF-SERVICE A: Little or no delay.

LEVEL-OF-SERVICE B: Short traffic delays.

LEVEL-OF-SERVICE C: Average traffic delays.

LEVEL-OF-SERVICE D: Long traffic delays.

LEVEL-OF-SERVICE E: Very long traffic delays.

LEVEL-OF-SERVICE F: Demand volume exceeds capacity, resulting in extreme delays with queuing that may cause severe congestion and affect other movements at the intersection.

Appendix C Intersection Capacity Analysis Worksheets

Parsons Brinckerhoff Quade & Douglas
Pacific Tower, Suite 3000
1001 Bishop Street
Honolulu, HI 96813-
Ph: (808) 531-7094

Streets: (N-S) Honoapiilani Hwy (E-W) Waiko Rd
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Existing Conditions, AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	< 0	1	1	1	0	> 1	1	0	> 1	< 0
Stop/Yield			N			N						
Volumes	5	786	19	39	472	6	29	5	12	18	19	33
PHF	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Grade		0			0			0			0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10			1.10			1.10	1.10	1.10	1.10	1.10	1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	837	497
Potential Capacity: (pcph)	521	775
Movement Capacity: (pcph)	521	775
Prob. of Queue-Free State:	0.93	0.98

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	847	503
Potential Capacity: (pcph)	677	987
Movement Capacity: (pcph)	677	987
Prob. of Queue-Free State:	0.93	0.99

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	1386	1390
Potential Capacity: (pcph)	204	203
Capacity Adjustment Factor due to Impeding Movements	0.93	0.93
Movement Capacity: (pcph)	189	188
Prob. of Queue-Free State:	0.88	0.97

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	1389	1410
Potential Capacity: (pcph)	166	162
Major LT, Minor TH Impedance Factor:	0.90	0.82
Adjusted Impedance Factor:	0.92	0.86
Capacity Adjustment Factor due to Impeding Movements	0.91	0.80
Movement Capacity: (pcph)	150	129

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	34	129	>	135	37.8	1.3	E	
EB	T	6	188	>					29.2
EB	R	14	775			4.7	0.0	A	
WB	L	21	150	>					
WB	T	22	189	>	248	21.6	1.6	D	21.6
WB	R	39	521	>					
NB	L	6	987			3.7	0.0	A	0.0
SB	L	45	677			5.7	0.1	B	0.4

Intersection Delay = 2.1 sec/veh

Parsons Brinckerhoff Quade & Douglas
Pacific Tower, Suite 3000
1001 Bishop Street
Honolulu, HI 96813-
Ph: (808) 531-7094

Streets: (N-S) Honoapiilani Hwy (E-W) Waiko Rd
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Existing Conditions, PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1 < 0		1	1	1	0 > 1		1	0 > 1 < 0		
Stop/Yield			N			N						
Volumes	11	489	21	27	614	37	20	4	11	21	35	53
PHF	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Grade		0			0			0			0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10			1.10			1.10	1.10	1.10	1.10	1.10	1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	526	646
Potential Capacity: (pcph)	750	652
Movement Capacity: (pcph)	750	652
Prob. of Queue-Free State:	0.92	0.98

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	537	685
Potential Capacity: (pcph)	951	808
Movement Capacity: (pcph)	951	808
Prob. of Queue-Free State:	0.97	0.98

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	1251	1223
Potential Capacity: (pcph)	241	249
Capacity Adjustment Factor due to Impeding Movements	0.95	0.95
Movement Capacity: (pcph)	229	237
Prob. of Queue-Free State:	0.82	0.98

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	1220	1278
Potential Capacity: (pcph)	208	193
Major LT, Minor TH Impedance Factor:	0.94	0.78
Adjusted Impedance Factor:	0.95	0.83
Capacity Adjustment Factor due to Impeding Movements	0.93	0.76
Movement Capacity: (pcph)	194	147

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	23	147 >	156	27.9	0.7	D	
EB	T	4	237 >					20.9
EB	R	13	652		5.6	0.0	B	
WB	L	24	194 >					
WB	T	41	229 >	330	17.7	2.0	C	17.7
WB	R	62	750 >					
NB	L	13	808		4.5	0.0	A	0.1
SB	L	31	951		3.9	0.0	A	0.2

Intersection Delay = 2.1 sec/veh

Parsons Brinckerhoff Quade & Douglas
Pacific Tower, Suite 3000
1001 Bishop Street
Honolulu, HI 96813-
Ph: (808) 531-7094

Streets: (N-S) Wailuku Agribusiness (E-W) Waiko Rd
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Existing Conditions, AM Peak Hour
All-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0
Volumes	1	4	4	10	3	12	20	76	0	2	49	24
PHF	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95

Volume Summary and Capacity Analysis WorkSheet

	NB	SB	EB	WB
LT Flow Rate	1	11	21	2
RT Flow Rate	4	13	0	25
Approach Flow Rate	9	27	101	79
Proportion LT	0.11	0.41	0.21	0.03
Proportion RT	0.44	0.48	0.00	0.32
Opposing Approach Flow Rate	27	9	79	101
Conflicting Approaches Flow Rate	180	180	36	36
Proportion, Subject Approach Flow Rate	0.04	0.13	0.47	0.37
Proportion, Opposing Approach Flow Rate	0.13	0.04	0.37	0.47
Lanes on Subject Approach	1	1	1	1
Lanes on Opposing Approach	1	1	1	1
LT, Opposing Approach	11	1	2	21
RT, Opposing Approach	13	4	25	0
LT, Conflicting Approaches	23	23	12	12
RT, Conflicting Approaches	25	25	17	17
Proportion LT, Opposing Approach	0.41	0.11	0.03	0.21
Proportion RT, Opposing Approach	0.48	0.44	0.32	0.00
Proportion LT, Conflicting Approaches	0.13	0.13	0.33	0.33
Proportion RT, Conflicting Approaches	0.14	0.14	0.47	0.47
Approach Capacity	207	313	921	772

Intersection Performance Summary

Movement	Approach Flow Rate	Approach Capacity	V/C Ratio	Average Total Delay	LOS
NB	9	207	0.04	1.2	A
SB	27	313	0.09	1.4	A
EB	101	921	0.11	1.5	A
WB	79	772	0.10	1.5	A

Intersection Delay = 1.5
Level of Service (Intersection) = A

Parsons Brinckerhoff Quade & Douglas
Pacific Tower, Suite 3000
1001 Bishop Street
Honolulu, HI 96813-
Ph: (808) 531-7094

Streets: (N-S) Wailuku Agribusiness (E-W) Waiko Rd
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Existing, PM Peak Hour
All-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0
Volumes	1	1	0	20	0	9	2	41	1	1	55	2
PHF	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95

Volume Summary and Capacity Analysis WorkSheet

	NB	SB	EB	WB
LT Flow Rate	1	21	2	1
RT Flow Rate	0	9	1	2
Approach Flow Rate	2	30	46	61
Proportion LT	0.50	0.70	0.04	0.02
Proportion RT	0.00	0.30	0.02	0.03
Opposing Approach Flow Rate	30	2	61	46
Conflicting Approaches Flow Rate	107	107	32	32
Proportion, Subject Approach Flow Rate	0.01	0.22	0.33	0.44
Proportion, Opposing Approach Flow Rate	0.22	0.01	0.44	0.33
Lanes on Subject Approach	1	1	1	1
Lanes on Opposing Approach	1	1	1	1
LT, Opposing Approach	21	1	1	2
RT, Opposing Approach	9	0	2	1
LT, Conflicting Approaches	3	3	22	22
RT, Conflicting Approaches	3	3	9	9
Proportion LT, Opposing Approach	0.70	0.50	0.02	0.04
Proportion RT, Opposing Approach	0.30	0.00	0.03	0.02
Proportion LT, Conflicting Approaches	0.03	0.03	0.69	0.69
Proportion RT, Conflicting Approaches	0.03	0.03	0.28	0.28
Approach Capacity	115	176	618	640

Intersection Performance Summary

Movement	Approach Flow Rate	Approach Capacity	V/C Ratio	Average Total Delay	LOS
NB	2	115	0.02	1.1	A
SB	30	176	0.17	1.9	A
EB	46	618	0.07	1.3	A
WB	61	640	0.10	1.4	A

Intersection Delay = 1.5
Level of Service (Intersection) = A

Parsons Brinckerhoff Quade & Douglas
Pacific Tower, Suite 3000
1001 Bishop Street
Honolulu, HI 96813-
Ph: (808) 531-7094

Streets: (N-S) Kuihelani Hwy (E-W) Waiko Rd
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Existing Conditions, AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	0	0	1	1	0	> 0	< 0	0	0	0
Stop/Yield			N			N						
Volumes	39	250			365	24	18		33			
PHF	.95	.95			.95	.95	.95		.95			
Grade		0			0			0				
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10						1.10		1.10			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)		384
Potential Capacity: (pcph)		885
Movement Capacity: (pcph)		885
Prob. of Queue-Free State:		0.96

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)		409
Potential Capacity: (pcph)		1094
Movement Capacity: (pcph)		1094
Prob. of Queue-Free State:		0.96
TH Saturation Flow Rate: (pcphpl)		1700
Major LT Shared Lane Prob. of Queue-Free State:		0.95

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		700
Potential Capacity: (pcph)		416
Major LT, Minor TH Impedance Factor:		0.95
Adjusted Impedance Factor:		0.95
Capacity Adjustment Factor due to Impeding Movements		0.95
Movement Capacity: (pcph)		396

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB L	21	396 >	618	6.5	0.3	B	6.5
EB R	39	885 >					
NB L	45	1094		3.4	0.0	A	0.5

Intersection Delay = 0.6 sec/veh

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Streets: (N-S) Kuihelani Hwy (E-W) Waiko Rd
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Existing Conditions, PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	0	0	1	1	0	> 0	< 0	0	0	0
Stop/Yield			N			N						
Volumes	6	385			395	70	62		6			
PHF	.95	.95			.95	.95	.95		.95			
Grade		0			0			0				
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10						1.10		1.10			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)		416
Potential Capacity: (pcph)		852
Movement Capacity: (pcph)		852
Prob. of Queue-Free State:		0.99

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)		490
Potential Capacity: (pcph)		1001
Movement Capacity: (pcph)		1001
Prob. of Queue-Free State:		0.99
TH Saturation Flow Rate: (pcphpl)		1700
Major LT Shared Lane Prob. of Queue-Free State:		0.99

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		864
Potential Capacity: (pcph)		335
Major LT, Minor TH Impedance Factor:		0.99
Adjusted Impedance Factor:		0.99
Capacity Adjustment Factor due to Impeding Movements		0.99
Movement Capacity: (pcph)		332

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB L	72	332 >	351	13.2	1.0	C	13.2
EB R	7	852 >					
NB L	7	1001		3.6	0.0	A	0.1

Intersection Delay = 1.0 sec/veh

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Streets: (N-S) Honoapiilani Hwy (E-W) Waiko Rd
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 Background, AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1 < 0		1	1	1	0 > 1		1	0 > 1		< 0
Stop/Yield			N			N						
Volumes	5	790	20	40	475	10	30	5	15	20	20	35
PHF	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Grade		0			0			0			0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10			1.10			1.10	1.10	1.10	1.10	1.10	1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	842	500
Potential Capacity: (pcph)	518	773
Movement Capacity: (pcph)	518	773
Prob. of Queue-Free State:	0.92	0.98

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	853	511
Potential Capacity: (pcph)	672	979
Movement Capacity: (pcph)	672	979
Prob. of Queue-Free State:	0.93	0.99

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	1400	1400
Potential Capacity: (pcph)	201	201
Capacity Adjustment Factor due to Impeding Movements	0.93	0.93
Movement Capacity: (pcph)	186	186
Prob. of Queue-Free State:	0.88	0.97

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	1400	1424
Potential Capacity: (pcph)	164	159
Major LT, Minor TH Impedance Factor:	0.90	0.81
Adjusted Impedance Factor:	0.92	0.85
Capacity Adjustment Factor due to Impeding Movements	0.90	0.79
Movement Capacity: (pcph)	147	125

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB L	35	125 >	131	39.9	1.4	E	29.3
EB T	6	186 >					
EB R	18	773		4.8	0.0	A	
WB L	23	147 >					
WB T	23	186 >	242	23.2	1.8	D	23.2
WB R	41	518 >					
NB L	6	979		3.7	0.0	A	0.0
SB L	46	672		5.8	0.1	B	0.4

Intersection Delay = 2.4 sec/veh

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Streets: (N-S) Honoapiilani Hwy (E-W) Waiko Rd
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 Background, PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1 < 0		1	1	1	0 > 1		1	0 > 1		< 0
Stop/Yield			N			N						
Volumes	15	490	25	30	615	40	20	5	15	25	35	55
PHF	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Grade		0			0			0			0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10			1.10			1.10	1.10	1.10	1.10	1.10	1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	529	647
Potential Capacity: (pcph)	747	651
Movement Capacity: (pcph)	747	651
Prob. of Queue-Free State:	0.91	0.97
Step 2: LT from Major Street	**SB**	**NB**
Conflicting Flows: (vph)	542	689
Potential Capacity: (pcph)	946	805
Movement Capacity: (pcph)	946	805
Prob. of Queue-Free State:	0.96	0.98
Step 3: TH from Minor Street	**WB**	**EB**
Conflicting Flows: (vph)	1266	1237
Potential Capacity: (pcph)	236	245
Capacity Adjustment Factor due to Impeding Movements	0.94	0.94
Movement Capacity: (pcph)	222	231
Prob. of Queue-Free State:	0.82	0.97
Step 4: LT from Minor Street	**WB**	**EB**
Conflicting Flows: (vph)	1235	1292
Potential Capacity: (pcph)	204	189
Major LT, Minor TH Impedance Factor:	0.92	0.77
Adjusted Impedance Factor:	0.94	0.82
Capacity Adjustment Factor due to Impeding Movements	0.91	0.75
Movement Capacity: (pcph)	186	142

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	23	142	>	154	28.8	0.7	D	
EB	T	6	231	>					20.1
EB	R	18	651			5.7	0.0	B	
WB	L	29	186	>					
WB	T	41	222	>	314	19.9	2.4	C	19.9
WB	R	64	747	>					
NB	L	18	805			4.6	0.0	A	0.1
SB	L	35	946			4.0	0.0	A	0.2

Intersection Delay = 2.4 sec/veh

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Streets: (N-S) Waiko Baseyard Subd. (E-W) Waiko Rd
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 Background, AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	0	0	1	< 0	0	0	0	0	> 0	< 0
Stop/Yield			N			N						
Volumes	20	80			50	30				15		15
PHF	.95	.95			.95	.95				.95		.95
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10									1.10		1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)		69
Potential Capacity: (pcph)		1278
Movement Capacity: (pcph)		1278
Prob. of Queue-Free State:		0.99

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		85
Potential Capacity: (pcph)		1562
Movement Capacity: (pcph)		1562
Prob. of Queue-Free State:		0.99
TH Saturation Flow Rate: (pcphpl)		1700
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-Free State:		0.98

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)		174
Potential Capacity: (pcph)		840
Major LT, Minor TH Impedance Factor:		0.98
Adjusted Impedance Factor:		0.98
Capacity Adjustment Factor due to Impeding Movements		0.98
Movement Capacity: (pcph)		827

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
SB L	18	827 >	1004	3.7	0.0	A	3.7
SB R	18	1278 >					
EB L	23	1562		2.3	0.0	A	0.5

Intersection Delay = 0.8 sec/veh

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Streets: (N-S) Waiko Baseyard Subd. (E-W) Waiko Rd
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 Background, PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	0	0	1	< 0	0	0	0	0	> 0	< 0
Stop/Yield			N			N						
Volumes	5	45			55	10				25		10
PHF	.95	.95			.95	.95				.95		.95
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10									1.10		1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)		64
Potential Capacity: (pcph)		1285
Movement Capacity: (pcph)		1285
Prob. of Queue-Free State:		0.99

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		69
Potential Capacity: (pcph)		1589
Movement Capacity: (pcph)		1589
Prob. of Queue-Free State:		1.00
TH Saturation Flow Rate: (pcphpl)		1700
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-Free State:		1.00

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)		116
Potential Capacity: (pcph)		907
Major LT, Minor TH Impedance Factor:		1.00
Adjusted Impedance Factor:		1.00
Capacity Adjustment Factor due to Impeding Movements		1.00
Movement Capacity: (pcph)		903

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
SB L	29	903 >	989	3.8	0.0	A	3.8
SB R	12	1285 >					
EB L	6	1589		2.3	0.0	A	0.2

Intersection Delay = 1.0 sec/veh

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Streets: (N-S) Existing Cane Road (E-W) Waiko Road
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 Background, AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1 <	0	0 >	1	0	0 >	0 <	0	0	0	0
Stop/Yield			N			N						
Volumes		90	5	5	70		10		5			
PHF		.95	.95	.95	.95		.95		.95			
Grade		0			0			0				
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10			1.10		1.10			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	98	
Potential Capacity: (pcph)	1235	
Movement Capacity: (pcph)	1235	
Prob. of Queue-Free State:	1.00	

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	100	
Potential Capacity: (pcph)	1536	
Movement Capacity: (pcph)	1536	
Prob. of Queue-Free State:	1.00	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-Free State:	1.00	

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	176	
Potential Capacity: (pcph)	837	
Major LT, Minor TH Impedance Factor:	1.00	
Adjusted Impedance Factor:	1.00	
Capacity Adjustment Factor due to Impeding Movements	1.00	
Movement Capacity: (pcph)	834	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB L	12	834 >	935	3.9	0.0	A	3.9
NB R	6	1235 >					
WB L	6	1536		2.4	0.0	A	0.2

Intersection Delay = 0.4 sec/veh

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Streets: (N-S) Existing Cane Road (E-W) Waiko Road
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 Background, PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1 <	0	0 >	1	0	0 >	0 <	0	0	0	0
Stop/Yield			N			N						
Volumes		60	10	5	55		10		0			
PHF		.95	.95	.95	.95		.95		.95			
Grade		0			0			0				
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10			1.10		1.10			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	68	
Potential Capacity: (pcph)	1279	
Movement Capacity: (pcph)	1279	
Prob. of Queue-Free State:	1.00	

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	74	
Potential Capacity: (pcph)	1581	
Movement Capacity: (pcph)	1581	
Prob. of Queue-Free State:	1.00	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-Free State:	1.00	

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	132	
Potential Capacity: (pcph)	888	
Major LT, Minor TH Impedance Factor:	1.00	
Adjusted Impedance Factor:	1.00	
Capacity Adjustment Factor due to Impeding Movements	1.00	
Movement Capacity: (pcph)	885	

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB	L	12	885 >	885	4.1	0.0	A	4.1
NB	R	0	1279 >					
WB	L	6	1581		2.3	0.0	A	0.2

Intersection Delay = 0.4 sec/veh

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Streets: (N-S) Kuihelani Hwy (E-W) Waiko Rd
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 Background, AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	0	0	2	1	1	0	1	0	0	0
Stop/Yield			N			N						
Volumes	40				450	25	20		35			
PHF	.95				.95	.95	.95		.95			
Grade		0			0			0				
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10						1.10		1.10			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)		237
Potential Capacity: (pcph)		1050
Movement Capacity: (pcph)		1050
Prob. of Queue-Free State:		0.96

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)		500
Potential Capacity: (pcph)		924
Movement Capacity: (pcph)		924
Prob. of Queue-Free State:		0.95

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		529
Potential Capacity: (pcph)		486
Major LT, Minor TH Impedance Factor:		0.95
Adjusted Impedance Factor:		0.95
Capacity Adjustment Factor due to Impeding Movements		0.95
Movement Capacity: (pcph)		462

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB L	23	462		8.2	0.0	B	5.3
EB R	41	1050		3.6	0.0	A	
NB L	46	924		4.1	0.0	A	4.1

Intersection Delay = 0.8 sec/veh

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Streets: (N-S) Kuihelani Hwy (E-W) Waiko Rd
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 Background, PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	0	0	2	1	1	0	1	0	0	0
Stop/Yield			N			N						
Volumes	10				485	70	65		10			
PHF	.95				.95	.95	.95		.95			
Grade		0			0			0				
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10						1.10		1.10			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)		256
Potential Capacity: (pcph)		1027
Movement Capacity: (pcph)		1027
Prob. of Queue-Free State:		0.99

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)		585
Potential Capacity: (pcph)		832
Movement Capacity: (pcph)		832
Prob. of Queue-Free State:		0.99

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		559
Potential Capacity: (pcph)		465
Major LT, Minor TH Impedance Factor:		0.99
Adjusted Impedance Factor:		0.99
Capacity Adjustment Factor due to Impeding Movements		0.99
Movement Capacity: (pcph)		458

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB L	75	458		9.4	0.6	B	
EB R	12	1027		3.5	0.0	A	8.6
NB L	12	832		4.4	0.0	A	4.4

Intersection Delay = 1.1 sec/veh

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Streets: (N-S) Honoapiilani Hwy (E-W) Waiko Rd
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 With Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	< 0	1	1	1	0	> 1	1	0	> 1	< 0
Stop/Yield			N			N						
Volumes	5	790	30	50	475	10	30	5	15	20	20	35
PHF	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Grade		0			0			0			0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10			1.10			1.10	1.10	1.10	1.10	1.10	1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	848	500
Potential Capacity: (pcph)	515	773
Movement Capacity: (pcph)	515	773
Prob. of Queue-Free State:	0.92	0.98

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	864	511
Potential Capacity: (pcph)	664	979
Movement Capacity: (pcph)	664	979
Prob. of Queue-Free State:	0.91	0.99

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	1417	1422
Potential Capacity: (pcph)	197	196
Capacity Adjustment Factor due to Impeding Movements	0.91	0.91
Movement Capacity: (pcph)	179	178
Prob. of Queue-Free State:	0.87	0.97

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	1416	1440
Potential Capacity: (pcph)	160	155
Major LT, Minor TH Impedance Factor:	0.88	0.79
Adjusted Impedance Factor:	0.91	0.84
Capacity Adjustment Factor due to Impeding Movements	0.88	0.77
Movement Capacity: (pcph)	141	120

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	35	120	>	126	42.2	1.5	E	
EB	T	6	178	>					31.0
EB	R	18	773			4.8	0.0	A	
WB	L	23	141	>					
WB	T	23	179	>	234	24.4	1.9	D	24.4
WB	R	41	515	>					
NB	L	6	979			3.7	0.0	A	0.0
SB	L	58	664			5.9	0.2	B	0.6

Intersection Delay = 2.5 sec/veh

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Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 With Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1 < 0		1	1	1	0 > 1		1	0 > 1 < 0		
Stop/Yield			N			N						
Volumes	15	490	30	30	615	40	20	5	15	35	35	60
PHF	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Grade		0			0			0			0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10			1.10			1.10	1.10	1.10	1.10	1.10	1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	532	647
Potential Capacity: (pcph)	744	651
Movement Capacity: (pcph)	744	651
Prob. of Queue-Free State:	0.91	0.97

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	548	689
Potential Capacity: (pcph)	940	805
Movement Capacity: (pcph)	940	805
Prob. of Queue-Free State:	0.96	0.98

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	1269	1243
Potential Capacity: (pcph)	235	243
Capacity Adjustment Factor due to Impeding Movements	0.94	0.94
Movement Capacity: (pcph)	221	229
Prob. of Queue-Free State:	0.81	0.97

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	1237	1298
Potential Capacity: (pcph)	203	188
Major LT, Minor TH Impedance Factor:	0.92	0.77
Adjusted Impedance Factor:	0.94	0.82
Capacity Adjustment Factor due to Impeding Movements	0.91	0.74
Movement Capacity: (pcph)	185	140

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	23	140	>	152	29.2	0.8	D	
EB	T	6	229	>					20.4
EB	R	18	651			5.7	0.0	B	
WB	L	41	185	>					
WB	T	41	221	>	302	23.7	3.1	D	23.7
WB	R	69	744	>					
NB	L	18	805			4.6	0.0	A	0.1
SB	L	35	940			4.0	0.0	A	0.2

Intersection Delay = 2.9 sec/veh

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Streets: (N-S) Waiko Baseyard Subd. (E-W) Waiko Rd
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 With Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	0	0	1	< 0	0	0	0	0	> 0	< 0
Stop/Yield			N			N						
Volumes	40	80			50	65				20		20
PHF	.95	.95			.95	.95				.95		.95
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10									1.10		1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)		87
Potential Capacity: (pcph)		1251
Movement Capacity: (pcph)		1251
Prob. of Queue-Free State:		0.98

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		121
Potential Capacity: (pcph)		1501
Movement Capacity: (pcph)		1501
Prob. of Queue-Free State:		0.97
TH Saturation Flow Rate: (pcphpl)		1700
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-Free State:		0.97

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)		213
Potential Capacity: (pcph)		797
Major LT, Minor TH Impedance Factor:		0.97
Adjusted Impedance Factor:		0.97
Capacity Adjustment Factor due to Impeding Movements		0.97
Movement Capacity: (pcph)		771

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
SB L	23	771 >	954	4.0	0.0	A	4.0
SB R	23	1251 >					
EB L	46	1501		2.5	0.0	A	0.8

Intersection Delay = 0.9 sec/veh

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Streets: (N-S) Waiko Baseyard Subd. (E-W) Waiko Rd
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 With Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	0	0	1	< 0	0	0	0	0	> 0	< 0
Stop/Yield			N			N						
Volumes	10	45			55	20				60		25
PHF	.95	.95			.95	.95				.95		.95
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10									1.10		1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)		68
Potential Capacity: (pcph)		1279
Movement Capacity: (pcph)		1279
Prob. of Queue-Free State:		0.98

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		79
Potential Capacity: (pcph)		1572
Movement Capacity: (pcph)		1572
Prob. of Queue-Free State:		0.99
TH Saturation Flow Rate: (pcphpl)		1700
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-Free State:		0.99

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)		126
Potential Capacity: (pcph)		895
Major LT, Minor TH Impedance Factor:		0.99
Adjusted Impedance Factor:		0.99
Capacity Adjustment Factor due to Impeding Movements		0.99
Movement Capacity: (pcph)		888

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
SB L	69	888 >	976	4.1	0.3	A	4.1
SB R	29	1279 >					
EB L	12	1572		2.3	0.0	A	0.4

Intersection Delay = 1.7 sec/veh

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Streets: (N-S) Existing Cane Road (E-W) Waiko Road
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 With Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1 <	0	0 >	1	0	0 >	0 <	0	0	0	0
Stop/Yield			N			N						
Volumes		95	5	5	105		10		5			
PHF		.95	.95	.95	.95		.95		.95			
Grade		0			0			0				
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10			1.10		1.10			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	102	
Potential Capacity: (pcph)	1229	
Movement Capacity: (pcph)	1229	
Prob. of Queue-Free State:	1.00	

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	105	
Potential Capacity: (pcph)	1528	
Movement Capacity: (pcph)	1528	
Prob. of Queue-Free State:	1.00	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-Free State:	1.00	

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	218	
Potential Capacity: (pcph)	792	
Major LT, Minor TH Impedance Factor:	1.00	
Adjusted Impedance Factor:	1.00	
Capacity Adjustment Factor due to Impeding Movements	1.00	
Movement Capacity: (pcph)	789	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB L	12	789 >	896	4.1	0.0	A	4.1
NB R	6	1229 >					
WB L	6	1528		2.4	0.0	A	0.1

Intersection Delay = 0.3 sec/veh

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Streets: (N-S) Existing Cane Road (E-W) Waiko Road
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 With Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	< 0	0	> 1	0	0	> 0	< 0	0	0	0
Stop/Yield			N			N						
Volumes		95	10	5	65		10		0			
PHF		.95	.95	.95	.95		.95		.95			
Grade		0			0			0				
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10			1.10		1.10			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	106	
Potential Capacity: (pcph)	1224	
Movement Capacity: (pcph)	1224	
Prob. of Queue-Free State:	1.00	

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	111	
Potential Capacity: (pcph)	1518	
Movement Capacity: (pcph)	1518	
Prob. of Queue-Free State:	1.00	
TH Saturation Flow Rate: (pcphpl)	1700	
RT Saturation Flow Rate: (pcphpl)		
Major LT Shared Lane Prob. of Queue-Free State:	1.00	

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	178	
Potential Capacity: (pcph)	835	
Major LT, Minor TH Impedance Factor:	1.00	
Adjusted Impedance Factor:	1.00	
Capacity Adjustment Factor due to Impeding Movements	1.00	
Movement Capacity: (pcph)	832	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB L	12	832 >	832	4.4	0.0	A	4.4
NB R	0	1224 >					
WB L	6	1518		2.4	0.0	A	0.2

Intersection Delay = 0.3 sec/veh

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Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 With Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	0	0	2	1	1	0	1	0	0	0
Stop/Yield			N			N						
Volumes	50				450	50	25		35			
PHF	.95				.95	.95	.95		.95			
Grade		0			0			0				
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10						1.10		1.10			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)		237
Potential Capacity: (pcph)		1050
Movement Capacity: (pcph)		1050
Prob. of Queue-Free State:		0.96

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)		527
Potential Capacity: (pcph)		894
Movement Capacity: (pcph)		894
Prob. of Queue-Free State:		0.94

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		554
Potential Capacity: (pcph)		468
Major LT, Minor TH Impedance Factor:		0.94
Adjusted Impedance Factor:		0.94
Capacity Adjustment Factor due to Impeding Movements		0.94
Movement Capacity: (pcph)		438

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB L	29	438		8.8	0.1	B	5.7
EB R	41	1050		3.6	0.0	A	
NB L	58	894		4.3	0.1	A	4.3

Intersection Delay = 0.9 sec/veh

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Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... A. Graves
Date of Analysis..... 9/3/98
Other Information.....Year 2004 With Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	0	0	2	1	1	0	1	0	0	0
Stop/Yield			N			N						
Volumes	15				485	75	90		20			
PHF	.95				.95	.95	.95		.95			
Grade		0			0			0				
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10						1.10		1.10			

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)		256
Potential Capacity: (pcph)		1027
Movement Capacity: (pcph)		1027
Prob. of Queue-Free State:		0.98

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)		590
Potential Capacity: (pcph)		827
Movement Capacity: (pcph)		827
Prob. of Queue-Free State:		0.98

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		566
Potential Capacity: (pcph)		460
Major LT, Minor TH Impedance Factor:		0.98
Adjusted Impedance Factor:		0.98
Capacity Adjustment Factor due to Impeding Movements		0.98
Movement Capacity: (pcph)		450

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB L	105	450		10.4	1.0	C	
EB R	23	1027		3.6	0.0	A	9.2
NB L	18	827		4.4	0.0	A	4.4

Intersection Delay = 1.6 sec/veh