

JOHN WAIHEE
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

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ROBERT P. TAKUSHI
COMPTROLLER

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FLOYD I. UNEBASAMI
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LETTER NO. (P) 1244.4

APR 6 1994

Mr. Brian J. J. Choy
Director
Office of Environmental
Quality Control
Central Pacific Plaza
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

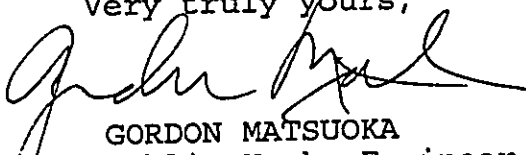
Dear Mr. Choy:

Subject: Final EA for Waimano Training
School and Hospital
Negative Declaration
TMK 9-7-25:01 Ewa, Oahu

The Department of Accounting and General Services has not received any comments during the 30-day public comment period which began on February 23, 1994. The agency has determined that this project will not have any significant environmental effect and has issued a negative declaration. Please publish this notice in the April 23, 1994 OEQC Bulletin.

We have enclosed a completed OEQC Bulletin Publication Form and four copies of the final EA. If there are any questions, please have your staff call Mr. Allen Yamanoha of the Planning Branch at 586-0483.

Very truly yours,


GORDON MATSUOKA
State Public Works Engineer

AY:jy
Attachments

1994-04-23-DA-FEA-Waimano Training
School & Hospital Master Plan

APR 23 1994



WAIMANO RIDGE MASTER PLAN

For

Department of Accounting
& General Services for the
Department of Health

April 1994

**FINAL
ENVIRONMENTAL
ASSESSMENT**

**WAIMANO RIDGE
MASTER PLAN**

For

**Department of Accounting
& General Services for the
Department of Health**

April 1994

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I. INTRODUCTION & SUMMARY

A. INTRODUCTION

Waimano Training School and Hospital (WTSH) is proposing a new Master Plan for the facility to address its future needs and to incorporate new campus facilities including the State laboratory and a multi-purpose cultural center. The facility is located on the upper ridge of Pearl City in the Ewa District of Oahu. The facility is owned by the State of Hawaii and is presently administered by the Department of Health.

The overall scope of this master planning incorporates WTSH facilities, privately-run programs for the developmentally disabled, the Pearl City Cultural Center, baseball fields for the Pearl City Youth Association, the Department of Health Laboratory Facility, future Department of Health office spaces, and appropriate community uses.

As a State funded project, this master plan effort is subject to Chapter 343, Hawaii Revised Statutes. The project plan also delineates the individual component actions which will be subject to Chapter 343. This document is prepared to assess potential environmental impacts which may result from total development as proposed in the Waimano Ridge Master Plan.

B. DEVELOPMENT SUMMARY

| | |
|----------------------|---|
| Project Name: | Waimano Training School and Hospital |
| Agency: | State of Hawaii, Department of Accounting and General Services. |
| Accepting Authority: | Governor, State of Hawaii |
| Project Location: | Waimano Ridge, Pearl City, Oahu |
| Tax Map Key: | 9-7-25:01 |
| Landowner: | State of Hawaii |

WAIMANO RIDGE MASTER PLAN
Final Environmental Assessment

| | |
|---|--|
| Land Area: | 242 acres |
| Existing Use: | The project site is a medical facility and training school for the developmentally disabled and mentally retarded. |
| State Land Use Designation: | Urban |
| Development Plan Land Use Designation: | The project site is designated as a public facility. |
| Development Plan Public Facilities Map: | No public works facilities are shown on the Public Facilities Map for the site. |
| Zoning Designation: | Residential District (R-5), Preservation District (P-1), and General Preservation (P-2). |

C. SUMMARY OF PROBABLE IMPACTS

Short-term impacts will result from construction related activities, such as noise, dust, and traffic. However, these impacts will only last during the duration of construction. Mitigation measures will be taken wherever possible to minimize these impacts.

Long-term impacts resulting from the project are minimal in that the existing air quality, noise, and traffic conditions will remain unchanged.

II. PROJECT DESCRIPTION

A. LOCATION

Waimano Training School and Hospital (WTSH) is located on the gently rising slopes of Waimano between the Pearl City coastal plain and the main Koolau ridgeline, on the island of Oahu, shown in Figures 1 and 2. The 242-acre Waimano Ridge site (TMK: 9-07-25:01) overlooks Pearl Harbor and the city of Honolulu in the distance.

Immediately south are Pearl City High School, Momilani Elementary School, and the Pearl City residential neighborhoods. Waimano Valley and the Pacific Palisades neighborhoods lie to the west, while Waimalu Valley and the Wailuna residential developments are located immediately east of the site. These residential neighborhoods were built incrementally over the years and characterize the ridge's broad lower slopes.

The high school and elementary school, which serve Waimano and adjacent neighborhoods, form the upper terminus of these residential areas. Immediately north of these schools on a long, narrowing stretch of open ridgetop stands the Waimano Training School and Hospital. It is this uppermost area, to which this report will refer as "The Waimano Ridge", that is the area of study. The immediate context and residential neighbors are shown in Figure 3.

B. PROJECT PROPOSAL

1. Master Plan Goals

The future of the spectacularly situated lands of Waimano Ridge and their continuing role in health care are the focus of this master planning effort. The Plan is oriented toward defining the future needs of the WTSH within an overall context of health services for the developmentally disabled and mentally retarded.

The current Department of Health perspectives on health care policies for the developmentally disabled and mentally retarded follows a new national trend toward deinstitutionalized treatment for these client groups. With this goal in mind a Master Plan has been developed that creates a community of residences and services that respond to the surrounding neighborhoods both in scale and

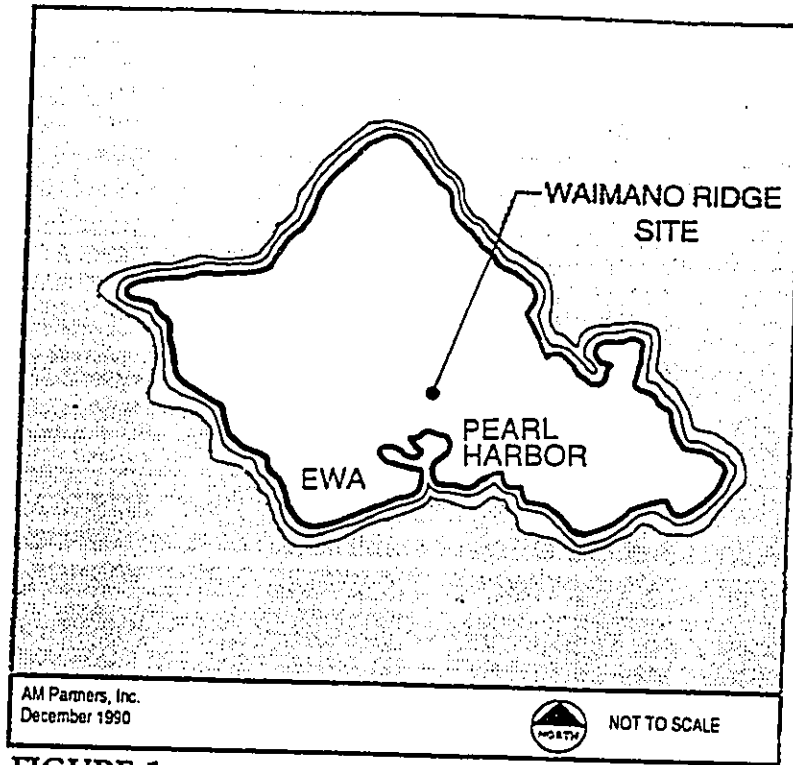


FIGURE 1 Location Map

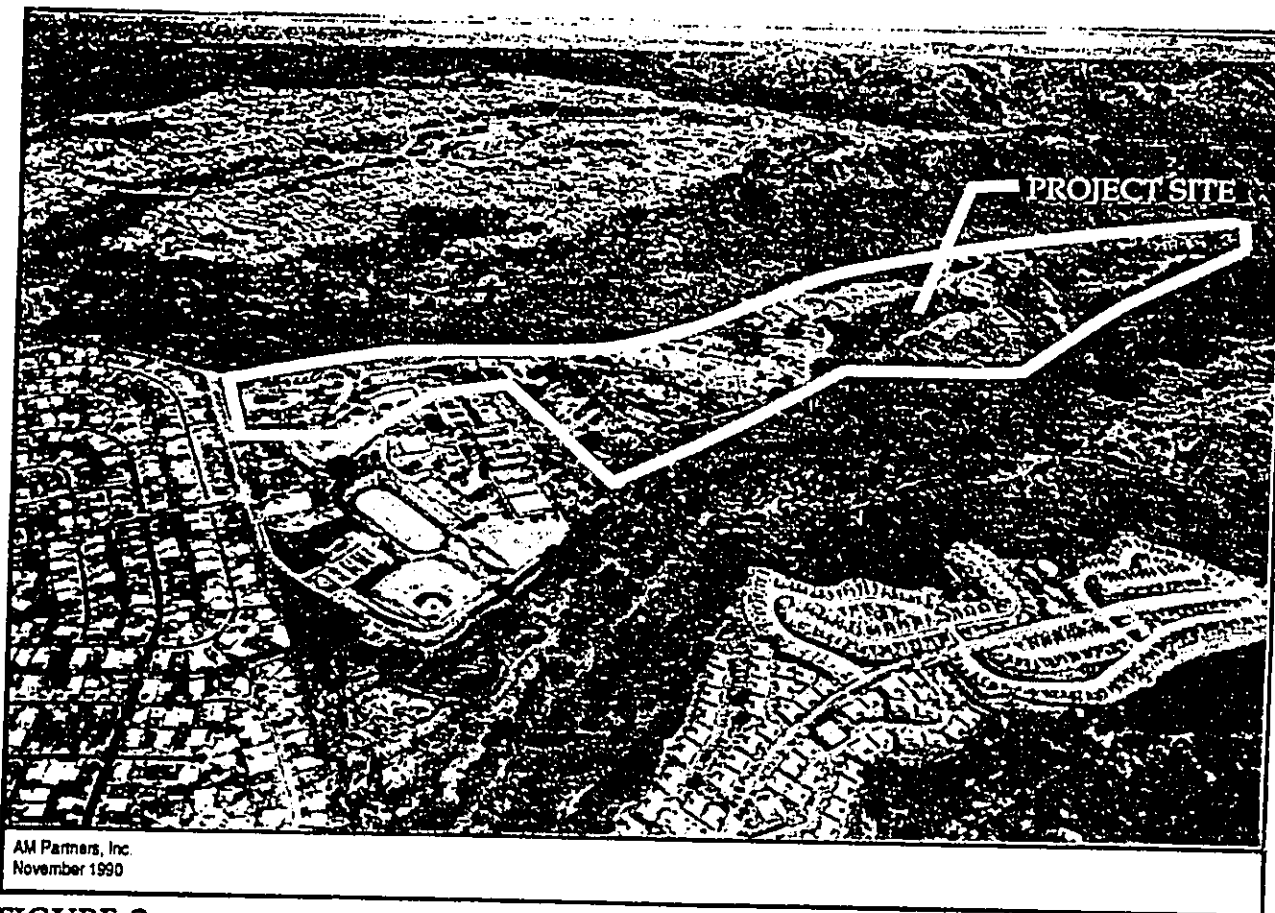


FIGURE 2 The Waimano Ridge Vicinity

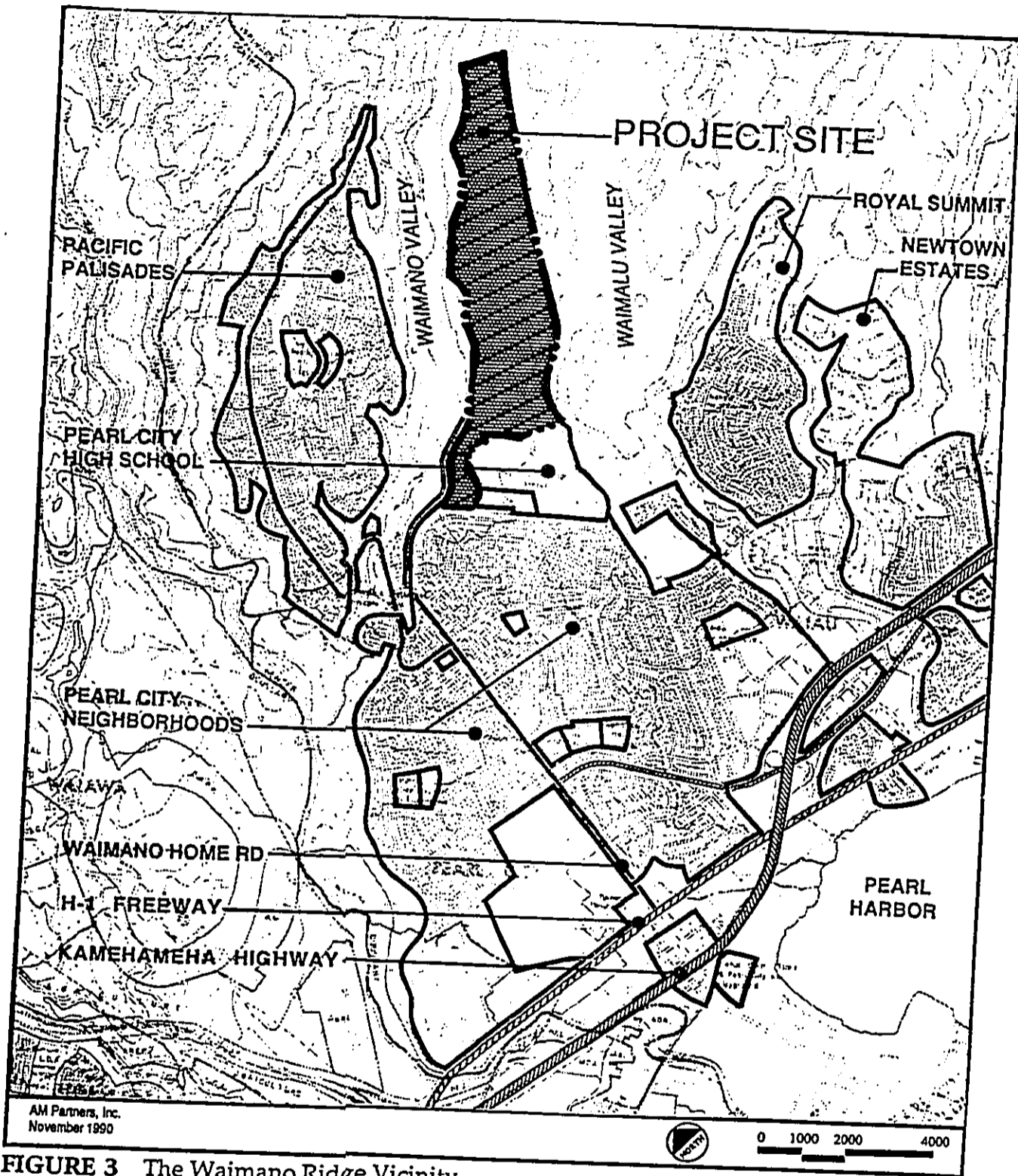


FIGURE 3 The Waimano Ridge Vicinity

WAIMANO RIDGE MASTER PLAN
Final Environmental Assessment

physical character. The objective is to create a comprehensive Master Plan for the Waimano Ridge that meets WTSH space and facility needs and incorporates other appropriate facilities at suitable ridge locations.

Approaching master planning and facility development in this way will assist in providing an optimally organized complex of facilities for the WTSH, the State, and the community at large. Redevelopment of the Waimano Ridge could thus implement a Master Plan for the developmentally disabled in accordance with thoroughly considered policies for appropriate health care. As cited by the Environmental Design Group (EDG), the project medical facilities architectural consultant, the optimizing of services for the developmentally disabled in accordance with current technologies and philosophies could enable the State to emerge as a national leader in this vital aspect of health care.

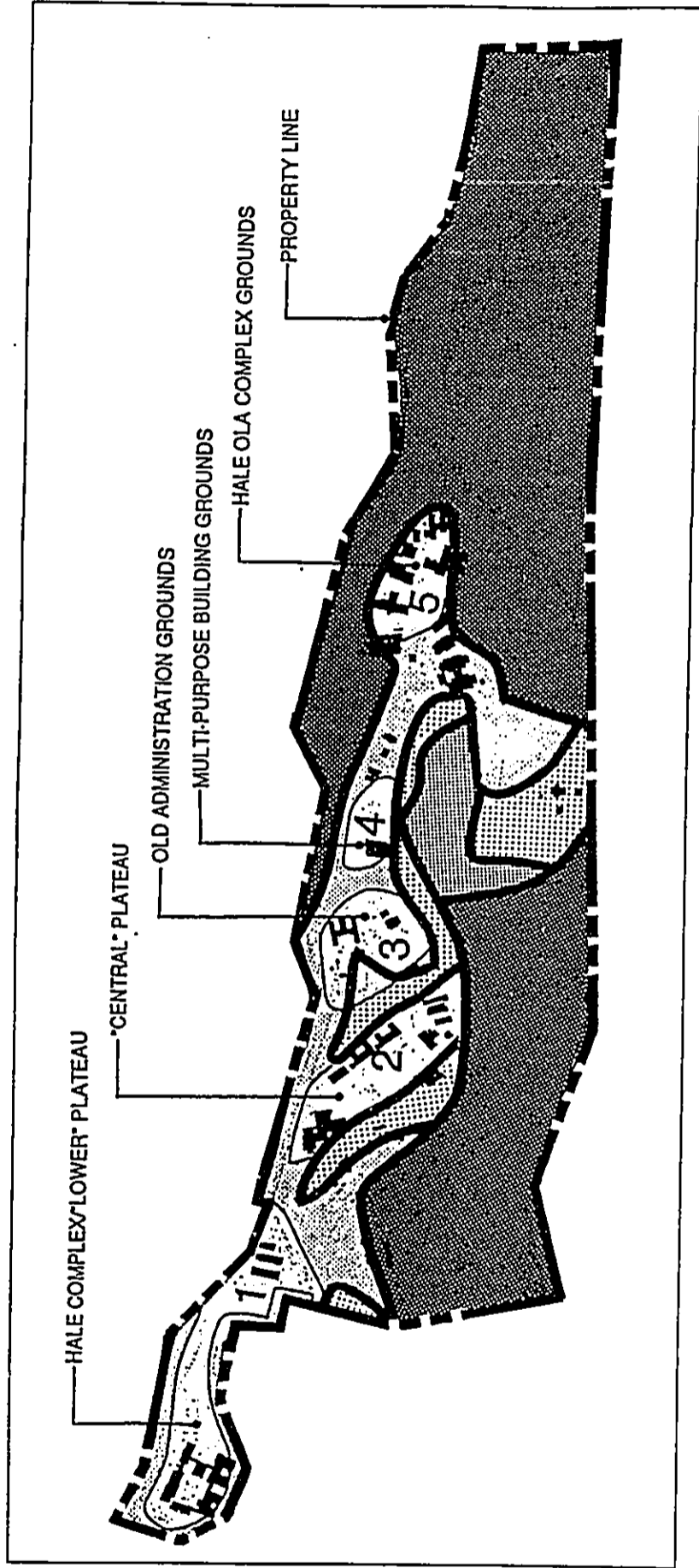
2. Technical Characteristics

The plan for Waimano Ridge simulates the surrounding community in its appearance and its structure. The new Cultural Center and baseball field along Waimano Home Road help integrate Waimano Ridge into the community. The DOH Administrative Services and new State Laboratory Building at the top of the ridge help increase community awareness of activities in the area.

The Waimano Training School and Hospital campus is concentrated in the central portion of the site where the land is fairly level, allowing the physically impaired access to all necessary buildings (Figure 4). The total WTSH property consists of 240 acres of which approximately 30 acres will be developed into a new master planned area for the developmentally disabled. There is ample land in this area for open space and future growth as show in Figure 5.

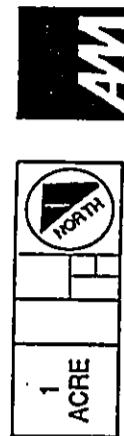
The facilities are distributed in 24 new buildings including 14 residential buildings with a total area of 175,960 square feet. The site will contain 344 parking spaces with 22 loading spaces. These new facilities will replace all buildings located at the mid-level area of the campus.

The Waimano Ridge community is physically defined by the main road which has been realigned along the edge of the ridge to provide the largest possible contiguous parcel of land. The location of the road eliminates pedestrian and vehicular conflicts by keeping all



KEY TO DESIGNATIONS

| DESIGNATION | DESCRIPTION | ACREAGE | DESIGNATION | DESCRIPTION | ACREAGE |
|-------------|---------------------------------------|---------|-------------|-----------------------------|---------|
| | PREFERRED BUILDING CONSTRUCTION ZONES | ---- | | SEVERE CONSTRAINT ZONE | 20.0 |
| | MINIMAL CONSTRAINT ZONE | 77.0 | | PROHIBITIVE CONSTRAINT ZONE | 127.5 |
| | MODERATE CONSTRAINT ZONE | 17.5 | HA | EXISTING BUILDING | ---- |



0 100 300 600

1 ACRE

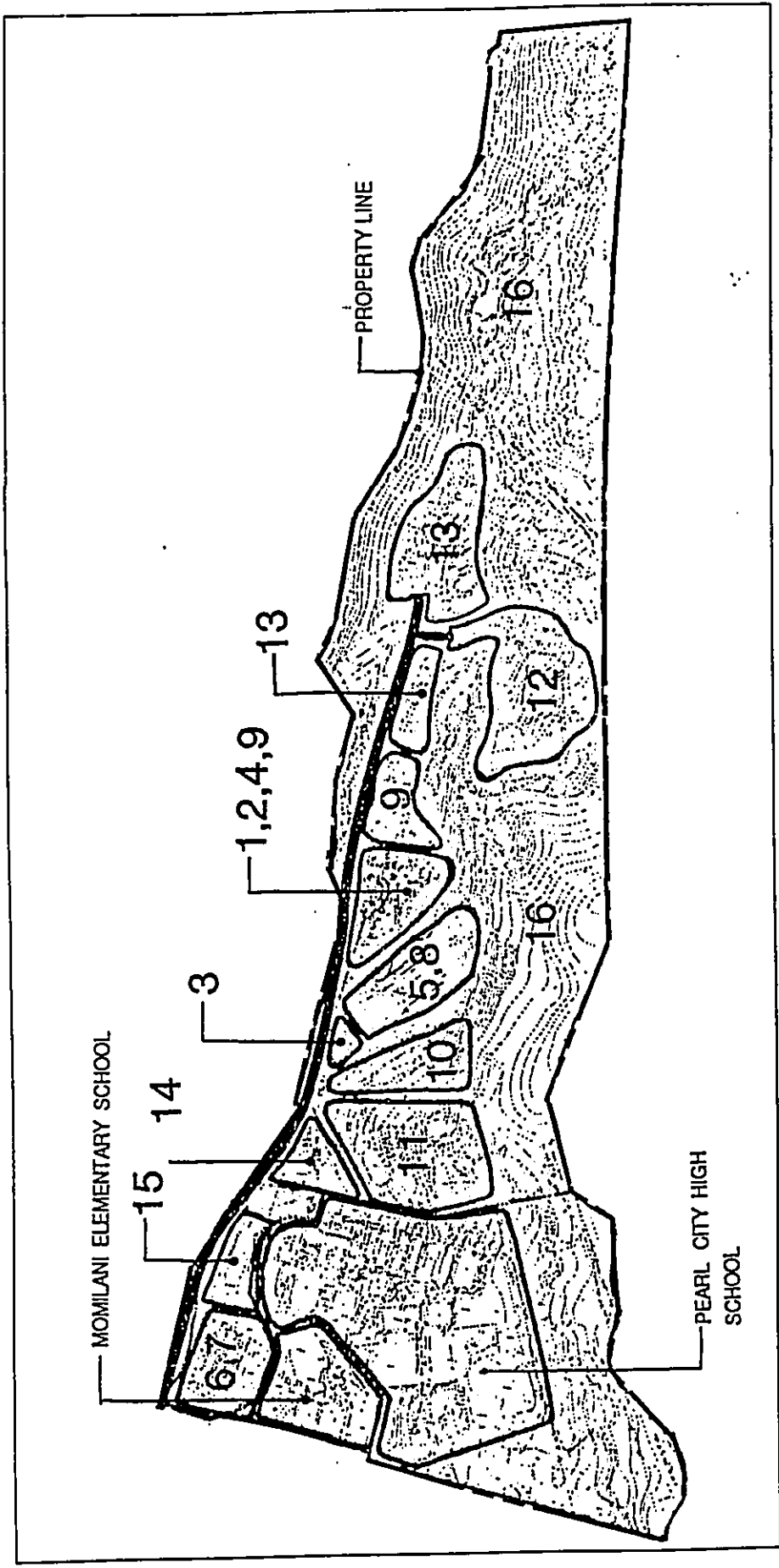


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WAIMANO RIDGE MASTER PLAN

FIGURE 4 BUILDING CONSTRAINTS & PREFERRED CONSTRUCTION ZONES

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100



| LEGEND | | | | | |
|--------|----------------------------------|---------|-----|---|---------|
| No. | FUNCTIONAL AREA | ACREAGE | No. | FUNCTIONAL AREA | ACREAGE |
| 1 | TRAINING & CONFERENCE CENTER | 7.0 | 11 | FUTURE EXPANSION | 13.0 |
| 2 | DDD/CSD & WAIMANO ADMIN. OFFICES | 1.0 | 12 | LABORATORY FACILITY | 14.0 |
| 3 | ANCILLARY (SPECIALIZED) SERVICES | 2.0 | 13 | OTHER DEPARTMENT OF HEALTH OFFICES & FACILITIES | 8.5 |
| 4 | RECREATION CENTER | 1.5 | 14 | PEARL CITY CULTURAL CENTER | 5.0 |
| 5 | WAIMANO DAY PROGRAMS | 7.0 | 15 | PEARL CITY YOUTH ASSOCIATION | 8.5 |
| 6 | EXISTING COMMUNITY DAY PROGRAMS | 7.0 | 16 | GENERAL OPEN SPACE | 167.0 |
| 7 | FUTURE DAY PROGRAMS | 7.0 | | TOTAL | 242.0 |

0 200 400 600
2.0
ACRE



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July 1991

WAIMANO RIDGE MASTER PLAN
FIGURE 5 SITE UTILIZATION DIAGRAM: ALTERNATIVE 2

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pedestrians on the eastern side of the main road. The buildings used most frequently by the public are located at the entrances to the community where parking is available.

The existing natural landscape is maintained where possible with the addition of new landscaping used to define spaces and direct views. The natural look of the campus is an important aspect of the design helping promote integration into the surrounding community.

Buildings are small in scale and clustered in groups, ranging in size from one to two stories. The residential units are arranged along a street with yards and outdoor areas where activities can be programmed. The clustered houses permit shared activities and staff interaction when necessary.

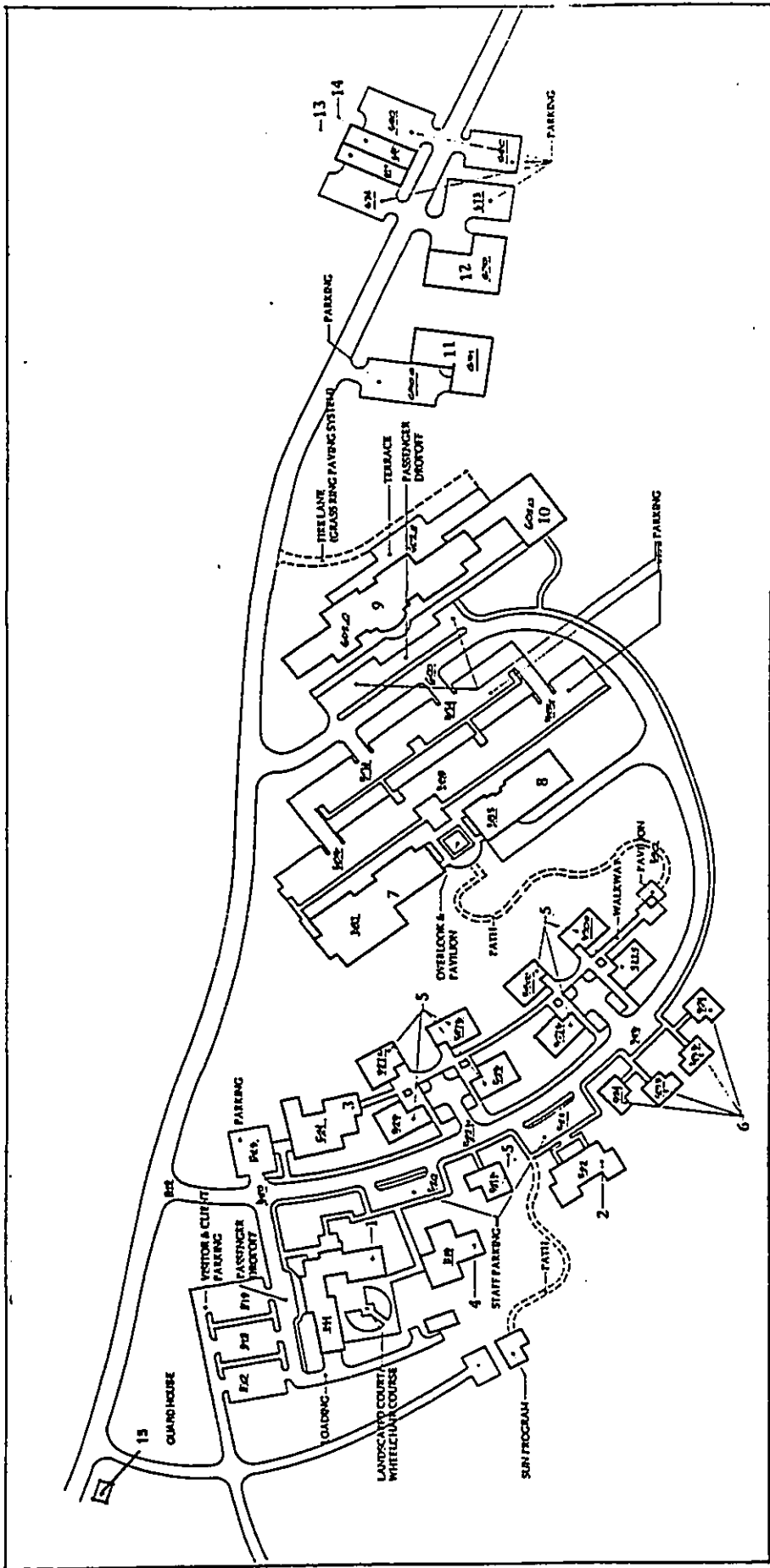
The Master Plan intends to preserve the natural drainage of the site by maintaining as much as possible of the existing vegetation and drainage-ways, such as the stone water-way along the main road. The large existing trees will promote a sense of history as well as reduce the costs of new earthwork and landscaping.

As shown in Figure 5, general use zones were established to guide further growth and development as well as to secure important areas for developmentally disabled uses. Formerly, developmentally disabled uses were spread throughout the entire ridge. The Master Plan calls for the centralization of developmentally disabled uses on the mid-level plateau as shown in Figure 6.

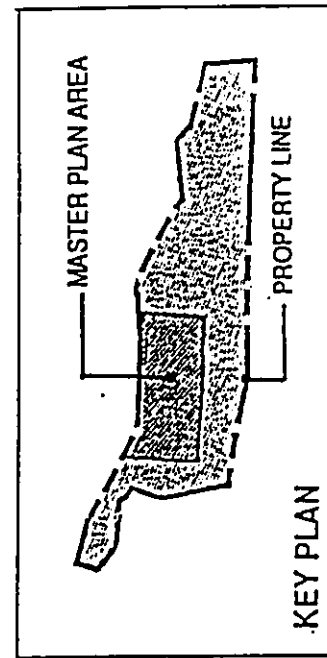
With the centralization of developmentally disabled uses, buildings located on the upper and lower levels formerly used by WTSH will be used as appropriate for other Department of Health and State uses or will be demolished if impracticable for reuse.

Specifically, no physical alterations are planned for the upper campus area under the scope of the Waimano Master Plan, with the exception of the State Laboratory facility which is not part of the Master Plan. The lower campus area will feature more community uses including the Pearl City Cultural Center (PCCC), which was planned independently from the Waimano Master Plan, and the proposed playing fields. The old maintenance facility had been replaced by the PCCC.

The specific building and service facilities planned for the mid-level area described in Table 1. Full implementation will result in approximately 170,000 square feet of improvements with 344 parking stalls and 22 loading areas. These new improvements will replace approximately 115,000 square feet of existing structures and ancillary parking. While there will be an increase in building area,



| KEY TO FACILITIES | |
|-------------------|---|
| NO. | BUILDING DESCRIPTION |
| 1 | SPECIALIZED SERVICES |
| 2 | DAY PROGRAMS, BEHAVIORALLY CHALLENGED |
| 3 | DAY PROGRAMS, BEHAVIOR, CHALLENGE, TRAINABLE |
| 4 | DAY PROGRAMS, MEDICALLY FRAGILE |
| 5 | 12-BEDROOM RESIDENCE |
| 6 | 6-BEDROOM RESIDENCE |
| 7 | 4-BEDROOM RESIDENCE |
| 8 | FOOD SERVICE |
| 9 | WAIMANO & ODDCSDD ADMINISTRATION |
| 10 | TRAINING & CONFERENCE CENTER |
| 11 | CENTRAL SUPPLY, HOUSE KEEPING, LAUNDRY & BOILER |
| 12 | ELECTRICAL & MAINTENANCE SHOPS & OFFICE |
| 13 | AUTOMOTIVE SHOPS |
| 14 | GROUNDKEEPING & VEHICLE STORAGE |
| 15 | GUANO HOUSE |



0 150 300

1 ACRE

0.25 0.50

NORTH

WAIMANO RIDGE MASTER PLAN
FIGURE 6 Site Building Layout Plan

| DESCRIPTION | BUILDING TOTAL SPACE | PROGRAM PRIORITY TOTAL SPACE |
|--|-------------------------|---------------------------------|
| DAY PROGRAMS | | 23,170 |
| Medically Fragile | 10,810 | |
| Behaviorally Challenged | 9,980 | |
| Behaviorally Challenged, Trainable | 2,380 | |
| TREATMENT TRAINING & RESEARCH | | 46,280 |
| Medically Fragile - 1 unit | 7,630 | |
| Behaviorally Challenged - 9 units @ 3250 sf each | 29,250 | |
| Behaviorally Challenged - 4 units @ 2020 sf each | 8,080 | |
| Shared Space | 1320 | |
| SPECIALIZED SERVICES | | 15,540 |
| Comprehensive Rehabilitation Technology Center | 3,090 | |
| Health Care Services Center | 4,220 | |
| Leeward / Central Services | 3,870 | |
| Shared Space | 4,360 | |
| RECREATION CENTER | | 20,990 |
| WAIMANO ADMINISTRATION | | 14,540 |
| DDD AND CSDD ADMINISTRATION | | 7,140 |
| DDD Administration | 2,710 | |
| CSDD Administration | 2,040 | |
| Shared Space | 2,390 | |
| TRAINING AND CONFERENCE CENTER | | 8,640 |
| Staff Development | 1090 | |
| University Affiliate Program | 2,840 | |
| Conference & Classrooms | 3,510 | |
| Shared Space | 1,200 | |
| INSTITUTIONAL FACILITIES | | 39,660 |
| Maintenance Cluster | 28,660 | |
| Food Service | 11,000 | |
| TOTAL* | 175,960 | 175,960 |

* Includes 344 parking stalls and 22 loading stalls

TABLE 1: Summary of Program and Building Space Requirements

WAIMANO RIDGE MASTER PLAN
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the actual parking requirements for WTSH are expected to decrease due to a decreasing client base and downsized staff.

4. Project Phasing

The Plan is designed to be phased over the next few years in the order of the prioritized recommendations. Construction is presently under way on the new Laboratory Building and Cultural Center, not included in the implementation plan.

The feasibility of each phase is based on the existing topography, accessibility and other physical considerations such as sewer, water and electrical lines. The concept for these phases is established, while the details remain for the next level of design. A rendering of the specific project area is shown in Figure 7.

Phase I: The initial increment of the master plan requires the relocation of the Institutional Support Facilities to the area along the main road where direct access and parking are available. This phase consolidates all the support facilities in one area, except Food Services. The site is mostly clear except for the Doctor's Residence and the Multi-purpose building that would remain until all phases of the project are complete.

The three new facilities buildings will be phased with the third structure replacing the Multi-purpose building during phase IV. The first two buildings house Automotive shops, Groundskeeping & Vehicle Storage, Electrical & Maintenance Shops and Office. The third building will serve as the Central Supply facility

Improvements to the main road between the buildings will not affect the phasing of these buildings since the road is following the existing alignment.

Phase II: This phase of implementation is centered on the residential community and Day Programs. The new loop drive and parking areas will be built to provide access to this portion of the site.

The new Treatment Training and Research Facilities will displace the existing Day Program Buildings located at the mid-level area. The Vendor Day Programs will be moved to Building 7 at the top of the ridge. New Day Program Facilities will be constructed and the Medically Fragile clients will move to their new building upon completion of the new Specialized Services Building. Vendor day

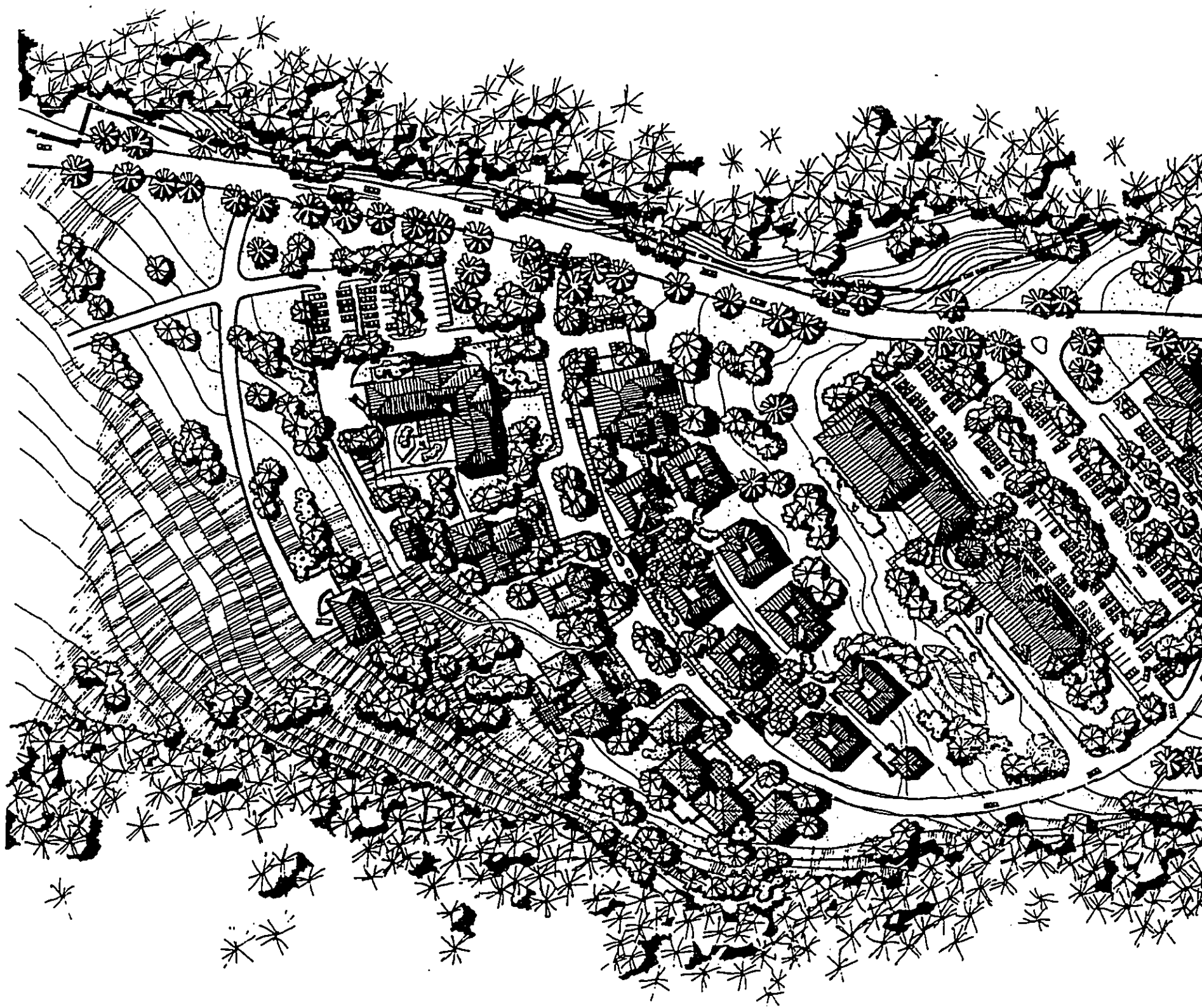
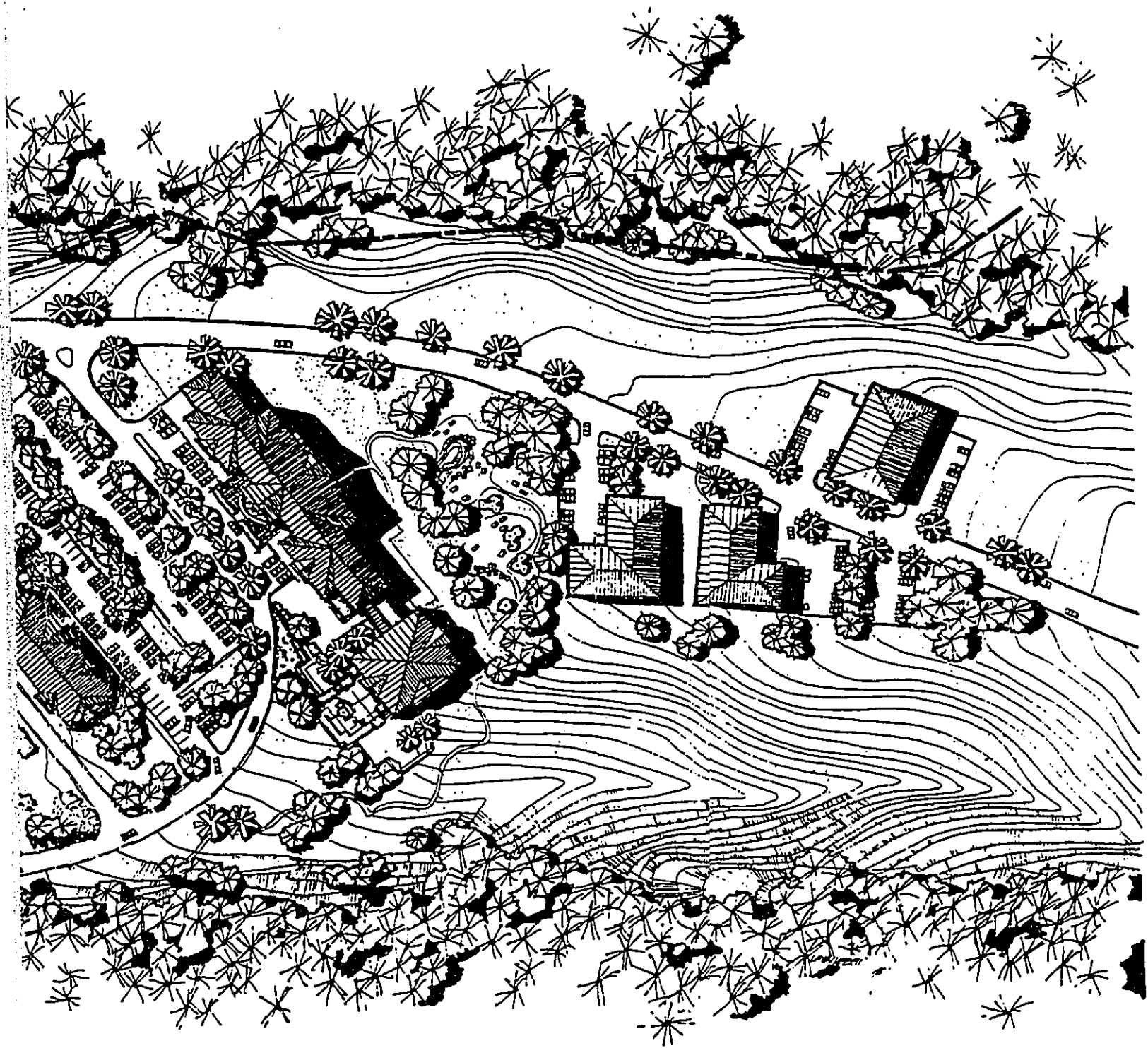
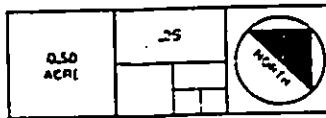


FIGURE 7

WAIMANO RIDGE MASTER PLAN



0 50 100 200



0.50
ACRE

25



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WAIMANO RIDGE MASTER PLAN
Final Environmental Assessment

programs located in Buildings 1 & 2 will move to Building 9 on the upper campus. Other community programs located in Building 3 may be moved to the Multipurpose Building until the new buildings are complete.

Phase III: The entrance and parking for the new Waimano & DDD/CSDD Administration Building will be completed in this phase, allowing the construction of this facility and the Food Services building (Figure 6, page 10). This parking area also ties into the loop drive connecting the lower campus and completing the circulation pattern of the campus.

Phase IV: The final component in the implementation of the Master Plan is the completion of the Training & Conference Center and the Recreation Facility. At the same time the final Support Services Building, housing Central Supply, House Keeping, Laundry and the Boiler, will be constructed on the site of the existing Multipurpose building (Building 4). While these buildings are under construction the remaining site work and landscaping can be finished bringing the new WTSH "community" to completion.

C. LAND USE AND ZONING CONTROLS

The State Land Use Classification is Urban. The City and County of Honolulu Development Plan designates the site for maintenance in preservation, public, or quasi-public use. No public facilities are shown on the Public Facilities Map for the site.

The site consists of mixed zoning: R-5 (Residential), P-1 (Restricted Preservation), and P-2 (General Preservation). The adjoining Pearl City High School parcel is zoned R-5 (Residential). Figure 8 identifies existing land uses surrounding the project location.

D. PROJECT FUNDING

The proposed project will be funded by the State of Hawaii. The project is planned to be completed in four construction phases. Phase I consists of general site work and the relocation of the institutional service facilities at a cost of approximately \$19,200,000. Phase II will include the construction of the residential, day programs and specialized service facilities. Phase II costs are expected to be approximately 13,100,000. The administration buildings and food service facility planned for Phase III will have construction costs of approximately \$5,200,000. The construction of the Recreation Center, Training and Conference Center and completion of the institutional facilities relocation will incur a cost of approximately \$4,200,000 for Phase IV. Completion of the Waimano Ridge Master Plan is to have a grand total cost of approximately \$42,000,000.

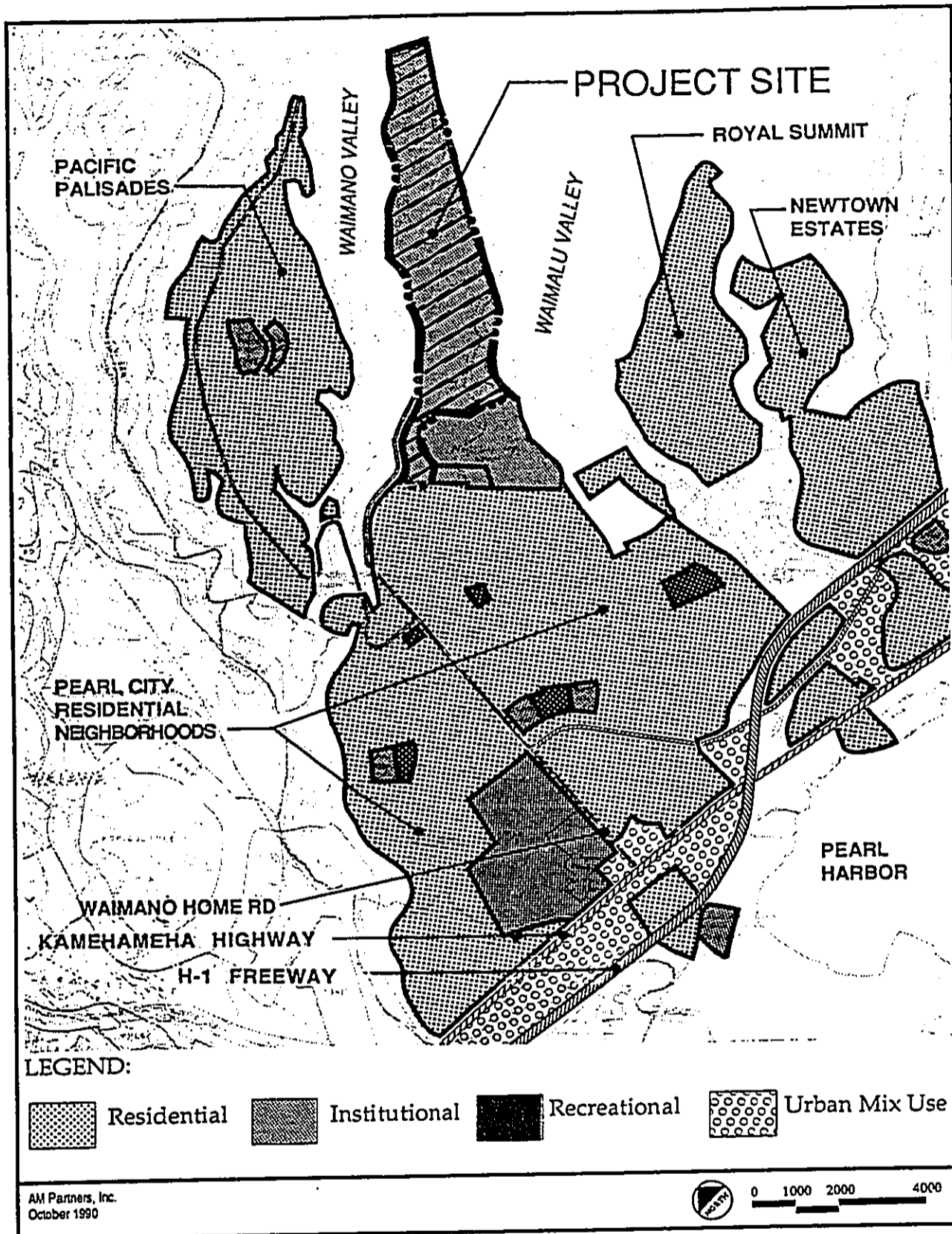


FIGURE 8 Existing Land Use Patterns

III. DESCRIPTION OF THE AFFECTED ENVIRONMENT

A. PHYSICAL CHARACTERISTICS

1. Building Locations and Site Plan

The Waimano Ridge Master Plan concentrates the new WTSH facilities in the central portion of the site between the proposed baseball fields and the new State Laboratory Facility. The site is divided into four distinct areas as the property rises up Waimano Ridge.

The first area is located just above the baseball fields between elevations 460 and 505 feet. The Sun Program is presently located in this area. This is also the area for future expansion of the WTSH facilities. The PCCC is presently being constructed in this area, on the former site of the relocated maintenance facilities.

The second area is located between elevations 510 and 535 feet where the Specialized Services, the Day Programs and the new residential areas are concentrated. The existing Day Programs and residential facilities are also located in this area. This is the largest and most level portion of the site where 17 of the proposed new buildings will be built.

The third site area is located between elevations 580 and 605 feet where the Administration, Training & Conference Center, Recreation Center and Food Service Facilities are to be located. Housekeeping and Training are presently located at this level.

The fourth area of the new master plan is located between elevations 645 and 690 feet and is the proposed location of the new Institutional Facilities including auto, groundskeeping and electrical maintenance, laundry, central supply and boiler. The existing Multi-Purpose Building and Doctor's Residence will be relocated.

2. Site Limitations

Due to the steep slopes of Waimano Ridge the developable land area of the site is limited to about 110 of its 242 acres (Figure 9). The continued use of existing buildings is limited for the future due to age, condition and their ability to adapt to present program needs. The structures range in age from 20 to 55 years old. Some are in poor condition and most need some form of maintenance. All need updating to conform to current functional requirements and codes.

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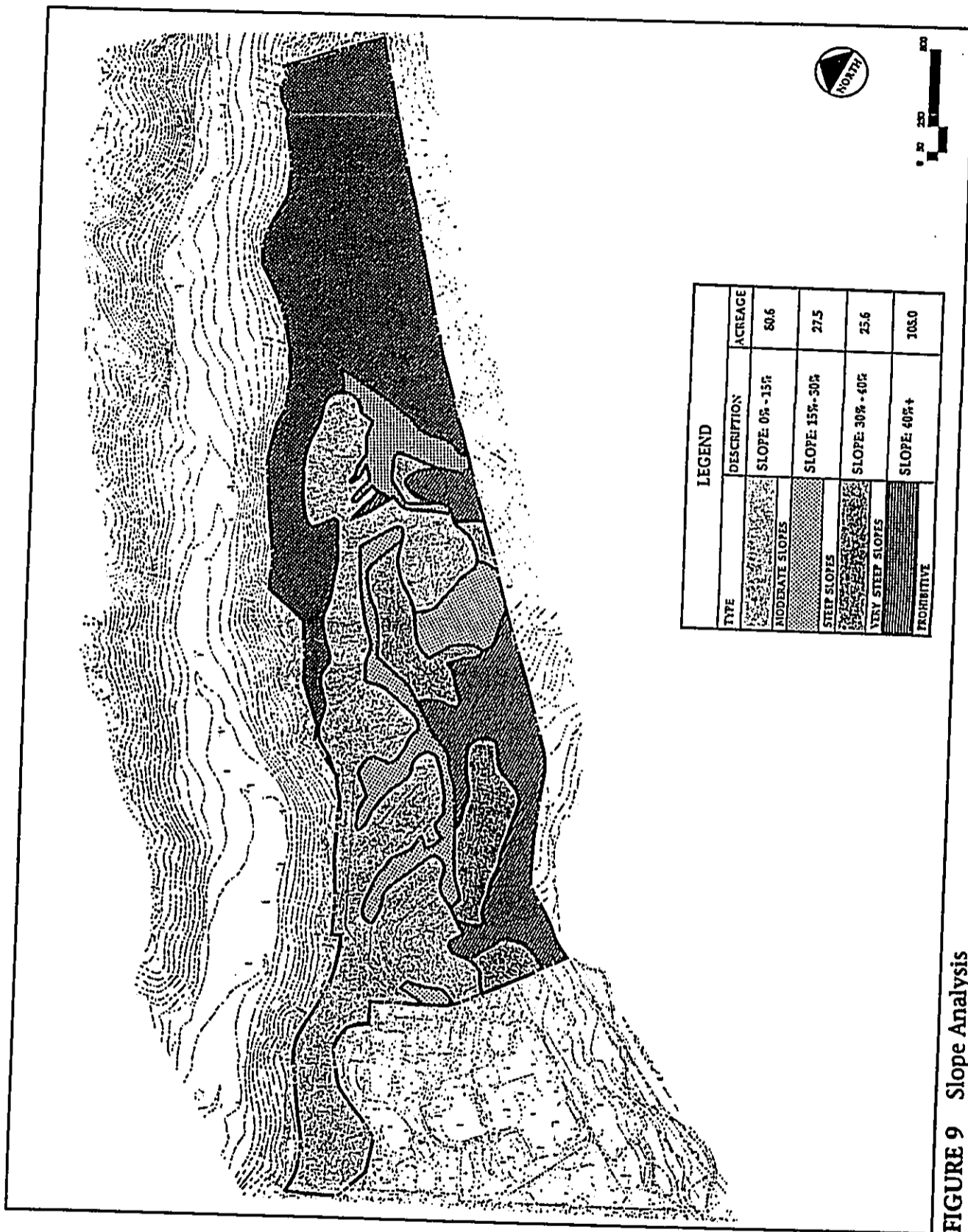


FIGURE 9 Slope Analysis

WAIMANO RIDGE MASTER PLAN
Final Environmental Assessment

About 38% of the existing buildings at the site may qualify for re-use, provided that they meet requirements defined by the architectural program & the Master Plan for WTSH facilities. The rest are proposed for demolition to provide room for future new facility construction.

In view of the significant opportunities of the site and the generally poor condition of the existing buildings, site Master Planning placed primary consideration on architectural program requirements and site physical characteristics. Re-use of existing buildings is only considered if they are physically sound, spatially adaptable, and locationally suitable.

3. Topography and Soils

The Waimano site ranges from elevations of 42 feet in the gullies on both sides of the ridge to 785 feet at the upper end of the property. The Master Plan area is located between elevations 460 and 690 feet. The site is characterized by abundant vegetation, consisting primarily of trees, scrub, various weedy species, and smaller areas of maintained landscaping materials. While generally sloping along the main road and ridgeline, notable areas of relatively flat, cleared lands are found intermittently. No natural water features or resources are found on the site. The site commands broad, sweeping views of the ocean, lowlands, and adjacent ridge development.

Based on historic conditions around the site, soils present little or no constraint to building. A geotechnical investigation of the site will be conducted prior to construction of the first phase of development. Information regarding existing soil conditions has been summarized from the *Soil Survey of the Islands of Kauai, Oahu, Molokai, and Lanai State of Hawaii* by the USDA soil conversation service.

The existing soils are composed of the following types: FL, fill land, mixed; WaB, Wahiawa silty clay, 3 to 8 percent slopes; and MoC, Manana silty clay loam, 6 to 12 percent slopes.

Fill land, mixed occurs mostly near Pearl Harbor and in Honolulu, adjacent to the ocean. It consists of areas filled with material dredged from the ocean or hauled from nearby areas, garbage, and general material from other sources. Included in mapping were a few acres that have been excavated. This land type is used for urban development including airports, housing areas, and industrial facilities.

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Wahiawa silty clay, 3 to 8 percent slopes produces slow runoff and the erosion hazard is slight. Included in this mapping are small areas of nearly level soil.

Manana silty clay loam is on smooth slopes in the uplands. The surface layer is dark reddish-brown silty clay loam about 8 inches thick. The subsoil, about 42 inches thick is dusky-red, dark reddish-gray, and dark reddish-brown silty clay that has subangular blocky structure. A nonporous, panlike sheet, 1/8 inch to 1/4 inch thick, occurs in the subsoil at depths ranging from 15 to 50 inches. The substratum is soft, weathered basic igneous rock. The soil is very strongly acid to extremely acid in the subsoil.

The depth of the panlike sheet is 15 to 30 inches. Permeability is moderately rapid above the pan and moderate below. Runoff is medium, and the erosion hazard is moderate. The available water capacity is about 1.2 inches per foot in the surface layer and 1.3 inches per foot in the subsoil. Roots penetrate to a depth of 15 to 30 inches, except that where there are cracks in the panlike sheet, they may extend to a depth of 4 feet.

4. Water Resources

a. Flood Hazard

Flood hazard for the area has not been determined by the Federal Insurance Administration. Because of the sloping nature of the property and drainage improvements, flooding has not been a problem historically.

b. Wetlands

There are no designated wetlands in the project area.

c. Coastal Zone Management

The project site does not lie in the Special Management Area designated by the Department of Land Utilization under Chapter 205A, Hawaii Revised Statutes.

d. Tsunami Inundation

The site is outside the vulnerable tsunami inundation area as determined by the Civil Defense "Tsunami Inundation Maps" (GTE Hawaiian Tel, March 1992-93).

e. **Water Quality**

Surface Water

The only surface water bodies in the area are Waimano Stream which flows down the steep, narrow valley between Waimano Ridge and Pacific Palisades, and Waiau Stream, which flows down the Waiau Gulch to the east of the Ridge. The site presently includes buildings and paved areas, and the proposed Master Plan will present minimal or no effects to existing water conditions. Neither of the streams would be significantly affected by the proposed project.

Ground Water

High-level ground water in the Koolau Mountains provide the base flow of streams and water for human use. The WTSH has its own potable water system, with two deep wells and pump stations. This system supplies the 800,000 gallon reservoir located on the WTSH grounds.

5. **Flora and Fauna**

a. **Flora**

A field reconnaissance to assess the botanical resources found on the 110 acre buildable portion of the WTSH site was made on 24 July 1990 by Char & Associates as part of the environmental assessment for the WTSH Master Plan. A summary of this study follows.

Because the relatively level, buildable portions of the site have been in use for a long period of time, there are no remnants of any sensitive native plant communities on the site. No officially listed threatened and endangered species, protected by the Federal and State endangered species laws, were found during the survey, nor any plants proposed or candidate for such status (U.S. Fish and Wildlife Service 1989, 1990). A few of the more common natives indigenous to the islands, such as 'ohi'a (*Metrosideros polymorpha*), koa (*Acacia koa*), and 'akai (*Wikstroemia oahuensis*) can be found on the steep slopes outside of the areas to be developed. These native trees can be found in similar environmental habitats throughout the islands. An earlier survey of the DOH Laboratory Facility site (Char 1989) recorded similar findings.

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None of the trees on the WTSH site are listed on the City and County's Register of Exceptional Trees (Ordinance 78-91. 81-32). There is very little of botanical interest or concern on the property. The proposed development is not expected to have a significant negative impact on the botanical resources as almost all the vegetation consists of landscape material or weedy species associated with disturbed areas. There are no botanical reasons to impose any restrictions, impediments, or conditions to the development of this site.

b. **Fauna**

The Waimano Ridge area is a habitat for common introduced birds. The only terrestrial endemic species known to be found within the Waiawa watershed is the Short-eared owl (*Asio flammeus sandwichensis*) (Hawaiian Agronomics, 1986). This species, known locally as the Pueo, is identified by the State of Hawaii as an endangered species on Oahu. Native birds that would be expected to be found in the mixed forests on the steep slopes which mark the perimeter of the buildable areas include Eleaio (*Chasiempis sandwichensis favi*) and Iiwi (*Vestiaria coccinea*). The Pueo and Iiwi, which is also listed as a state-endangered species on Oahu, may occasionally fly through the Waimano Ridge site while searching for food.

The property would be expected to provide habitat for or be frequented by common mammals known to exist in the region such as feral cats and dogs, rats, mice, and mongoose (*Herpestes auropunctatus*).

The Waimano Ridge Master Plan is not expected to affect the Pueo or Iiwi or any other native fauna.

6. **Air Quality**

Existing air quality in the upper Pearl City area is generally excellent due to the lack of significant sources or air pollution in the vicinity and the presence of tradewinds that blow any pollutants out to sea. During periods when trade winds diminish, there may be some reduction in visibility but no violation of air quality standards.

Construction emissions are expected to affect the air quality during the construction phase. These emissions will be minimal and mitigated wherever possible.

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7. Noise

Ambient noise levels in this area are generally quite low, particularly when compared to the more urbanized areas at lower elevations. However, during the course of construction, noise levels will exceed the acceptable noise standards. Mitigation measures to minimize noise will be used wherever possible. Construction hours will conform to the existing noise standards to reduce high noise impacts.

8. Scenic and Visual Resources

The upper parts of the Waimano Ridge site includes scenic vantages and provides sweeping views of the area. Portions of the area of the proposed Master Plan will take advantage of this natural resource with overlooks and other built features.

B. SOCIAL AND ECONOMIC CHARACTERISTICS

1. Population

According to the 1990 census, the resident population of Pearl City (census tracts 80.01 through 80.07), where the proposed facility is located, is 22,796. The number of households in this same area is 8,102. The resident population of WTSH is expected to decrease as out-placement of clients increases. This downsizing reflects current trends in health care treatment models.

2. Land Ownership and Use

The project is located in an area of Pearl City that is primarily residential and consists of privately owned single family homes. Immediately adjacent to the project site are the Momilani Elementary School and the Pearl City High School, owned by the State of Hawaii.

The Waimano Training School and Hospital is owned and operated by the State of Hawaii, providing resident care for its clients and instruction for clients with special needs. The current facilities include administrative buildings, residential buildings, dining facilities, maintenance facilities, classroom facilities and housekeeping facilities.

3. Employment

Construction of the proposed Waimano Training School and Hospital will provide significant short-term employment. However, no new long-term jobs are expected upon completion of the master plan.

4. Historic and Archaeological Resources

An archaeological reconnaissance of the project site was conducted as part of the environmental assessment for the WTSI Master Plan on June 23, 1990 by Cultural Surveys Hawaii, Inc. The report prepared by Cultural Surveys indicates that no traditional Hawaiian archaeological sites were located in the study area.

It is very probable that this area was a part of the *wao kele* or *wao kanaka*, the inland and upland forest regions where people "may live or occasionally frequent" (Pukui and Elbert 1985) and was used for its resources of flora and fauna. If isolated occupation sites did exist, all surface traces of them have been obliterated by sugar cultivation and/or the building of the Waimano Home in 1919-1921. No Hawaiian archaeological sites were located by Jensen (1989) in the excluded Test Laboratory site. It is not expected that subsurface features or sites will be unearthed during construction. However, if sites are unearthed, an archaeologist at the State Historic Sites Office will be contacted before construction work proceeds.

C. PUBLIC SERVICES

1. Transportation

The project site is located at the uppermost developable portion of the Waimano Ridge, accessible from regional arterials and adjacent areas via Waimano Home Road. The major thoroughfares that provide access to Waimano Home Road are Kamehameha Highway, Moanalua Road, and the H-1 Freeway.

Public transportation to Waimano Ridge is provided by the City & County of Honolulu bus system on a limited basis. A shuttle bus, route #73, provides morning and afternoon service between Pearl City Uplands, Leeward Community College and Pearl City Peninsula. No weekend service is provided.

Pacific Planning & Engineering, Inc. was engaged to undertake a traffic impact study to identify and assess future traffic impacts caused by the proposed Waimano Training School and Hospital

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Master Plan. The study also included traffic generated by the Pearl City Cultural Center and the Department of Health Laboratory facilities to be built adjacent to the WTSH. The report identifies and evaluates the probable impacts of traffic generated by the proposed development in the year 1993 when the project is expected to be completed.

Intersection analysis was conducted at four intersections to determine the relative impact of the proposed project on the local roadway system. The intersections studied were as follows:

- Waimano Home Road and Hookie Street
- Waimano Home Road and Komo Mai Drive
- Waimano Home Road and Noelani Street
- Waimano Home Road and Moanalua Road

The Report assesses the impact on each intersection by determining the *level-of-service* (LOS) for existing, 1993 forecast without the project, and 1993 forecast with the project traffic conditions. The LOS is divided into six categories ranging from vary little delay (LOS A) to very long delays (LOS F).

The report concludes that the proposed Waimano Training School and Hospital master plan when completed, will have a slight impact on traffic conditions at the study intersections.

Presently, most of the movements at the study intersections operate at LOS D or better during the morning and afternoon peak hours. Only the following movements experience very long delays:

- Vehicles on Waimano Home Road turning left onto Moanalua Road experience LOS F during the morning peak hour. Many of these vehicles are headed towards Honolulu via the H-1 Freeway. The long delays are due to a lack of adequate storage lane and relatively short green phase for the protected left turn movement at the intersection.
- Vehicles heading northbound at the intersection of Waimano Home Road and Komo Mai Drive. The vehicles making this movement are due in part to the high school and elementary school. Since there is a large volume of vehicles exiting Komo Mai Drive, the green time for Waimano Home Road is allocated to accommodate these vehicles.

With the project, the analysis indicates little or no change in the level-of-service to the study intersections. The project traffic will cause a slight increase in delays at the study intersections during the morning and afternoon peak hours. The project will add about 75

trips during the morning peak hour, which is 2.5% of the total traffic entering the intersection of Waimano Home Road and Moanalua Road. This is not a significant number of trips added to the study intersections during the peak hour.

2. Infrastructure and Utilities

Various preliminary engineering analyses have been conducted to review the effects and requirements of the proposed Master Plan. A brief summary follows:

a. Sewer

The on-site sanitary sewer system which consisted of building connections to individual cesspools was recently upgraded. Cesspools were abandoned and direct sewer connections were made to a new sanitary sewer system which connects directly to the existing City & County of Honolulu's Sewer System at the intersection of Waimano Home Road and Hookie Street.

The design of the sewer system also incorporated additional capacity for the proposed Department of Health's Laboratory Facility. Design data and calculations indicates that the existing sewer system would be adequate for the additional sewage flows.

The master plan for WTSH intends to reduce the number of patients to 80, thus reducing the demand on the new sewer capacity from its present requirements. This reduction will create no new demand on the existing system.

The City & County of Honolulu's Division of Wastewater Management currently requires submittal of a sewer connection application request in order to make a determination whether or not the existing City & County Sewer System has adequate sewer capacity. Pertinent information required consists of the existing number and types of structures on site, the number and types of structures to be demolished and the number and types of new structures planned.

Preliminary engineering analysis indicates sufficient capacity in the existing sewer system for the new Master Planned buildings of Waimano Ridge.

b. Water

The Waimano Training School & Hospital Facility has its own potable water source provided by two deep wells located on-site. The domestic water system currently appears to be adequate for the present needs. The on-site fire protection system, however, will require upgrading.

Fire hydrants will be provided adjacent to roadways throughout the site to allow full coverage of all the buildings. The facilities are accessible via roadways and parking areas and the proposed roadways are wide enough to accommodate fire trucks. There will be one fire access lane located north of the Administration Building.

c. Drainage

The existing on-site stormwater drainage system consists of swales, lined channels and roadway culverts which pipe stormwater runoff to the adjacent gullies. There does not appear to be any drainage problems on-site at the present time. Anticipated changes to the site due to the projected building and parking improvements will include a modest increase to the amount of storm water run-off from the site and will require modification of the drainage conditions at the site.

For proposed development, the City & County of Honolulu Drainage Standards require consideration of designs to prevent increase of additional stormwater runoff from leaving the project site. Implementation of storage or siltation basins and debris barriers will need to be taken into consideration.

Stormwater runoff along the realigned Waimano Home Road will flow into catch basins located on both sides of the road. Catch basins will also be located within the parking area south of the Administration Building and along the south side of the new roadway loop. The catch basins along Waimano Home Road will be connected by 18-inch and 24-inch diameter drain pipes. This drain line will discharge the stormwater into a detention basin located south of the facilities. The catch basins located on the new roadway loop will also be connected with 18-inch and 24-inch drain lines which discharge the stormwater into the detention basin. This detention basin will be designed to regulate discharge equal to the existing quantity of stormwater runoff that the site produces into the gulch.

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d. Electrical

Preliminary studies indicate the existing capacity of available power is adequate for the proposed Master Plan.

Although the present aerial distribution system is extremely functional and maintainable, the overall site when improved, would be better served by a totally underground system employing pad mounted transformers similar to those one would find in a normal residential neighborhood. Thus all systems have been developed using the concept of underground distribution of power and signal wiring.

e. Telephone and TV System

The existing GTE Hawaiian Tel service in the area has adequate capacity for the expanded demand of the WTSH master plan.

Placing of the telephone plant underground will, besides making the site less cluttered, enhance the reliability of service. The placement of TV ducts within the complex will allow the entry of a cable TV service if desired by the school.

f. Fire Safety

To bring WTSH up to modern Fire Safety standards a new fire safety system will be installed throughout the site. The Pearl City Fire Station will continue to provide fire protection for the site.

The most recent developments in the continually evolving fire safety industry place emphasis on a strategy of fire management as opposed to immediate alarm and evacuation. The technologies available make it possible to precisely identify the location and nature of alarm and trouble signals, to respond by verifying alarms, and by selectively evacuating specific areas through fireman's phone and voice evacuation/public address systems. Additionally, smoke dampers, stair pressurization fans and other mechanical means of fire and smoke control can be controlled directly or indirectly by the fire management system.

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g. Hazardous Materials

There is no indication of hazardous materials on the WTSH Master Plan site. Other areas of the site have had hazardous materials which have been removed.

The site of the new Cultural Center had a 1,000-gallon underground storage tank which has been removed under federal regulations, 40 CFR 280 - Subpart G - Out of Service UST Systems and Closures.

The Cultural Center site included maintenance (auto, truck, construction, storage) facilities which were constructed in the early to mid nineteen-sixties. An environmental assessment was conducted by Masa Fujioka & Associates to (1) assess potential contamination from the underground gasoline storage tank prior to its removal, and (2) sample and test for the presence of hazardous materials associated with the auto maintenance facility located on the site.

Soil boring samples taken at the perimeter of the underground storage tank from depths of ten and twenty feet were analyzed for the presence of Total Petroleum Hydrocarbons. The auto maintenance area was tested for polychlorinate biphenyls and other potentially hazardous chemicals.

The report on the assessment indicates that there has been no excess leakage from the underground storage tank. Similarly, tests, including laboratory analyses, indicate no detectable concentrations of PCB's or lead at the auto maintenance facility.

h. Solid Waste

The refuse collection will continue to be serviced by two private vendors. No additional refuse is expected as a result of the new master plan.

3. Police

The Pearl City Police Department, located on Waimano Home Road, will continue to provide police protection services for the project site. Emergency response time to the project site is approximately three (3) minutes. The area is regularly patrolled by Beat 331.

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4. Emergency Medical Services

The nearest emergency medical service facility is Kaiser Permanente Moanalua Medical Center, located on Moanalua Road.

5. Fire Protection Service

Fire protection will be provided by the Honolulu Fire Department's Wai'au Station (#38) located at Komo Mai Drive and Kaahumanu Street.

**IV. PROBABLE IMPACTS AND PROPOSED MITIGATION MEASURES FOR
PROPOSED ACTION**

A. Water Quality

There will be no impacts to surface water quality from construction or use of the new facilities. Existing drainage systems will be modified to ensure that there is no adverse impact on ground water quality from redevelopment of the site.

B. Air Quality

The proposed construction of the new Waimano Training School and Hospital will not change the ambient concentrations over what would occur without the project. With a client reduction to eighty patients, the staff and visitor parking requirements should not significantly increase with the new project.

Short-term construction emissions will be minimal and can be mitigated. Suppression measures for fugitive dust will be employed for any grading or demolition activities, including frequent watering and adherence to all applicable Department of Health regulations.

C. Flora and Fauna

There will be no adverse impacts on flora and fauna. No rare or endangered species were found on-site

D. Noise

No increase in noise levels are expected from the operation of the new facilities. There will be an increase in noise levels during construction period. However, noise mitigation measures will be implemented whenever possible. All Department of Health noise guidelines will be observed.

E. Traffic

The traffic impact study conducted by Pacific Planning & Engineering assessing future traffic impacts caused by all site improvements. A summary of the conclusions and recommendations of this study follows:

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The proposed Waimano School and Hospital Master Plan, when implemented in 1993, will have a slight impact on traffic conditions at the study intersections.

Presently, most of the movements at the study intersections operate at LOS D or better during the morning and afternoon peak hours. Only the following movements experience very long delays.

- Vehicles on Waimano Home Road turning left onto Moanalua Road experience LOS F during the morning peak hour. The majority of these vehicles are headed towards Honolulu via the H-1 Freeway. The long delays are due to a lack of adequate storage land and relatively short green phase for the protected left turn movement at the intersection.
- Vehicles heading northbound at the intersection of Waimano Home Road with Komo Mai Drive. These vehicles making this movement are due in part to the high school and elementary school. Since there is a large volume of vehicles exiting Komo Mai Drive, the green time for Waimano Home Road is allocated to accommodate these vehicles.

With the project, the analysis indicates little or no change in the level-of-service to the study intersections. The project traffic will cause a slight increase in delays at the study intersections during the morning and afternoon peak hours. The project will add about 75 trips during the morning peak hour, which is 2.5% of the total traffic entering the intersection of Waimano Home Road and Moanalua Road. This is not a significant number of trips added to the study intersections during the peak hour.

Roadway improvements that will take place at the project site will be coordinated with the State Department of Transportation and the City Department of Transportation Services.

F. Utilities

The adequacy of the existing utilities has been assessed. Since the new facilities do not increase the demand for service in any significant way, the existing utilities with the proposed improvements will have adequate capacity for the proposed Master Plan.

G. Hazardous Materials

No hazardous materials have been found on the site to be used for the WTSH Master Plan. The WTSH Master Plan site is limited in size and contains only the areas used for temporary maintenance since the old maintenance facility was removed to make space for the new Cultural Center.

Hazardous materials were found on the Cultural Center site but have been removed. Closure of a 1000-gallon gasoline underground storage tank was conducted in accordance with federal regulation. Additional soil samples were taken and any contamination has been removed or treated. There are no indications of contamination from PCB's or lead.

H. Historic and Archaeological Resources

No adverse impacts on historic or archaeological resources are anticipated. In the event that any archaeological remnants are uncovered during construction, all work will be stopped and the State Historic Preservation Officer will be notified for further consultation.

I. Social and Economic Conditions

1. Social

Implementation of the proposed Master Plan will result in a decline in the resident population of WTSH. The addition of the DOH uses will, however, offset this decline. Future uses planned for the ridge will result in more active State departmental uses. This will increase an awareness of the Waimano Ridge as a regional administration center rather than the previous perceptions of Waimano as an isolated institution for the disabled.

2. Economic

As a regional health administration center, utilization of the site will increase significantly. This will occur as a result of consolidation of a number of DOH functions which were scattered throughout Honolulu. This consolidation is not, however, expected to result in a significant number of employment opportunities.

J. Scenic and Visual Resources

The new WTSH facilities will be more aesthetically pleasing than the older buildings which are presently in various states of disrepair. The

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new buildings will create a harmonious atmosphere and relate to the traditions of Hawaiian buildings, with sloped roofs, large overhangs, windows that open to allow the trades to cool them naturally and an overall scale that relates to the neighboring residential areas.

New landscaping will enhance the appearance of the facility and help define views toward Pearl Harbor and Honolulu. The new landscape will also help mitigate noise and visual impacts created by parking areas and streets while providing shade and definition of space within the site.

V. ALTERNATIVES TO PROPOSED ACTION

A. Project Alternatives

No other projects have been proposed for this site. The Master Plan for the WTSH is a consolidation of many functions into a concentrated area that will allow opportunities in other areas of the site like the state Laboratory building and the Pearl City Cultural Center. This plan will also produce a more efficient facility layout for the WTSH.

B. Site Alternatives

Various site alternatives were studied during the process of defining the Master Plan. The plan selected is the most practical for the continued use of the site by the WTSH. The alternatives evaluated can be found in the Waimano Ridge Master Plan, Volume Two, as prepared for the Department of Health Developmental Disabilities Division.

C. No Action Alternative

If the proposed master plan is not implemented, the WTSH facilities will continue to function in a state of disrepair and poor efficiency. There will be a continued need for improvements to the existing buildings to bring buildings up to city and state standards.

VI. DETERMINATION AND REASONS SUPPORTING DETERMINATION

A. Determination

Under Chapter 343, H.R.S. and Section 11-200-12 Administrative Rules, it has been determined that the Waimano Training School and Hospital project will not incur or significantly impact the environment. Therefore, it has been determined that a negative declaration will be filed.

B. Findings and Reasons Supporting Determination

1. The proposed project will not involve an irrevocable commitment to loss or destruction of any natural or cultural resources.
2. The proposed project will not curtail the range of beneficial uses of the environment.
3. The proposed project will not conflict with the State's or County's long-term environmental policies.
4. The proposed project will not substantially affect the economic or social welfare of the community or State.
5. The proposed project will not involve substantial secondary impacts, such as population changes or effects on public facilities.
6. The proposed project will not involve a substantial degradation of environmental quality.
7. The proposed project will not substantially effect any rare, threatened or endangered species of flora or fauna or habitat.
8. The proposed project will not detrimentally effect air or water quality. Noise impacts will be mitigated to meet applicable noise regulations.
9. The proposed project will not be located in any environmentally sensitive area, such as a flood plain, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

VII. LIST OF CONSULTED PARTIES

The following list includes government agencies and organizations who have been contacted as part of the planning and analysis process for the preparation of the draft environmental assessment.

City and County of Honolulu

- Planning Department
- Department of Land Utilization
- Department of Park and Recreation
- Department of Public Works
- Department of Transportation Services

State of Hawaii

- Department of Health
- Department of Transportation - Highways Division
- Department of Land and Natural Resources
- Office of State Planning

The Draft Environmental Assessment (DEA) was published in the February 23, 1994 edition of the OEQC Bulletin. The deadline for comments on the DEA was March 28, 1994. No comments were received regarding the DEA document.

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APPENDIX A: WAIMANO TRAINING SCHOOL AND HOSPITAL MASTER
PLAN, TRAFFIC IMPACT ASSESSMENT REPORT

TRAFFIC IMPACT ASSESSMENT REPORT

for

WAIMANO TRAINING SCHOOL & HOSPITAL
MASTER PLAN

Pearl City, Oahu

October 1990

Prepared for:

KRP Information Services

Prepared by:

Pacific Planning & Engineering, Inc.
1221 Kapiolani Blvd., Suite 740
Honolulu, Hawaii 96814

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EXECUTIVE SUMMARY

Pacific Planning & Engineering, Inc. (PPE) was engaged to undertake a traffic impact study to identify and assess future traffic impacts caused by the proposed Waimano Training School and Hospital Master Plan. This Report identifies and evaluates the probable impacts of traffic generated by the proposed development in the year 1993 when the project is expected to be completed and fully occupied.

Project Description

Waimano Training School and Hospital is located in Pearl City, Oahu, Hawaii. The Master Plan basically consists of demolishing or renovating existing buildings and constructing replacement buildings. Ultimately, the goal is for Waimano Training School and Hospital to care for 80 clients. Figure 1 shows the project location and the roadway network in the vicinity.

Completion of construction and full occupancy of the project is expected by the December of 1993. The major roadway access to the project is via Waimano Home Road.

Methodology

Intersection analysis was conducted at four intersections to determine the relative impact of the proposed project on the local roadway system. The intersections under study are as follows:

- Waimano Home Road and Hookiekie Street
- Waimano Home Road and Komo Mai Drive

- Waimano Home Road and Noelani Street
- Waimano Home Road and Moanalua Road

Traffic was forecasted at these intersections by:

- Adding traffic generated by other planned developments in the area that would impact the study intersections, such as:

- * Pearl City Cultural Center
- * Department of Health Lab Facilities

The Report assesses the impact on each intersection by determining the *level-of-service* (LOS) for existing, 1993 forecast without the project, and 1993 forecast with the project traffic conditions.

Conclusions & Recommendations

The proposed Waimano Training School and Hospital master plan when completed in 1993, will have a slight impact on traffic conditions at the study intersections.

Presently, most of the movements at the study intersections operate at LOS D or better during the morning and afternoon peak hours. Only the following movements experience very long delays:

- Vehicles on Waimano Home Road turning left onto Moanalua Road experience LOS F during the morning peak hour. Many of these vehicles are headed towards Honolulu via the H-1 Freeway. The long delays are due to a lack of adequate storage lane and relatively short

green phase for the protected left turn movement at the intersection.

- Vehicles heading northbound at the intersection of Waimano Home Road with Komo Mai Drive. The vehicles making this movement are due in part to the high school and elementary school. Since there is a large volume of vehicles exiting Komo Mai Drive, the green time for Waimano Home Road is allocated to accommodate these vehicles.

With the project, the analysis indicates little or no change in the level-of-service to the study intersections. The project traffic will cause a slight increase in delays at the study intersections during the morning and afternoon peak hours. The project will add about 75 trips during the morning peak hour, which is 2.5% of the total traffic entering the intersection of Waimano Home Road and Moanalua Road. This is not a significant number of trips added to the study intersections during the peak hour.

PROJECT DESCRIPTION

The Waimano Training School and Hospital is located in Pearl City, Oahu, Hawaii. The project site consists of 240 acres of land adjacent to and above Pearl City High School. Figure 1 shows the project location and the roadway network in the vicinity.

The facility is owned and operated by the State of Hawaii, providing care for its patients and instruction for students. The current facilities include administrative buildings, residential buildings, dining facilities, maintenance facilities, classroom facilities, and housekeeping facilities. Presently, there are approximately 451 employees and 160 patients. About 30% of the employees work shift hours. The remaining 70% start work at 7:45 am and end at either 4:15 or 4:30 pm.

The Waimano Training School and Hospital Master Plan basically consists of demolishing or renovating existing buildings and constructing replacement buildings. Completion of construction and full occupancy of the project is expected by 1993. By completion, the employment is expected to increase by 177 employees to support the various programs at the facility. This will bring the total amount of employees to 628.

The project will have one roadway access via Waimano Home Road from which vehicles have a choice of remaining on Waimano Home Road or turning onto Hookiekie Street or Hoolaulea Street near the project site. These routes lead to Moanalua Road which links Pearl City to H-1 Freeway. Figure 1 shows some of the major streets in the area.

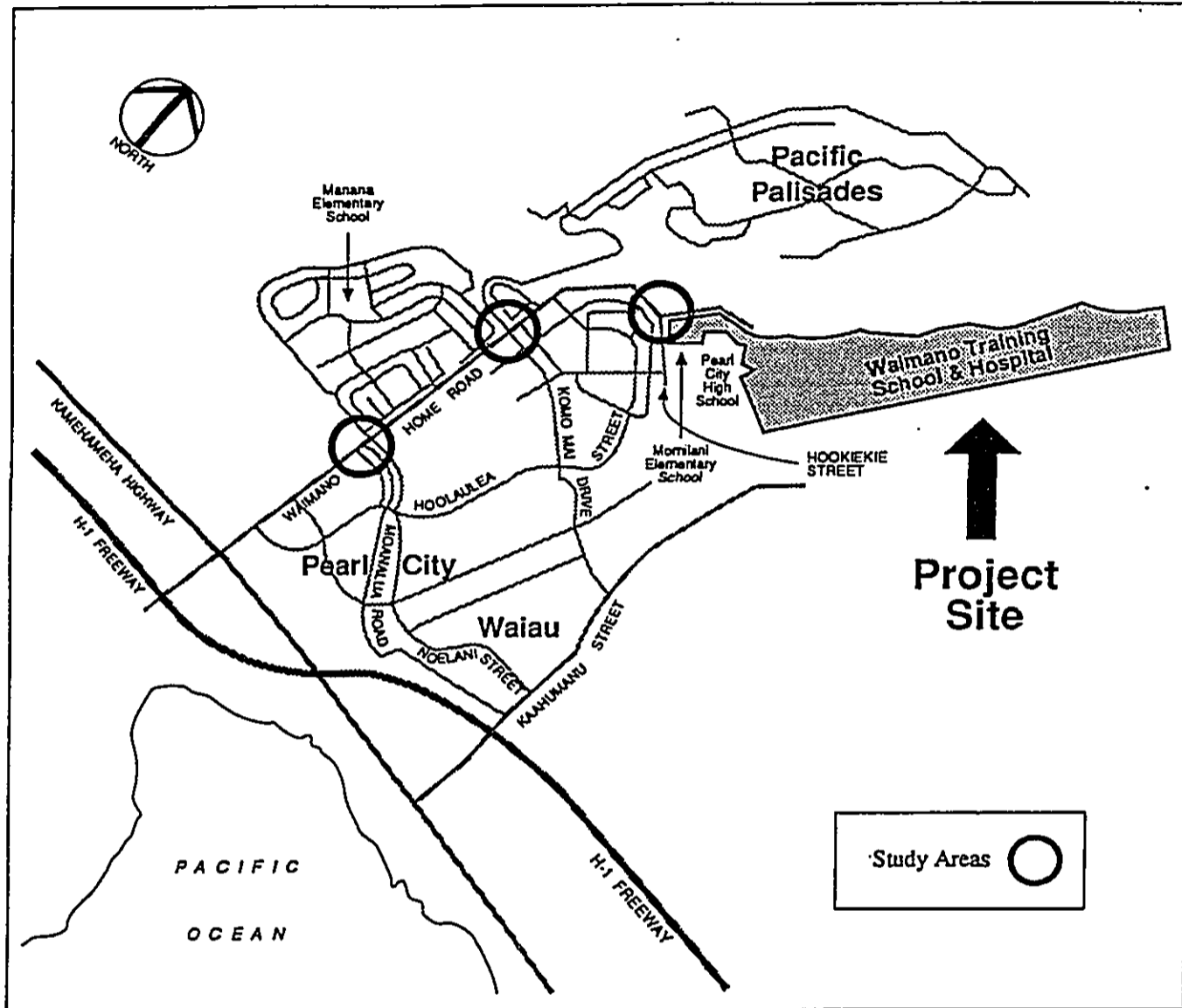
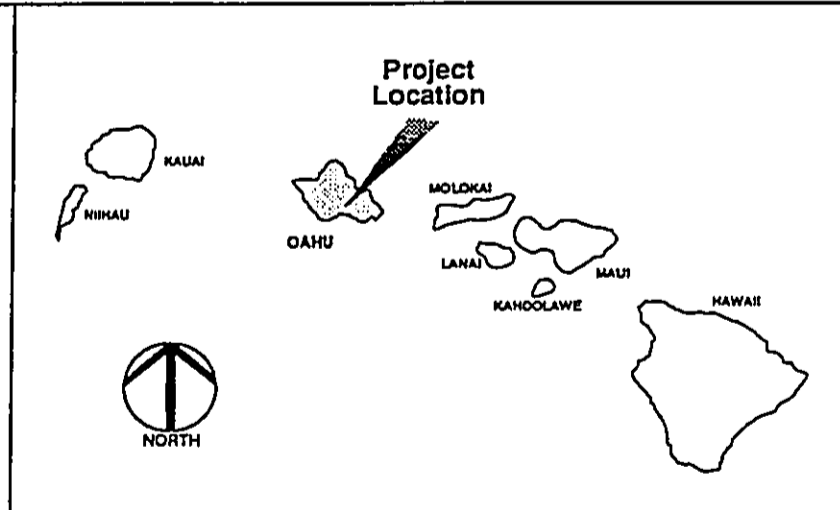


Figure 1. Project Location Map



EXISTING CONDITIONS

An inventory of existing conditions was conducted to better understand the traffic impact of the proposed project. The review included the land uses in the area, roadway facilities, and existing traffic conditions.

Land Uses

The project is located in an area that is primarily residential consisting of single family homes. Immediately adjacent to the project site is Momilani Elementary School and Pearl City High School.

Momilani Elementary School serves the students in the Momilani area of Pearl City. Pearl City High School serves the Pearl City area including Pacific Palisades, Momilani, Waiiau, Pearl City, and Manana Subdivisions.

Roadway Facilities

Waimano Home Road provides access to Waimano Training School and Hospital from other parts of the island. The major streets that provide access to the project are Waimano Home Road, Kamehameha Highway, Moanalua Road, and the H-1 Freeway. Figure 2 shows a detailed layout of the roadways and study intersections.

Streets

Waimano Home Road is a City and County (C&C) of Honolulu owned and maintained roadway. The lane width varies from 9 to 12 feet wide. The posted speed limit on this roadway varies from 25 to 35 miles per hour.

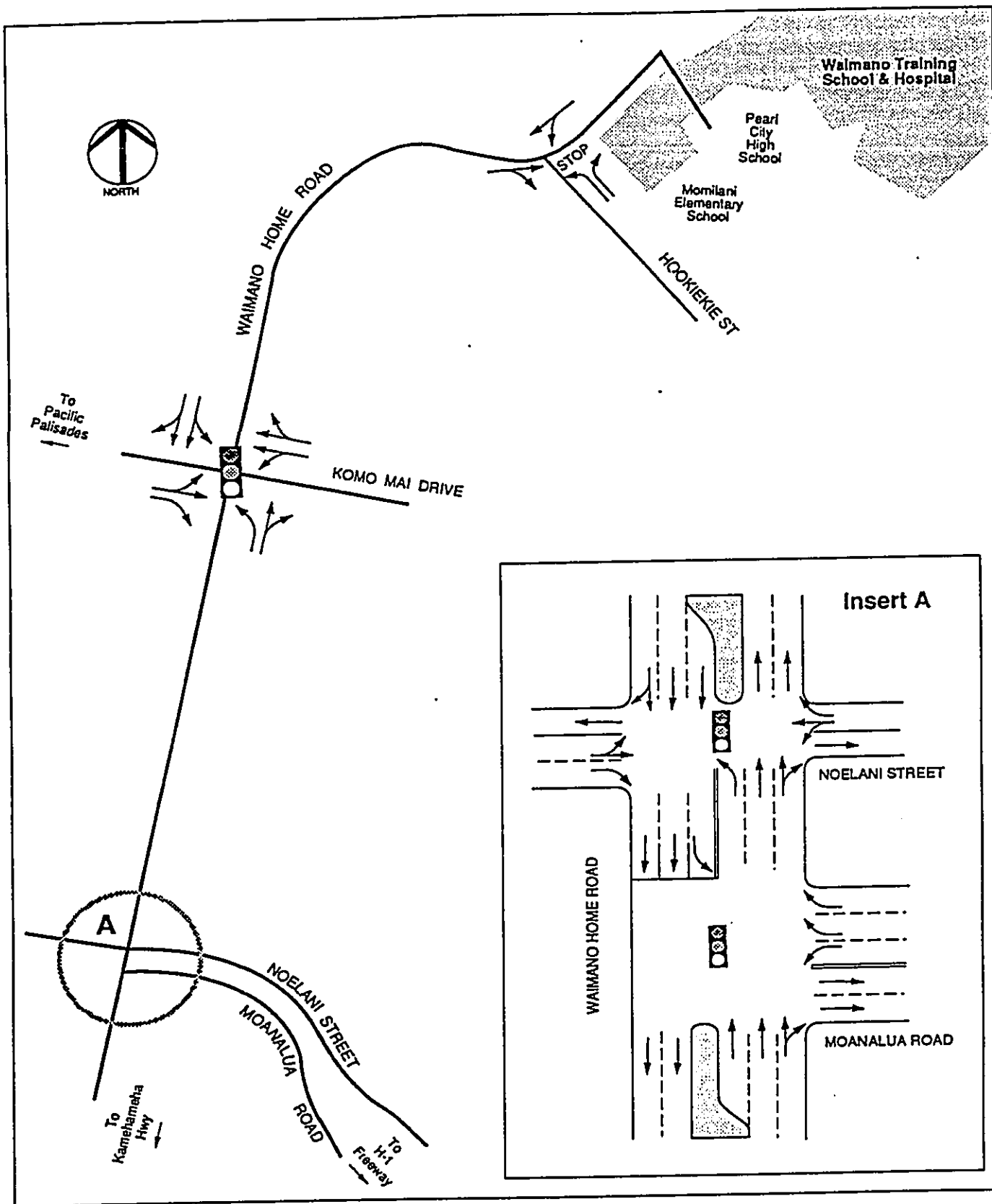


Figure 2. Existing Roadway Layout

Hookiekie Street has 20 feet wide lanes. This roadway provides access to Pearl City High School and Momilani Elementary School. The posted speed limit on this street is 25 mph.

Komo Mai Drive and Noelani Street are C&C streets. The speed limit on Komo Mai and Noelani is 25 mph.

Moanalua Road is a State owned and maintained roadway. Lane widths on this roadway vary between 11 and 13 feet. The posted speed limit on this roadway varies from 25 to 35 mph.

Study Intersections

Hookiekie Street connects to Waimano Home Road at a T-intersection. Traffic flow on Hookiekie is controlled by a stop sign.

The intersection of Waimano Home Road with Komo Mai Drive is signalized. The signal is pretimed with two-phases. There are pedestrian crossings across all four legs of the intersection. Near this intersection, there are two bus stops on Waimano Home Road in the southbound direction. These bus stops minimally affect vehicle movement since Waimano Home Road provides a 20 foot wide lane near the bus stops.

The intersections of Waimano Home Road with Noelani Street and Moanalua Road are signalized. These intersections are synchronized and actuated with three-phases. There are pedestrian crossings across all four legs of the intersection of Waimano Home Road with Noelani Street. A pedestrian overpass is provided across Moanalua Road.

Traffic Conditions

A review of the 1987 State Department of Transportation traffic count data for the intersection of Waimano Home Road with Komo Mai Drive indicated that the weekday commuter peak hours along Waimano Home Road in the vicinity of the project occurs between 7:00-8:00 in the morning and 4:30-5:30 in the afternoon. These peak hours were used to determine the traffic impacts since the project traffic would impact the roadways the most during these time periods.

Manual traffic counts were taken for the intersections of Waimano Home Road with Hookie Street, Komo Mai Drive, Noelani Street, and Moanalua Road on September 19, 1990, for the weekday morning and afternoon peak periods. These counts were used as the baseline condition upon which future estimated traffic volumes were added. Figures 3 and 4 shows the present volumes and movements of traffic at the study intersections for the observed peak hours.

The manual traffic count data are summarized in Appendix B. Manual counts were taken of passenger cars, trucks, buses, bicycles, motorcycles and pedestrians by turning movements and approaches. Any differences in the time of the manual peak hours from the peak hours found by the DOT data are due to normal variations in daily traffic.

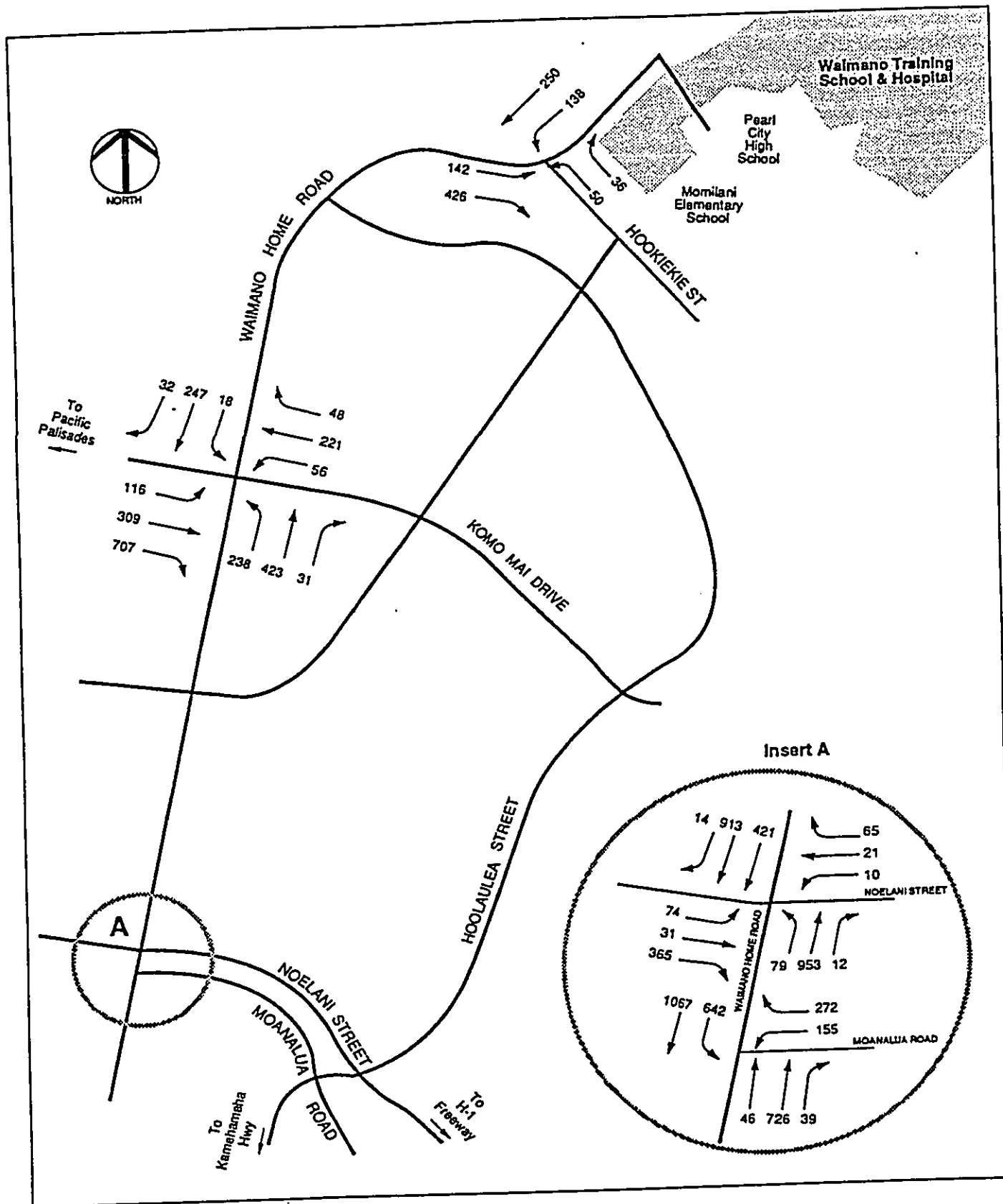


Figure 3. 1990 Existing AM Peak Hour Volumes

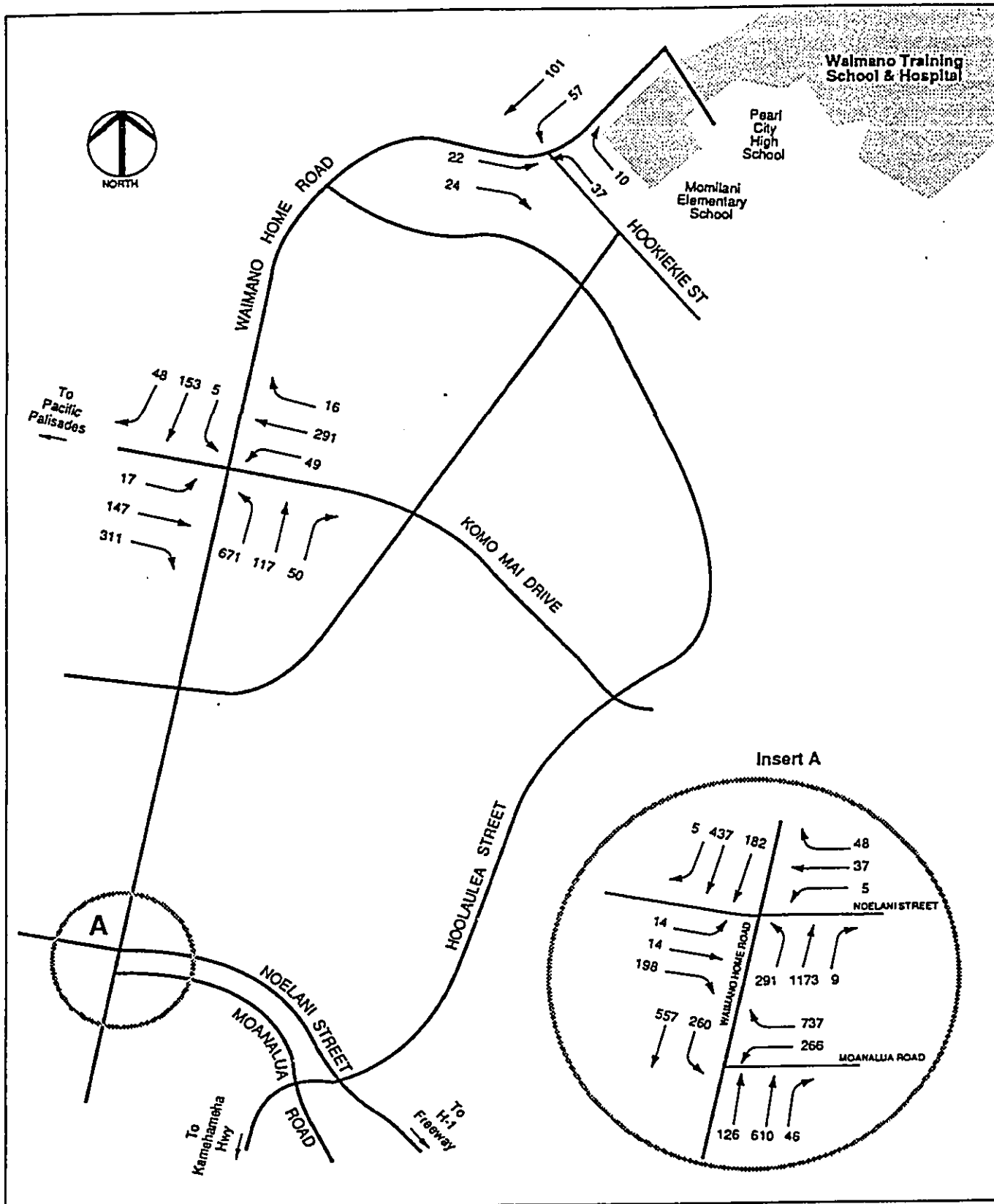


Figure 4. 1990 Existing PM Peak Hour Volumes

Observed Traffic Conditions

The following observations were made during the field survey:

1. At the intersection of Waimano Home Road with Moanalua Road during the morning peak hour, an average of six vehicles were able to turn left onto Moanalua Road from Waimano Home Road southbound during the permitted phase.
2. On Waimano Home Road at the intersection of Waimano Home Road with Noelani Street during the morning peak hour, there was a long queue of vehicles waiting to make left turns onto Moanalua Road.
3. Currently during the morning peak hour, vehicles enter Pearl City High School via Hookiekie Street and exit onto Waimano Home Road above Hookiekie.

FUTURE CONDITIONS

Research of approved planned developments and improvements to transportation facilities was conducted to estimate future traffic conditions at the study intersections.

Land Uses

Traffic generated by the following developments within the immediate area will impact the study intersections by the year 1993:

- *Pearl City Cultural Center*

The Pearl City Cultural Center consists of a 670 seat auditorium which will hold performances which will generally start between 6:30 and 8:00 during the weekday evenings. Also included in the cultural center is a 75 person capacity meeting room and a 15 person capacity craft room.

- *Department of Health Lab Facilities*

The laboratory will employ approximately 100 people by the year 1993 and will be used to test diseases, viruses, blood, soil, plants, etc.

Roadway Facilities

There are no planned roadway improvements in the vicinity of the project for either Waimano Home Road, Hookiekie Street, Komo Mai Drive, Noelani Street, or Moanalua Road.

PROJECTED TRAFFIC CONDITIONS

Future traffic was forecasted for the without project and with project conditions. Traffic forecasts were made for 1993 when the project is expected to be completed.

Future Traffic Without Project

Future traffic without the project was forecasted by adding the following: (1) existing peak hour traffic volumes; (2) traffic generated by developments proposed to be completed by 1993.

Since Waimano Home Road and Moanalua Road deadend in Pearl City, it was assumed that there would be no through traffic along these streets. Through-traffic is traffic that would pass through the Pearl City without stopping. These streets, therefore, were not increased for through traffic.

Traffic From Proposed Developments

The three-step procedure of trip generation, trip distribution and traffic assignment was used to estimate peak hour traffic from other proposed developments within the immediate area of the project.

The trip generation step estimates the number of trips which would be generated during the weekday morning and afternoon peak hours. The number of trips from the lab was estimated based on the number of employees and data from the ITE Trip Generation Report¹ (Fourth Edition, 1987) for research centers. The number of trips from the cultural

¹Trip Generation Report, by the Institute Transportation Engineers, Fourth Edition, 1987

center was estimated based on the number of seats the theater is projected to have and the data from the ITE Trip Generation Report (Fourth Edition, 1987) for live theaters.

Table 1 shows the trip rates derived from the ITE trip generation data and the number of trips generated for the weekday morning and afternoon peak hours.

Table 1. Trip Generation for Proposed Land Uses by 1993

| <i>Weekday Morning</i> | | | | | | |
|-----------------------------------|-----------------|--------------|-------------------|-------------|--------------|-------------|
| <u>Land Use</u> | <u>Quantity</u> | <u>Units</u> | <u>Trip Rates</u> | | <u>Trips</u> | |
| | | | <u>Enter</u> | <u>Exit</u> | <u>Enter</u> | <u>Exit</u> |
| <i>Lab</i> | | | | | | |
| Research Center | 100 | Employees. | 0.57 | 0.04 | 57 | 4 |
| <i>Pearl City Cultural Center</i> | | | | | | |
| Live Theater | 670 | Seats | - | - | 2* | 2* |
| TOTAL MORNING TRIPS | | | | | 59 | 6 |
| <i>Weekday Afternoon</i> | | | | | | |
| <u>Land Use</u> | <u>Quantity</u> | <u>Units</u> | <u>Trip Rates</u> | | <u>Trips</u> | |
| | | | <u>Enter</u> | <u>Exit</u> | <u>Enter</u> | <u>Exit</u> |
| <i>Lab</i> | | | | | | |
| Research Center | 100 | Employees. | 0.04 | 0.56 | 4 | 56 |
| <i>Pearl City Cultural Center</i> | | | | | | |
| Live Theater | 670 | Seats | 0.01 | 0.01 | 7 | 7 |
| TOTAL AFTERNOON TRIPS | | | | | 11 | 63 |

*The two trips take into account trips made by a director, and janitor.

The trip distribution step assigns trips to their expected origins and destinations. Trip distribution for the planned developments was based on the distribution of population on the island. It was estimated that approximately 67% of the employees live east of Pearl City, 27% west of Pearl City and 6% live in Pearl City.

The traffic assignment step assigns trips to a specific route on the roadway network that will take the driver from origin to destination. Traffic was assigned based on the estimated shortest path or travel time from origins to destinations.

Future Traffic With Project

Future traffic with project was forecasted by adding the without project traffic to the traffic generated by the proposed project. The three step procedure of trip generation, trip distribution, and traffic assignment was used to estimate peak hour traffic from the proposed project.

The number of trips from the project was estimated based on the estimated 177 additional employees Waimano Training School and Hospital will have and data from the existing trip generation from Waimano. Table 2 shows the trip rates derived from the trip generation data and the number of trips generated.

Table 2. Trip Generation

| | <u>Quantity</u> | <u>Units</u> | <u>Trip Rates</u> | | <u>Trips</u> | |
|-----------|-----------------|--------------|-------------------|-------------|--------------|-------------|
| | | | <u>Enter</u> | <u>Exit</u> | <u>Enter</u> | <u>Exit</u> |
| Morning | 177 | Employees | 0.32 | 0.14 | 57 | 25 |
| Afternoon | 177 | Employees | 0.06 | 0.27 | 11 | 47 |

The trip distribution step assigns trips to their expected origins and destinations. Trip distribution for the project was based on the distribution of population on the island as described for the trip distribution for the planned developments.

The traffic assignment step assigns trips to a specific route on the roadway network that will take the driver from origin to destination. Traffic was assigned based on the estimated shortest path or travel time from origins to destinations.

Total Forecast Traffic

The existing traffic volumes were added to the traffic generated by other developments. The resultant forecast traffic without the project is shown in Figures 5 and 6 for the morning and afternoon peak hours.

Traffic generated by the project was added to the forecast without project traffic to obtain the traffic forecast with the project. The resultant forecast traffic with project are shown in Figures 7 and 8 for the morning and afternoon peak hours. Table 3 shows the increase in traffic volumes at the study intersections generated by the project.

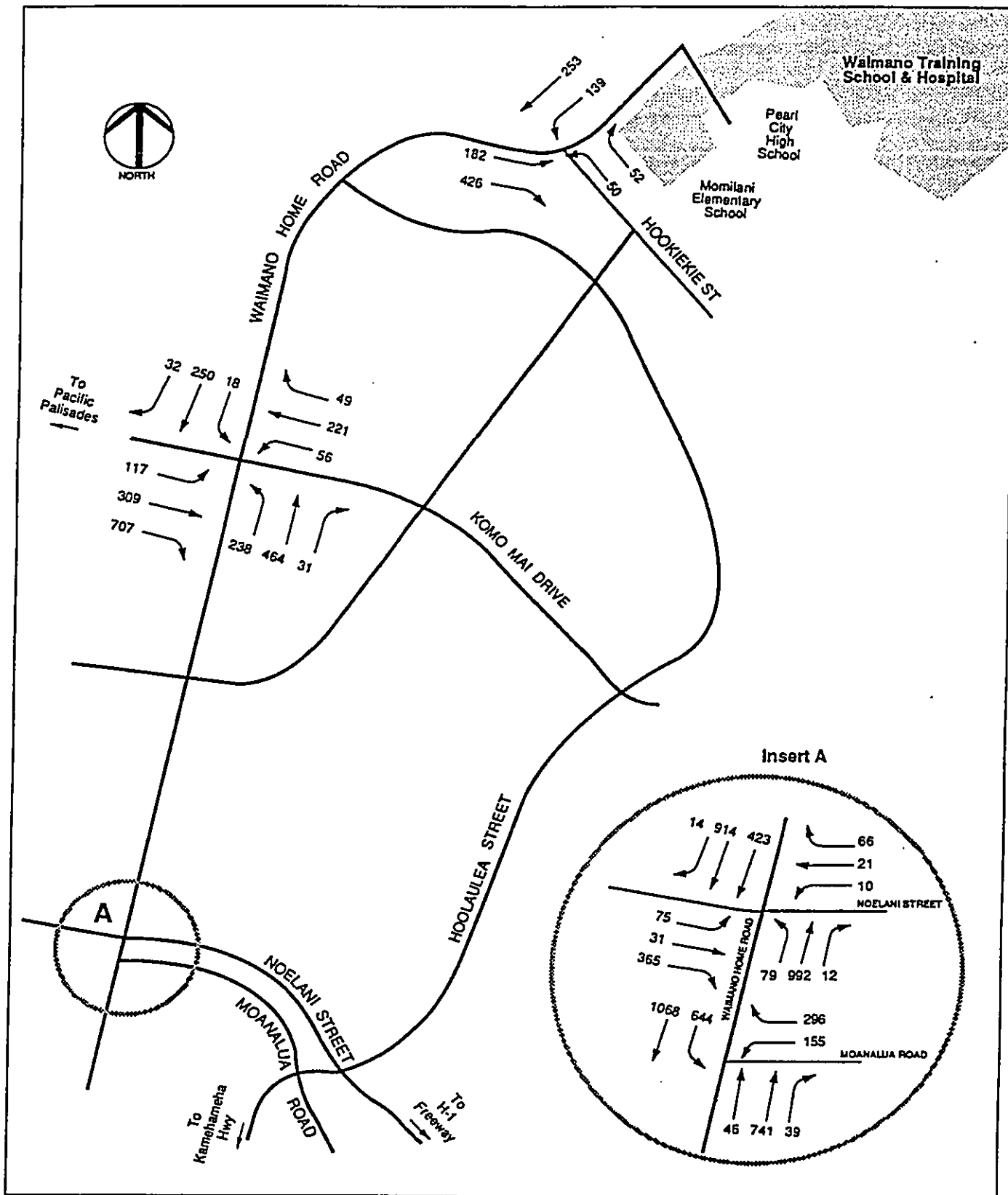


Figure 5. 1993 Without Project AM Peak Hour Forecasts

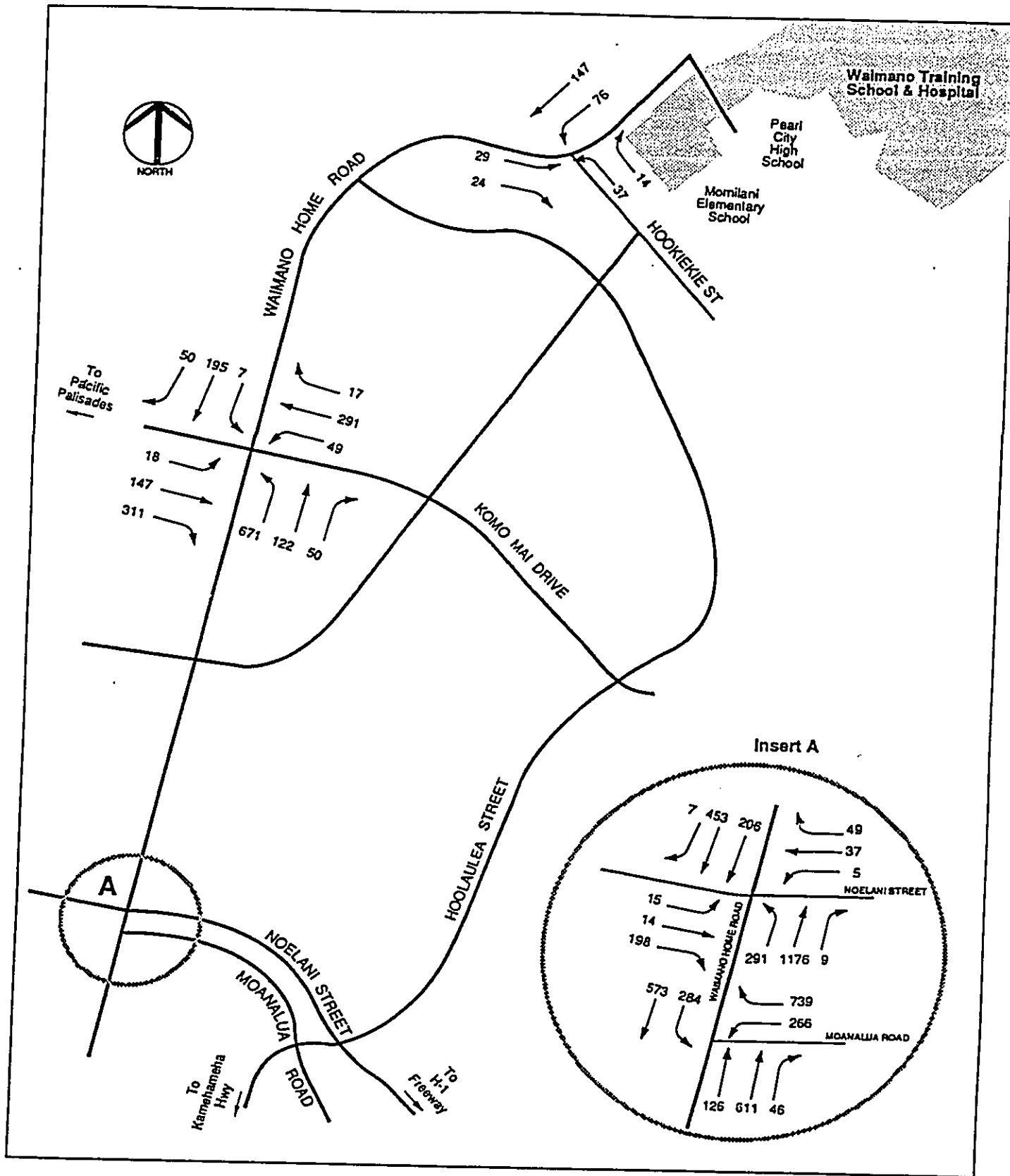


Figure 6. 1993 Without Project PM Peak Hour Forecasts

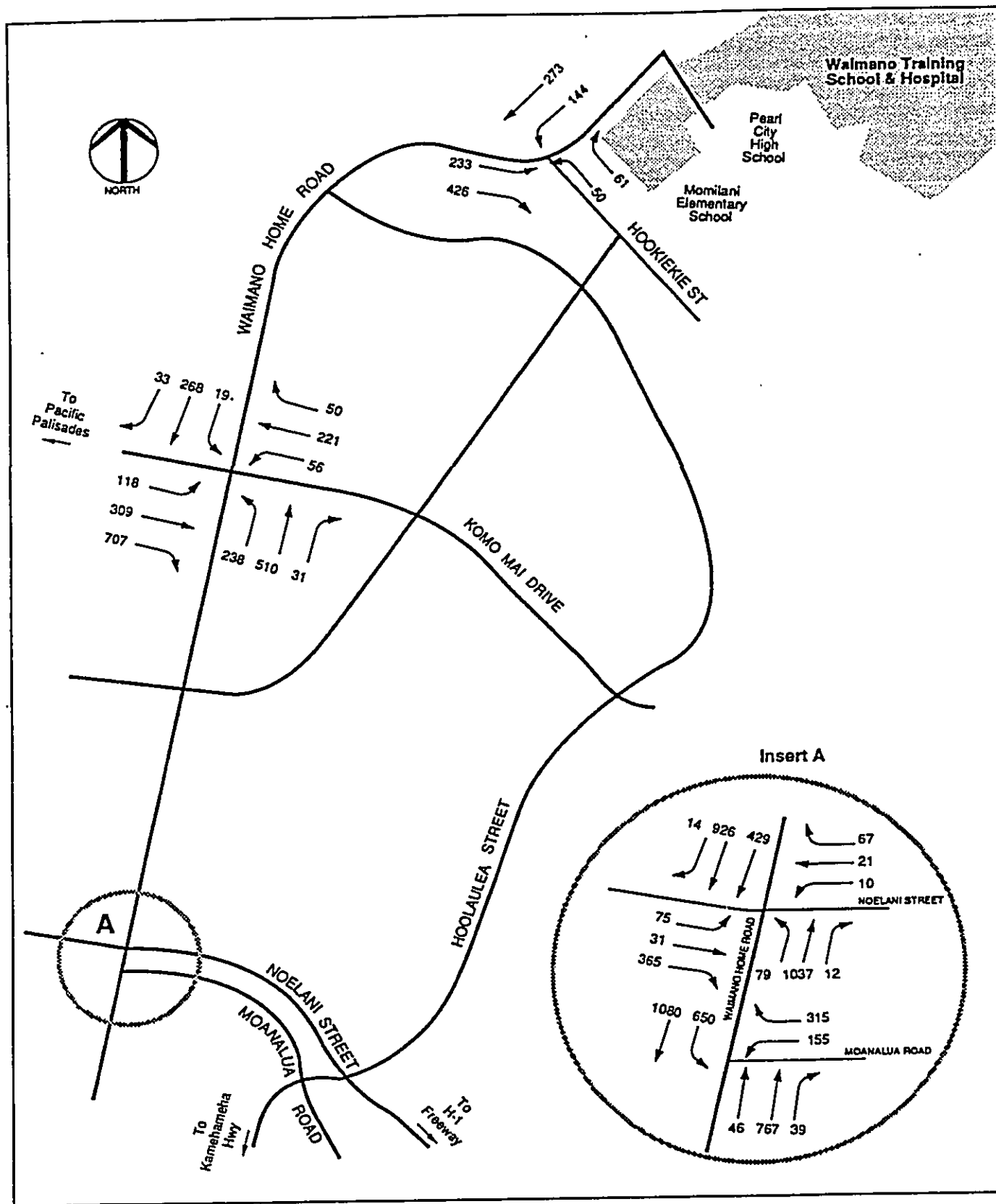


Figure 7. 1993 With Project AM Peak Hour Forecasts

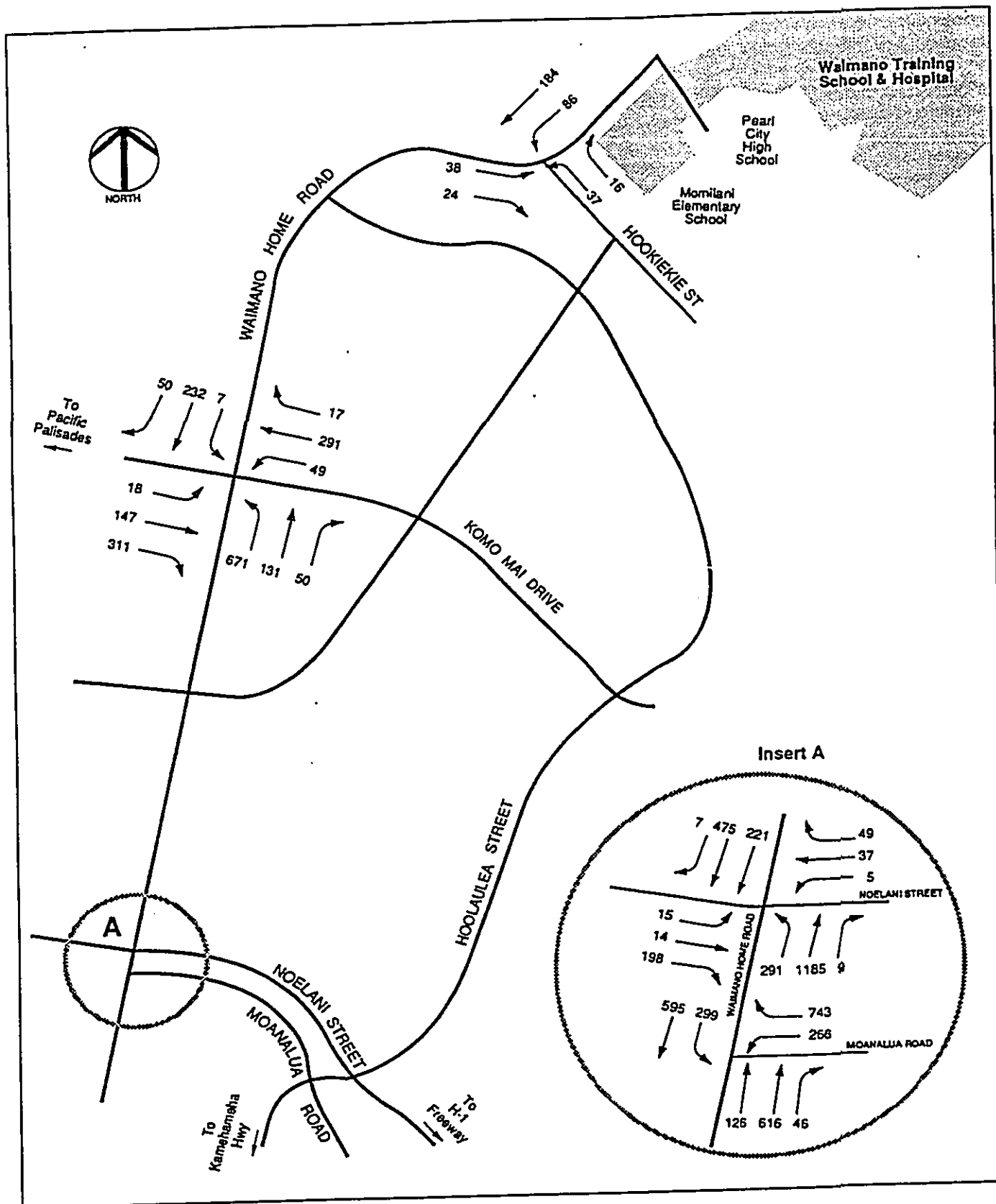


Figure 8. 1993 With Project PM Peak Hour Forecasts

Table 3. Project Generated Traffic at Study Intersections
1993 Forecast Peak Hour Volumes

| <u>INTERSECTION</u> | 1993 Without Project | | 1993 With Project | | 1993 Incremental Traffic | | |
|---|-------------------------|-----------|----------------------|-----------|-----------------------------|-----------|----|
| | <u>AM</u> | <u>PM</u> | <u>AM</u> | <u>PM</u> | <u>AM</u> | <u>PM</u> | |
| Waimano Home Road with Hookiekie Street | | | | | | | |
| Northbound | TH | 182 | 29 | 233 | 38 | 51 | 9 |
| | RT | 426 | 24 | 426 | 24 | 0 | 0 |
| Southbound | LT | 139 | 76 | 144 | 86 | 5 | 10 |
| | TH | 253 | 147 | 273 | 184 | 20 | 37 |
| Westbound | LT | 50 | 37 | 50 | 37 | 0 | 0 |
| | RT | 52 | 14 | 61 | 16 | 9 | 2 |
| Waimano Home Road with Komo Mai Drive | | | | | | | |
| Northbound | LT | 238 | 671 | 238 | 671 | 0 | 0 |
| | TH | 464 | 122 | 510 | 131 | 46 | 9 |
| | RT | 31 | 50 | 31 | 50 | 0 | 0 |
| Southbound | LT | 18 | 7 | 19 | 7 | 1 | 0 |
| | TH | 250 | 195 | 268 | 232 | 18 | 37 |
| | RT | 32 | 50 | 33 | 50 | 1 | 0 |
| Eastbound | LT | 117 | 18 | 118 | 18 | 1 | 0 |
| | TH | 309 | 147 | 309 | 147 | 0 | 0 |
| | RT | 707 | 311 | 707 | 311 | 0 | 0 |
| Westbound | LT | 56 | 49 | 56 | 49 | 0 | 0 |
| | TH | 221 | 291 | 221 | 291 | 0 | 0 |
| | RT | 49 | 17 | 50 | 17 | 1 | 0 |

Table 3. Project Generated Traffic at Study Intersections (Continued)
1993 Forecast Peak Hour Volumes

| <u>INTERSECTION</u> | | 1993 | | 1993 | | 1993 | |
|---------------------------------------|---------|-----------------|-----------|--------------|-----------|---------------------|-----------|
| | | Without Project | | With Project | | Incremental Traffic | |
| | | <u>AM</u> | <u>PM</u> | <u>AM</u> | <u>PM</u> | <u>AM</u> | <u>PM</u> |
| Waimano Home Road with Noelani Street | | | | | | | |
| Northbound | LT | 79 | 291 | 79 | 291 | 0 | 0 |
| | TH | 992 | 1176 | 1037 | 1185 | 45 | 9 |
| | RT | 12 | 9 | 12 | 9 | 0 | 0 |
| Southbound | LT (th) | 423 | 206 | 429 | 221 | 6 | 15 |
| | TH | 914 | 453 | 926 | 475 | 12 | 22 |
| | RT | 14 | 7 | 14 | 7 | 0 | 0 |
| Eastbound | LT | 75 | 15 | 75 | 15 | 0 | 0 |
| | TH | 31 | 14 | 31 | 14 | 0 | 0 |
| | RT | 365 | 198 | 365 | 198 | 0 | 0 |
| Westbound | LT | 10 | 5 | 10 | 5 | 0 | 0 |
| | TH | 21 | 37 | 21 | 37 | 0 | 0 |
| | RT | 66 | 49 | 67 | 49 | 1 | 0 |
| Waimano Home Road with Moanalua Road | | | | | | | |
| Northbound | LT (th) | 46 | 126 | 46 | 126 | 0 | 0 |
| | TH | 741 | 611 | 767 | 616 | 26 | 5 |
| | RT | 39 | 46 | 39 | 46 | 0 | 0 |
| Southbound | LT | 644 | 284 | 650 | 299 | 6 | 15 |
| | TH | 1068 | 573 | 1080 | 595 | 12 | 22 |
| Westbound | LT | 155 | 266 | 155 | 266 | 0 | 0 |
| | RT | 296 | 739 | 315 | 743 | 19 | 4 |

TRAFFIC IMPACTS

Intersection analyses was conducted at four critical intersections to determine the relative impact of the proposed project on the local roadway system. Each intersection was analyzed for existing, 1993 forecasts without project, and 1993 forecast with project traffic conditions. Analysis for projected traffic conditions were based on the existing roadway network.

Analysis Methods

The study intersections were analyzed using methods found in the Highway Capacity Manual². The HCM analysis utilizes level-of-service (LOS) to measure traffic operational conditions. LOS is divided into six categories ranging from little delays (LOS A) to very long delays (LOS F). LOS for signalized and unsignalized intersections is based on different methods and therefore is not directly comparable. The definition of LOS for signalized and unsignalized intersections is given in Appendix A.

Analysis Results

The results of the analysis indicate that even under existing conditions, there are extreme delays at two of the study intersections during the morning peak hour. The results of the analysis are discussed below and shown in Table 4.

Table 4. Intersection Analysis Results

| | EB | | WB | | NB | | SB | | INTERSECTION |
|--------------|-------|----|-------|----|----|-------|-------|----|--------------|
| | LT | RT | LT | RT | LT | RT | LT | RT | |
| AM Moanalua | | | | | | | | | |
| Existing | | | | | | | | | |
| Without | | | | | | | | | |
| With | | | | | | | | | |
| AM Noelani | | | | | | | | | |
| Existing | sh th | D | sh th | C | A | sh th | D | B | sh th |
| Without | sh th | D | sh th | C | A | sh th | D | B | sh th |
| With | sh th | D | sh th | C | B | sh th | D | B | sh th |
| AM Komo Mai | | | | | | | | | |
| Existing | sh th | B | sh th | B | E | sh th | sh th | C | sh th |
| Without | sh th | B | sh th | B | F | sh th | sh th | C | sh th |
| With | sh th | B | sh th | B | F | sh th | sh th | C | sh th |
| AM Hookiekie | | | | | | | | | |
| Existing | | | C | A | | | A | | |
| Without | | | C | A | | | A | | |
| With | | | D | A | | | A | | |

| | | | | | | | | | | |
|--------------|-------|---|-------|---|---|-------|---|---|-------|---|
| PM Moanalua | | | | | | | | | | |
| Existing | | | | | | | | | | |
| Without | | | | | | | | | | |
| With | | | | | | | | | | |
| PM Noelani | | | | | | | | | | |
| Existing | sh th | C | sh th | C | D | sh th | C | B | sh th | B |
| Without | sh th | C | sh th | C | D | sh th | C | B | sh th | B |
| With | sh th | C | sh th | C | D | sh th | C | B | sh th | B |
| PM Komo Mai | | | | | | | | | | |
| Existing | sh th | C | sh th | C | C | sh th | C | B | sh th | C |
| Without | sh th | C | sh th | C | C | sh th | C | B | sh th | C |
| With | sh th | C | sh th | C | C | sh th | C | B | sh th | C |
| PM Hookiekie | | | | | | | | | | |
| Existing | | | A | A | A | | | A | | |
| Without | | | A | A | A | | | A | | |
| With | | | A | A | A | | | A | | |

Waimano Home Road & Hookie Street

- *Presently*, all movements are operating at acceptable LOS (LOS D or better). During the afternoon peak hour, all turning movements at this intersection operate at LOS A.
- *By 1993 without project*, the level-of-service for all movements will continue to operate at the same LOS as existing.
- *By 1993 with project* the level-of-service for all movements will continue to operate at the same LOS as existing except for the westbound left turns which will drop from LOS C to LOS D (long traffic delays) during the morning peak hour.

Waimano Home Road & Komo Mai Drive

- *Presently*, this intersection is operating overall at LOS C during the morning and afternoon peak hours. All movements experience acceptable LOS except northbound vehicles turning right or going through which experience LOS E during the morning peak hour.
- *By 1993 without project*, the overall intersection level-of-service will continue to operate at the same LOS as existing. The LOS for all movements will remain the same except the northbound through and right turning vehicles will experience a decrease in level-of-service to LOS F.
- *By 1993 with project*, the overall intersection level-of-service will decrease from LOS C to LOS D during the morning peak hour. During the afternoon peak hour, the level-of-service will remain the same as for the without project condition and the overall level-of-service will remain at LOS C.

Waimano Home Road & Noelani Street

- *Presently*, this intersection is operating overall at LOS C during the morning peak hour and at LOS B during the afternoon peak hour. All movements experience acceptable LOS except vehicles who will be turning left at the next intersection from Waimano to Moanalua. These vehicles experience LOS F due to the delays caused by that intersection.
- *By 1993 without project*, the overall intersection level-of-service will continue to operate at the same LOS as existing. All movements will continue to operate at the same LOS as existing.
- *By 1993 with project*, the overall intersection will continue to operate at the same LOS as existing. During the morning peak hour, the LOS for all turning movements remains the same except the northbound through movement. This movement will experience a drop in level-of-service from LOS A to LOS B. During the afternoon peak hour, the LOS for all turning movements remains the same as for the without project conditions.

Waimano Home Road & Moanalua Road

- *Presently*, this intersection is operating overall at LOS E during the morning peak hour and at LOS B during the afternoon peak hour. All movements experience acceptable LOS except for vehicles turning left from Waimano to Moanalua which experience LOS F.
- *By 1993 without project*, the overall intersection level-of-service will continue to operate at the same LOS as existing. All movements will continue to operate at the same LOS as existing.
- *By 1993 with project*, the overall intersection will continue to operate at the same LOS as existing. All movements will continue to operate at the same LOS as the without and existing conditions.

CONCLUSIONS AND RECOMMENDATIONS

The proposed Waimano Training School and Hospital master plan when completed in 1993, will have a slight impact on traffic conditions at the study intersections.

Presently, most of the movements at the study intersections operate at LOS D or better during the morning and afternoon peak hours. Only the following movements experience very long delays:

- Vehicles on Waimano Home Road turning left onto Moanalua Road experience LOS F during the morning peak hour. The many of these vehicles are headed towards Honolulu via the H-1 Freeway. The long delays are due to a lack of adequate storage lane and relatively short green phase for the protected left turn movement at the intersection.
- Vehicles heading northbound at the intersection of Waimano Home Road with Komo Mai Drive. These vehicles making this movement are due in part to the high school and elementary school. Since there is a large volume of vehicles exiting Komo Mai Drive, the green time for Waimano Home Road is allocated to accommodate these vehicles.

With the project, the analysis indicates little or no change in the level-of-service to the study intersections. The project traffic will cause a slight increase in delays at the study intersections during the morning and afternoon peak hours. The project will add about 75 trips during the morning peak hour, which is 2.5% of the total traffic entering the

intersection of Waimano Home Road and Moanalua Road. This is not a significant number of trips added to the study intersections during the peak hour.

APPENDIX A

Definition of Level-of-Service

**Signalized Intersections
and
Unsignalized Intersections**

APPENDIX A

LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS

The concept of level of service is defined as a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. A level of service definition generally describes these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. Six levels of service are defined for each type of facility for which analysis procedures are available. They are given letter designations, from A to F, with level-of-service A representing the best operating conditions and level-of-service F the worst.

Level of service for signalized intersections is defined in terms of delay. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. Specifically, level-of-service criteria are stated in terms of the average stopped delay per vehicle for a 15-minute analysis period.

Level-of-Service A describes operations with very low delay, i.e., less than 5.0 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.

Level-of-Service B describes operations with delay in the range of 5.1 to 15.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.

Level-of-Service C describes operations with delay in the range of 15.1 to 25.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear in this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.

Level-of-Service D describes operations with delay in the range of 25.1 to 40.0 seconds per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or a high v/c ratio (volume of cars to capacity of intersection). Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

Level-of-Service E describes operations with delay in the range of 40.1 to 60.0 seconds per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle length, and high v/c ratios. Individual cycle failures are frequent occurrences.

Level-of-Service F describes operations with delay in excess of 60.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.00 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

REFERENCE: Highway Capacity Manual (Special Report 209, 1985)

APPENDIX A

LEVEL OF SERVICE FOR UNSIGNALIZED INTERSECTIONS

For unsignalized intersections, the traffic most impacted will be the minor or cross-street with the stop or yield control. The major roadway will have the right-of-way. The level-of-service is the amount of delay expected for the average vehicle desiring to cross or enter the major road. The following gives a general description of the measure.

The concept of levels of service is defined as a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. A level of service definition generally describes these conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety.

Six levels of service are defined for each type of facility for which analysis procedures are available. They are given letter designations, from A to F, with level-of-service A representing the best operating conditions and level-of-service F the worst.

Level-of-Service definitions--In general, the various levels of service are defined as follows for uninterrupted flow facilities:

Level-of-service A represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to maneuver within the traffic stream is extremely

high. The general level of comfort and convenience provided to the motorist, passenger, or pedestrian is excellent.

Level-of-service B is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is relatively unaffected, but there is slight decline in the freedom to maneuver within the traffic stream from LOS A. The level of comfort and convenience provided is somewhat less than at LOS A, because the presence of others in the traffic stream begins to affect individual behavior.

Level-of-service C is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interactions with others in the traffic stream. The selection of speed is now affected by the presence of others, and maneuvering within the traffic stream requires substantial vigilance on the part of the user. The general level of comfort and convenience declines noticeably at this level.

Level-of-service D represents high-density, but stable, flow. Speed and freedom to maneuver are severely restricted, and the driver or pedestrian experiences a generally poor level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.

Level-of-service E represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver within the traffic stream is extremely difficult, and it is generally accomplished by forcing a vehicle or pedestrian to "give way" to accommodate such maneuver. Comfort and convenience levels are

extremely poor, and driver or pedestrian frustration is generally high. Operations at this level are usually unstable, because small increases in flow or minor perturbations within the traffic stream will cause breakdowns.

Level-of-service F is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Queues form behind such locations. Operations within the queue are characterized by stop-and-go wave, and they are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclic fashion. Level-of-service F is used to describe the operating conditions within the queue, as well as the point of the breakdown. It should be noted, however, that in many cases operating conditions of the vehicles or pedestrians discharged from the queue may be quite good. Nevertheless, it is the point at which arrival flow exceeds discharge flow which causes the queue to form, and level-of-service F is an appropriate designation for such points.

These definitions are general and conceptual in nature, and they apply primarily to uninterrupted flow. Levels of service for interrupted flow facilities vary widely in terms of both the user's perception of service quality and the operational variables used to describe them.

REFERENCE: Highway Capacity Manual (Special Report 209, 1985)

APPENDIX B

MANUAL TRAFFIC COUNT DATA

Location: Waimano Home Road with Hookiekie Street

Date: September 19, 1990

| Time (am) | Waimano Home Road | | | | Hookiekie Street | |
|---------------------------------|-------------------|-----|------------|-----|------------------|----|
| | Northbound | | Southbound | | Westbound | |
| | TH | RT | LT | TH | LT | RT |
| 6:15-6:30 | 8 | 5 | 2 | 2 | 2 | 4 |
| 6:30-6:45 | 14 | 12 | 4 | 3 | 0 | 5 |
| 6:45-7:00 | 21 | 21 | 4 | 10 | 1 | 7 |
| 7:00-7:15 | 24 | 54 | 14 | 19 | 9 | 11 |
| 7:15-7:30 | 33 | 85 | 34 | 51 | 7 | 9 |
| 7:30-7:45 | 48 | 148 | 45 | 85 | 15 | 7 |
| 7:45-8:00 | 37 | 139 | 45 | 95 | 19 | 9 |
| 8:00-8:15 | 15 | 14 | 13 | 24 | 11 | 5 |
| <u>Peak Hour</u> (7:00-8:00) | 142 | 426 | 138 | 250 | 50 | 36 |

| Time (pm) | Waimano Home Road | | | | Hookiekie Street | |
|---------------------------------|-------------------|----|------------|-----|------------------|----|
| | Northbound | | Southbound | | Westbound | |
| | TH | RT | LT | TH | LT | RT |
| 3:15-3:30 | 5 | 10 | 8 | 30 | 14 | 4 |
| 3:30-3:45 | 8 | 11 | 11 | 13 | 12 | 3 |
| 3:45-4:00 | 3 | 11 | 1 | 19 | 7 | 3 |
| 4:00-4:15 | 6 | 8 | 7 | 31 | 10 | 3 |
| 4:15-4:30 | 7 | 6 | 21 | 45 | 6 | 2 |
| 4:30-4:45 | 5 | 6 | 24 | 17 | 11 | 4 |
| 4:45-5:00 | 4 | 4 | 5 | 8 | 10 | 1 |
| <u>Peak Hour</u> (3:45-4:45) | 21 | 31 | 53 | 112 | 34 | 12 |
| Use: (4:00-5:00) | 22 | 24 | 57 | 101 | 37 | 10 |

APPENDIX B

MANUAL TRAFFIC COUNT DATA

Location: Waimano Home Road with Noelani Street

Date: September 19, 1990

| Time (am) | Waimano Home Road | | | | | | Noelani Street | | | | | |
|---------------------------------|-------------------|-----|----|------------|-----|----|----------------|----|----|-----------|----|-----|
| | Northbound | | | Southbound | | | Westbound | | | Eastbound | | |
| | LT | TH | RT | LT(th) | TH | RT | LT | TH | RT | LT | TH | RT |
| 6:15-6:30 | 13 | 62 | 1 | 195 | 161 | 1 | 1 | 1 | 5 | 1 | 20 | 92 |
| 6:30-6:45 | 12 | 90 | 1 | 163 | 142 | 0 | 2 | 2 | 6 | 3 | 7 | 89 |
| 6:45-7:00 | 14 | 122 | 2 | 158 | 171 | 1 | 0 | 2 | 8 | 3 | 7 | 95 |
| 7:00-7:15 | 9 | 210 | 4 | 114 | 190 | 1 | 3 | 3 | 4 | 3 | 9 | 91 |
| 7:15-7:30 | 18 | 242 | 2 | 88 | 217 | 2 | 0 | 3 | 8 | 15 | 8 | 85 |
| 7:30-7:45 | 36 | 289 | 2 | 75 | 269 | 5 | 2 | 5 | 21 | 27 | 5 | 86 |
| 7:45-8:00 | 16 | 212 | 4 | 144 | 237 | 6 | 5 | 10 | 32 | 29 | 9 | 103 |
| 8:00-8:15 | 28 | 109 | 3 | 105 | 133 | 1 | 2 | 11 | 16 | 16 | 0 | 69 |
| <u>Peak Hour</u> (7:00-8:00) | 79 | 953 | 12 | 421 | 913 | 14 | 10 | 21 | 65 | 74 | 31 | 365 |

| Time (pm) | Waimano Home Road | | | | | | Noelani Street | | | | | |
|---------------------------------|-------------------|------|----|------------|-----|----|----------------|----|----|-----------|----|-----|
| | Northbound | | | Southbound | | | Westbound | | | Eastbound | | |
| | LT | TH | RT | LT(th) | TH | RT | LT | TH | RT | LT | TH | RT |
| 3:15-3:30 | 63 | 221 | 1 | 47 | 102 | 1 | 1 | 8 | 1 | 3 | 2 | 42 |
| 3:30-3:45 | 66 | 261 | 1 | 43 | 97 | 3 | 1 | 15 | 9 | 5 | 4 | 56 |
| 3:45-4:00 | 69 | 301 | 1 | 46 | 110 | 3 | 1 | 5 | 7 | 1 | 3 | 48 |
| 4:00-4:15 | 83 | 315 | 0 | 50 | 110 | 0 | 2 | 6 | 15 | 6 | 3 | 57 |
| 4:15-4:30 | 70 | 316 | 3 | 47 | 123 | 1 | 2 | 10 | 12 | 4 | 7 | 55 |
| 4:30-4:45 | 68 | 243 | 2 | 44 | 105 | 3 | 1 | 10 | 10 | 0 | 2 | 48 |
| 4:45-5:00 | 70 | 299 | 4 | 41 | 99 | 1 | 0 | 11 | 9 | 4 | 2 | 33 |
| 5:00-5:15 | 95 | 323 | 0 | 53 | 124 | 2 | 0 | 7 | 15 | 4 | 2 | 62 |
| 5:15-5:30 | 68 | 299 | 0 | 56 | 127 | 3 | 1 | 11 | 8 | 3 | 6 | 53 |
| <u>Peak Hour</u> (3:30-4:30) | 288 | 1193 | 5 | 186 | 440 | 7 | 6 | 36 | 43 | 16 | 17 | 216 |
| <u>Use:</u> (4:00-5:00) | 291 | 1173 | 9 | 182 | 437 | 5 | 5 | 37 | 46 | 14 | 14 | 193 |

Location: Waimano Home Road with Komo Mai Drive

Date: September 19, 1990

| <u>Time (am)</u> | Waimano Home Road | | | | | | Komo Mai Drive | | | | | |
|---------------------------------|-------------------|-----------|-----------|------------|-----------|-----------|----------------|-----------|-----------|-----------|-----------|-----------|
| | Northbound | | | Southbound | | | Westbound | | | Eastbound | | |
| | <u>LT</u> | <u>TH</u> | <u>RT</u> | <u>LT</u> | <u>TH</u> | <u>RT</u> | <u>LT</u> | <u>TH</u> | <u>RT</u> | <u>LT</u> | <u>TH</u> | <u>RT</u> |
| 6:15-6:30 | 31 | 16 | 5 | 3 | 19 | 1 | 11 | 7 | 0 | 3 | 68 | 212 |
| 6:30-6:45 | 34 | 42 | 9 | 5 | 24 | 1 | 9 | 12 | 3 | 5 | 64 | 187 |
| 6:45-7:00 | 34 | 29 | 7 | 10 | 24 | 1 | 14 | 19 | 0 | 6 | 73 | 185 |
| 7:00-7:15 | 55 | 71 | 5 | 3 | 25 | 1 | 16 | 16 | 1 | 20 | 79 | 201 |
| 7:15-7:30 | 61 | 104 | 6 | 5 | 51 | 6 | 9 | 37 | 3 | 26 | 82 | 163 |
| 7:30-7:45 | 60 | 141 | 11 | 5 | 78 | 16 | 15 | 72 | 6 | 46 | 68 | 178 |
| 7:45-8:00 | 62 | 107 | 9 | 5 | 93 | 9 | 16 | 96 | 38 | 24 | 80 | 165 |
| 8:00-8:15 | 54 | 16 | 12 | 9 | 97 | 25 | 10 | 68 | 7 | 5 | 34 | 103 |
| <u>Peak Hour</u> (7:00-8:00) | 238 | 423 | 31 | 18 | 247 | 32 | 56 | 221 | 48 | 116 | 309 | 707 |

| <u>Time (pm)</u> | Waimano Home Road | | | | | | Komo Mai Drive | | | | | |
|---------------------------------|-------------------|-----------|-----------|------------|-----------|-----------|----------------|-----------|-----------|-----------|-----------|-----------|
| | Northbound | | | Southbound | | | Westbound | | | Eastbound | | |
| | <u>LT</u> | <u>TH</u> | <u>RT</u> | <u>LT</u> | <u>TH</u> | <u>RT</u> | <u>LT</u> | <u>TH</u> | <u>RT</u> | <u>LT</u> | <u>TH</u> | <u>RT</u> |
| 3:15-3:30 | 120 | 20 | 12 | 1 | 41 | 3 | 8 | 41 | 4 | 2 | 22 | 87 |
| 3:30-3:45 | 135 | 35 | 12 | 1 | 25 | 7 | 10 | 44 | 2 | 3 | 16 | 76 |
| 3:45-4:00 | 145 | 19 | 11 | 1 | 38 | 5 | 16 | 64 | 5 | 3 | 27 | 91 |
| 4:00-4:15 | 168 | 32 | 12 | 0 | 43 | 14 | 12 | 68 | 1 | 4 | 34 | 75 |
| 4:15-4:30 | 173 | 32 | 18 | 1 | 51 | 13 | 15 | 65 | 3 | 4 | 41 | 73 |
| 4:30-4:45 | 159 | 23 | 10 | 3 | 37 | 12 | 11 | 75 | 7 | 3 | 28 | 89 |
| 4:45-5:00 | 171 | 30 | 10 | 1 | 22 | 9 | 11 | 83 | 5 | 6 | 44 | 74 |
| 5:00-5:15 | 159 | 40 | 5 | 5 | 42 | 11 | 17 | 80 | 7 | 8 | 37 | 89 |
| 5:15-5:30 | 146 | 29 | 10 | 2 | 31 | 4 | 18 | 58 | 4 | 0 | 25 | 98 |
| <u>Peak Hour</u> (4:15-5:15) | 662 | 125 | 43 | 10 | 152 | 45 | 54 | 303 | 22 | 21 | 150 | 325 |
| <u>Use:</u> (4:00-5:00) | 671 | 117 | 50 | 5 | 153 | 48 | 49 | 291 | 16 | 17 | 147 | 311 |

Location: Waimano Home Road with Moanalua Road
 Date: September 19, 1990

| Time (am) | Waimano Home Road | | | | Moanalua Road | | |
|---------------------------------|-------------------|-----|----|------------|---------------|-----------|-----|
| | Northbound | | | Southbound | | Westbound | |
| | LT(th) | TH | RT | LT | TH | LT | RT |
| 6:15-6:30 | 8 | 51 | 5 | 258 | 191 | 6 | 17 |
| 6:30-6:45 | 7 | 73 | 4 | 219 | 177 | 25 | 23 |
| 6:45-7:00 | 7 | 99 | 5 | 183 | 241 | 24 | 32 |
| 7:00-7:15 | 7 | 165 | 8 | 196 | 202 | 34 | 51 |
| 7:15-7:30 | 16 | 180 | 4 | 139 | 251 | 32 | 66 |
| 7:30-7:45 | 13 | 239 | 10 | 128 | 304 | 45 | 75 |
| 7:45-8:00 | 10 | 142 | 17 | 179 | 310 | 44 | 80 |
| 8:00-8:15 | 15 | 82 | 7 | 192 | 117 | 44 | 43 |
| <u>Peak Hour</u> (7:00-8:00) | 46 | 726 | 39 | 642 | 1067 | 155 | 272 |

| Time (pm) | Waimano Home Road | | | | Moanalua Road | | |
|---------------------------------|-------------------|-----|----|------------|---------------|-----------|-----|
| | Northbound | | | Southbound | | Westbound | |
| | LT(th) | TH | RT | LT | TH | LT | RT |
| 3:15-3:30 | 38 | 129 | 9 | 92 | 100 | 53 | 118 |
| 3:30-3:45 | 22 | 171 | 10 | 64 | 133 | 63 | 135 |
| 3:45-4:00 | 29 | 155 | 5 | 75 | 130 | 59 | 187 |
| 4:00-4:15 | 29 | 167 | 12 | 80 | 139 | 73 | 202 |
| 4:15-4:30 | 38 | 159 | 15 | 72 | 155 | 71 | 192 |
| 4:30-4:45 | 28 | 124 | 10 | 62 | 136 | 53 | 161 |
| 4:45-5:00 | 31 | 160 | 9 | 46 | 127 | 69 | 182 |
| 5:00-5:15 | 34 | 173 | 10 | 82 | 157 | 65 | 211 |
| 5:15-5:30 | 22 | 145 | 10 | 87 | 150 | 64 | 200 |
| <u>Peak Hour</u> (3:30-4:30) | 118 | 652 | 42 | 291 | 557 | 266 | 716 |
| Use: (4:00-5:00) | 126 | 610 | 46 | 260 | 557 | 266 | 737 |

WAIMANO RIDGE MASTER PLAN
Final Environmental Assessment

APPENDIX B: ARCHAEOLOGICAL RECONNAISSANCE OF THE WAIMANO
TRAINING SCHOOL AND HOSPITAL, WAIMANO, 'EWA, O'AHU

ARCHAEOLOGICAL RECCNNAISSANCE
OF THE WAIMANO TRAINING SCHOOL AND HOSPITAL
WAIMANO, 'EWA, O'AHU

By
WILLIAM H. FOLK, II

Prepared For
KRP INFORMATION SERVICES
and
AM PARTNERS, INC.

By
CULTURAL SURVEYS HAWAII
HALLETT H. HAMMATT, Ph.D.

ABSTRACT

A cemetery, a dressed stone irrigation ditch and a cache of loose, dressed stones were recorded during a reconnaissance of the Waimano Training School and Hospital site. The cemetery is known to contain deceased members of the Waimano Institution. The irrigation ditch and loose stones are clearly historic and believed to be associated with sugar cane cultivation by Honolulu Plantation Co. in the early 20th century. There are no literary or physical records of traditional Hawaiian enterprise in the project area. No Kuleana claims were filed in the project area which appears to have been government lands since the Mahele of 1848. Portions of the project area may have been under cultivation of sugar or pineapple prior to establishment of the Waimano Home in 1919-1921. None of the existing structures of the facility are deemed significant for preservation. Preservation of the cemetery, irrigation ditch and dressed stones is recommended. No further archaeological investigation nor monitoring during construction is recommended upon the plateaus in the project area.

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Special thanks to Dr. Hal Hammatt for his enthusiasm and support.

INTRODUCTION

On June 23, 1990 the author conducted an archaeological reconnaissance of the grounds of the existing Waimano Training School and Hospital (Figs. 1-3) situated on the ridge east of Waimano Stream, at the mauka end of Waimano Home Road. This study area is within the traditional land division (ahupua'a) of Waimano in the 'Ewa District. The purpose of this work was to identify any archaeological or historical resources prior to construction to modernize the facility.

The reconnaissance involved on-site examination of the plateau areas of the ridge from Pearl City High School at about 425 ft. elevation, mauka to the Hawaiian Electric Co. powerline easement at an elevation of about 1,000 ft. The ravines and gulches along the edges of the plateau were not included in the study area and an easterly spur of the plateau at 600 to 700 ft. elevation was also excluded.

In addition to the field work, a search for pertinent prior archaeological studies was made. Survey and tax maps and basic historical works were reviewed as well to obtain a general historical perspective.

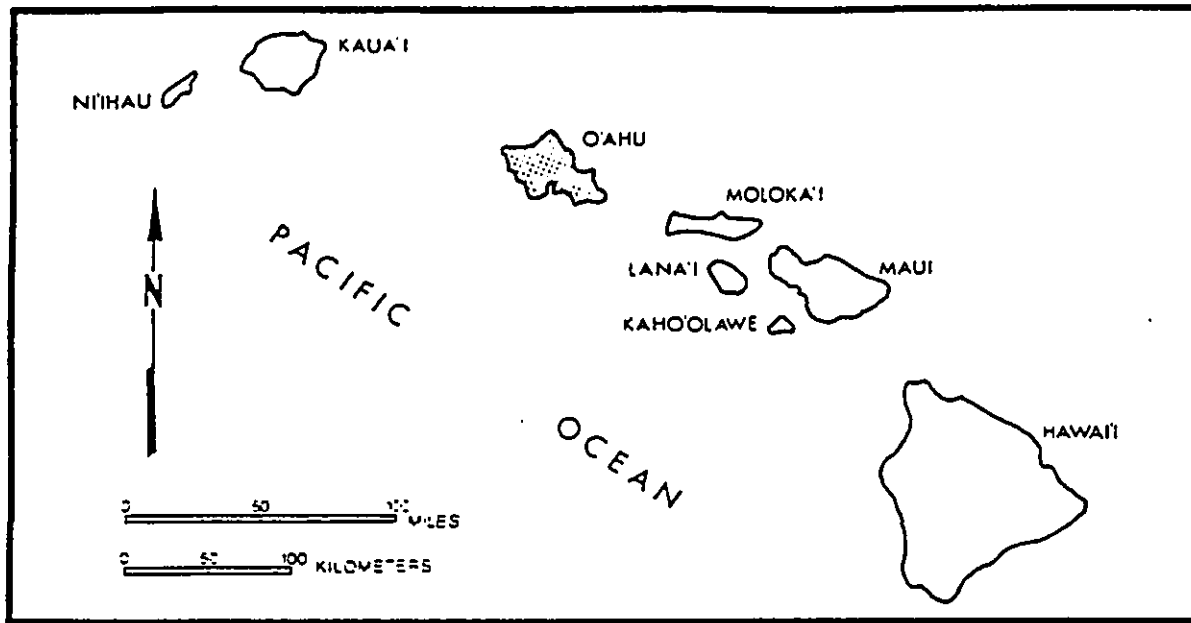


Fig. 1. State of Hawaii

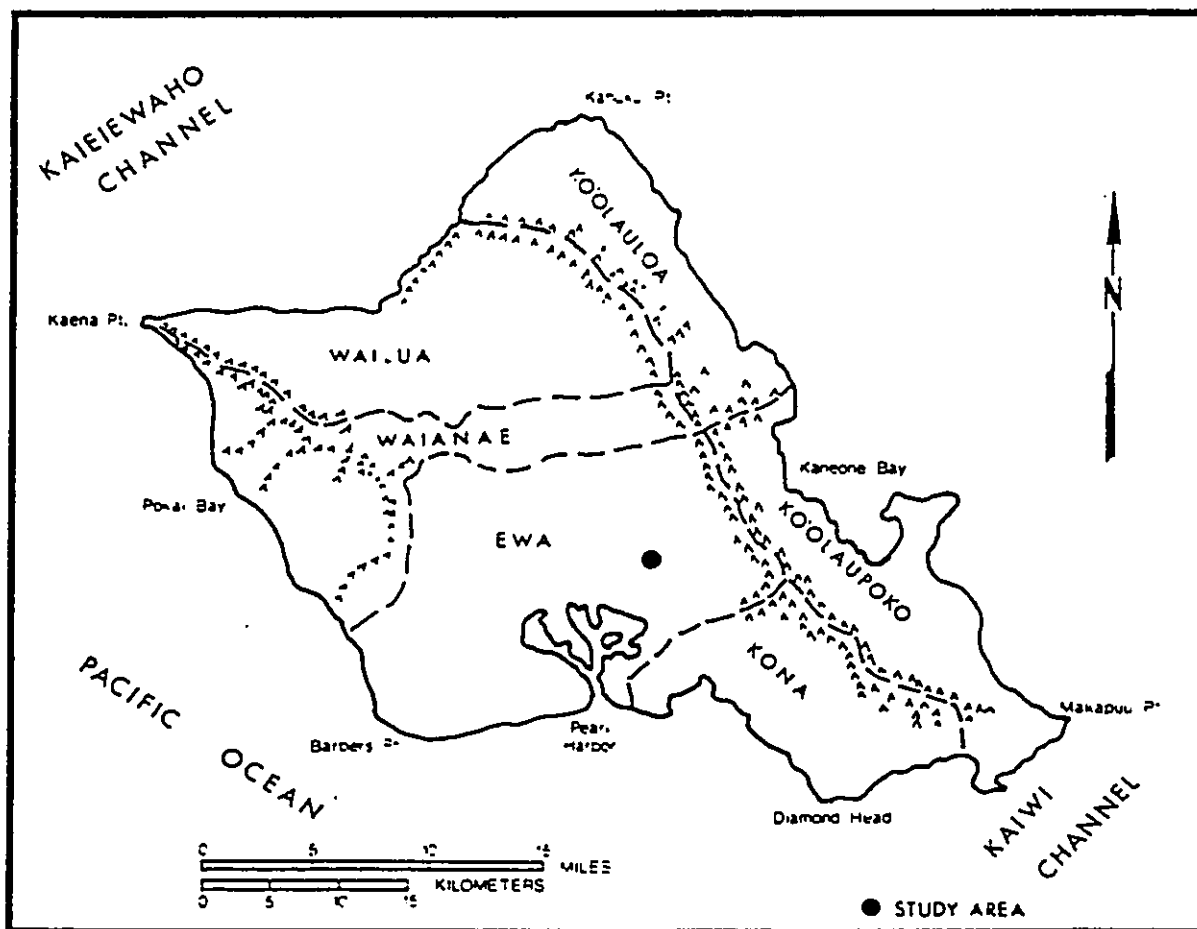


Fig. 2. General Location Map, O'ahu Island.

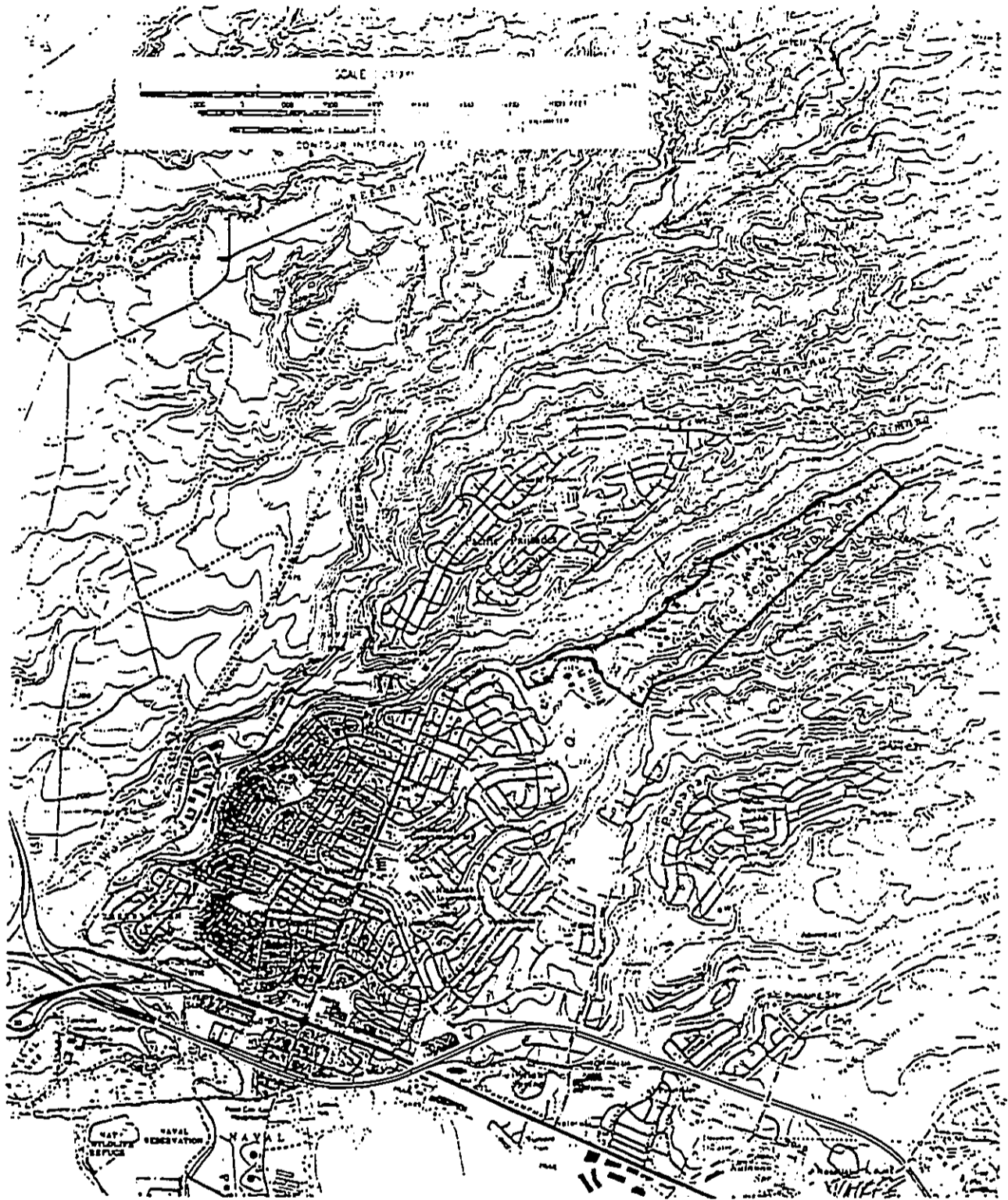


Fig. 3 Portion of U.S.G.S. Topographical Map, Waipahu
Quadrangle. Showing Project Area and Historical Sites.

HISTORICAL REVIEW

Natural History

Waimano ahupua'a in Ewa District is translated literally as "many waters" by Pukui et. al. (1984). The significance of this translation is not apparent in terms of stream flow within the boundaries of the ahupua'a. Although two streams are associated with the ahupua'a neither have their entire course within it.

The first of these, bearing the name Waimano Stream on current U.S.G.S. maps, originates at the summit of Koolau within Waimano ahupua'a and has only two major tributaries whose confluence is above 400 ft elevation. Mauka of this elevation in the stream bed the stream valleys are V-shaped, steeply rising to knife edged ridges clearly unsuitable to Hawaiian settlement of any magnitude. Old terraces in the stream bottoms may have been used for planting of food crops in the past. However, it is very unlikely the ridges above, at elevations of 1,000 ft. and more, were used for anything other than collecting the natural products of the forest. (Fig. 4)

Below the 400 ft. elevation in the stream bed, Waimano stream travels a horizontal distance of only 8,000 ft. before it passes out of Waimano ahupua'a, over 2 miles from the shore, crossing Manana ahupua'a towards its confluence with Waiawa Stream. Within that 8,000 ft. section the old stream terraces are wider than the valley bottom, flatter with a very low gradient, more amenable to traditional Hawaiian agriculture. It is also in this same stretch that the ridge tops, at about 800

ft. elevation, becomes flatter and broader as rainfall decreases to 50 to 75 in. per year. It is upon this plateau of the ridge forming the south east side of Waimano Stream that the study area is situated (Fig. 5).

The second stream associated with Waimano ahupua'a originates in the Koolau in Waiau ahupua'a and enters Waimano ahupua'a from the south east about 1.5 miles from the shore at an elevation of approximately 300 ft. This stream is unnamed on the U.S.G.S. map and is intermittent. It flows into the east loch of Pearl Harbor within Waimano ahupua'a just east of Pearl City peninsula.

Culture History

There is relatively little information on early land use as well as on the inhabitants of Waimano ahupua'a. Although it borders on Pearl Harbor it is overshadowed in all respects by neighboring ahupua'a in ethnographic records. No archaeological sites are noted in Waimano ahupua'a by McAlister (1933). Sterling and Summers (1978:16) note only three references to Waimano the most descriptive of which is from Archibald Campbell. Campbell relates that he received from the King, sixty acres of land called "Wymannoo" (Waimano) on Pearl Harbor; that it is four or five miles from the mouth of a river. Although this locational information is confusing in that Waimano Stream does not enter Pearl Harbor, but joins Waiawa stream well inland, it does suggest the prior existence of agriculture well inland in

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Fig. 4 View of Waimano Stream Valley Facing Mauka from Study Area.

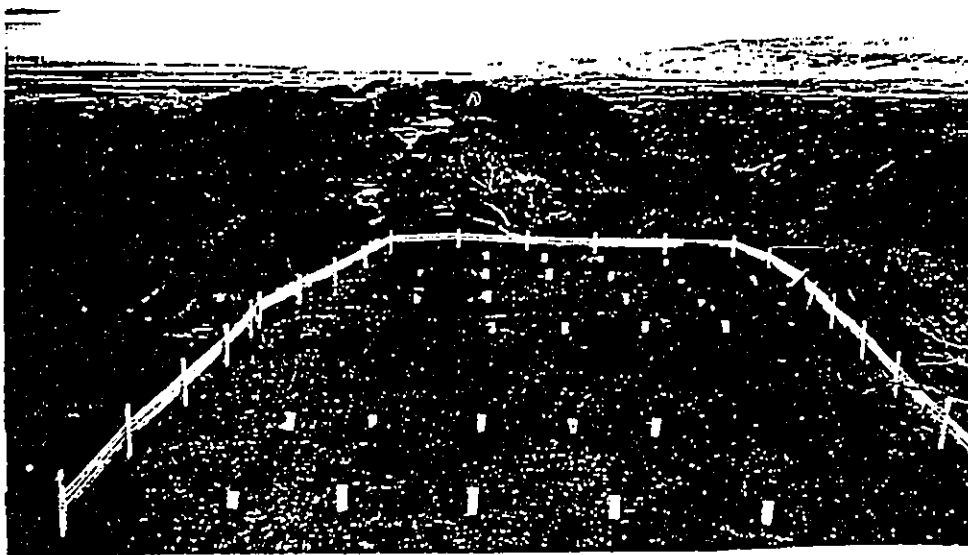


Fig. 5 View of Waimano Stream Valley (to right) and Study Area Plateau. Facing Makai.

the valleys. This is confirmed by agricultural and habitation sites located in two surveys of the Waimano Stream bed by Griffin and Yent (1978 and 1979).

Early agriculture is also supported indirectly by use of the Waimano Valley floor for growing sugar cane evidenced by notations on the 1924 Territory of Hawaii Survey Map (R.M. 2715) (Fig. 6) and physical remains of a railroad bed and plowed fields in the valley (Griffin and Yent 1979). Further evidence of upland agriculture can be gleaned from the missionary census (Schmitt 1973:22) that records in 1835 a population of 184 people in (upland) Manananui (Handy 1940:81).

Current U.S.G.S. maps apparently show the west boundary of Waimano ahupua'a incorrectly, as not including any part of the Pearl City peninsula in Pearl Harbor. Territory of Hawaii Survey Maps of 1924 (R.M. 2715) however, show that the peninsula was divided between Manana ahupua'a on the west and Waimano ahupua'a on the east. The majority of the population probably lived in this area near the shore of the lagoon.

This contention that the majority of the population was distributed near the shore of Pearl Harbor is supported by a number of data including the location of the ten land commission awards (tax maps of Zone 9 Section 7) assigned in Waimano ahupua'a. Nine are located near the lagoon below 100 ft. elevation. The 10th, being an award of Kula lands immediately mauka of the near shore taro lands, at about 100 ft. to 400 ft.

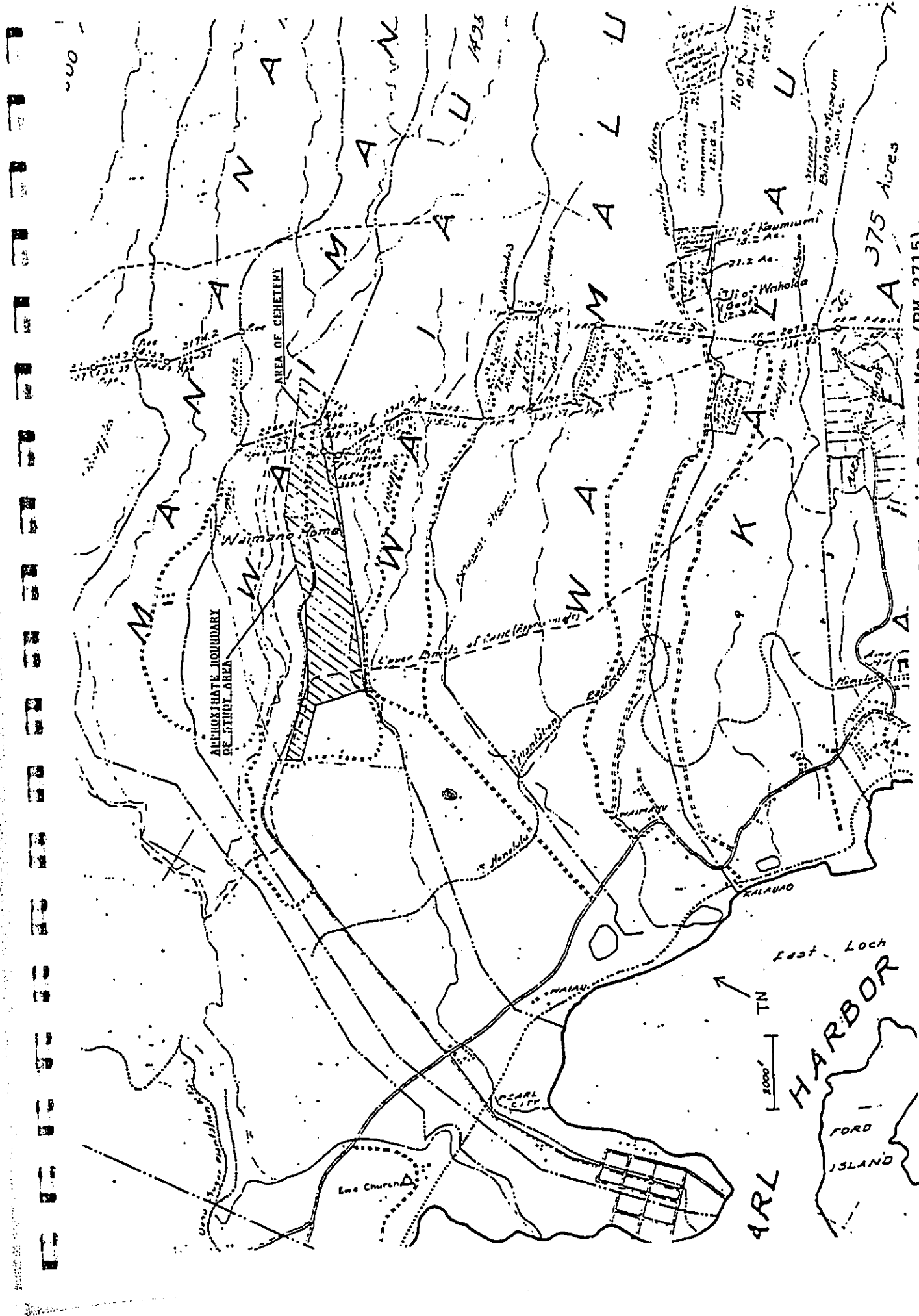


Fig. 6 Portion of 1924 Territory of Hawaii Survey Map (RM 2715).

elevation, was awarded to the foreigner Stevenson (Indices of Awards 1929). Furthermore, the 1924 Territory Survey map shows continuous agricultural plots and fishponds in the area of the L.C. awards and on Pearl City peninsula. The configuration of the two streams in Waimano ahupua'a probably helped to divide the population where Waimano Stream supported a smaller upland community, and the unnamed stream from Waiiau ahupua'a supported the larger coastal community. The coastal community was more populous because, as Hammatt et. al. (1988:10) aptly put it, "Fresh water, good agricultural land and abundant sea food (emphasis added) were to be found around the north central portion of Pearl Harbor and this is where people liked to live." This is also the immediate area where the legendary shark chiefess, Kaahupahau was said to bathe (Sterling and Summers 1978), where Handy (1940) recorded irrigated terraces, and where John Papa Ii (1959:97) locates the main trail from Honolulu through the taro patches and maika fields of Waiiau "to Waimano, to Manana, and to Waiawa.

Industry

The advent of sugar cane cultivation in Waimano ahupua'a may have been as early as 1850 or as late as 1900, first as the Honolulu Sugar Plantation, then as the Honolulu Plantation Company and finally, after 1947, as part of the Oahu Sugar Company. By the 1940's virtually all the accessible ridge top plateaus from Red Hill to Waiawa and Waimano Streams, up to elevations of 1,000 ft. or more were under sugar cultivation by

the Honolulu Plantation company. (Conde and Best 1973:331). The upper reaches of some of these ridge plateaus were also planted in pineapple as shown on the 1924 Territory Survey Map (R.M. 2715). This map also shows buildings of the Waimano Home, already in existence in 1924 (Refer to Fig. 6).

The 1924 Territorial Survey Map also shows an approximate upper limit of cane that appears to be at the lower boundary of the present study area. However, this line does not correlate with the field boundary lines shown on an undated map of the Honolulu Plantation Co. in Conde and Best (1973:331). Comparing the meanders and tributaries of Waiawa - Waimano streams on the plantation map to the current U.S.G.S. Topographical Map it appears plausible that Honolulu Plantation's field #34 was situated in the study area. In any event the study area was utilized by the sugar plantation to bring water to their fields. A dam at 636 ft. elevation in the Waimano Stream bed (mauka of the study area) collects water for the ditch that runs along the southeast side of the valley, tunneling through one ridge spur, and tops the study area plateau at about the 600' elevation contour mauka of the present day swimming pool (Refer to Fig. 3). This site (of the present day pool) was previously a reservoir of the plantation (personal communication). From the reservoir a formal ditch, constructed of hand dressed, basalt stones cemented with mortar using beach sand, proceeds makai upon the northwest side of the plateau (Figs. 7-9). The ditch presently appears to terminate within the Pearl City High School grounds.

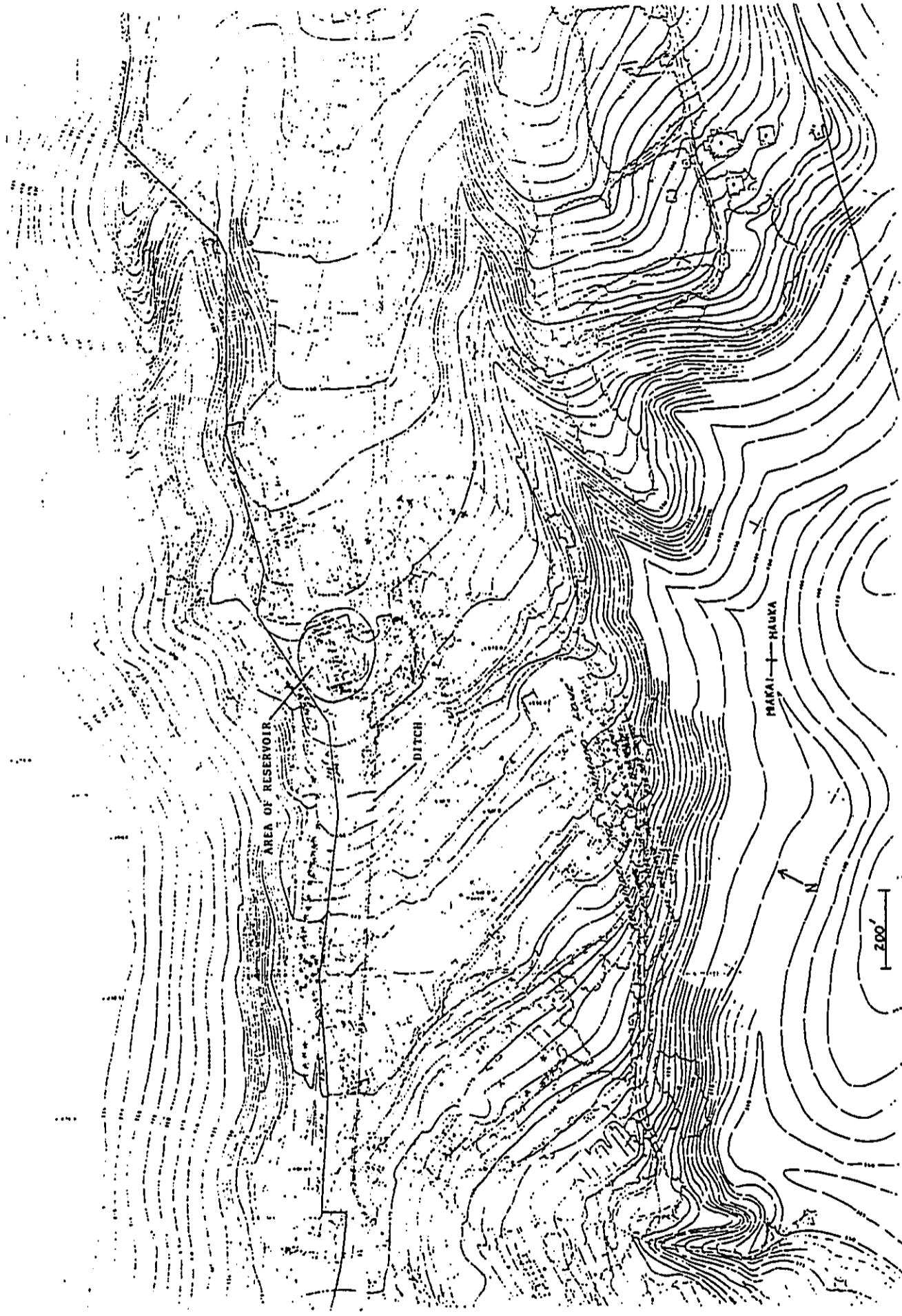


Fig. 7 Portion of Study Area, 5' Contours. Showing Reservoir Area and Ditch.

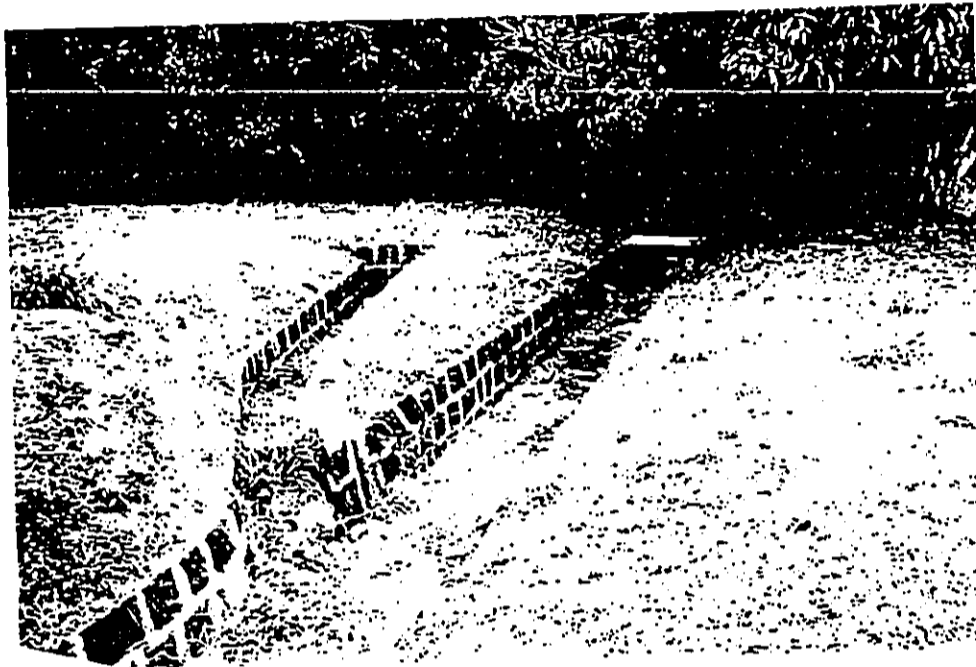


Fig. 8 Makai Portion of the Irrigation Ditch Showing
Primary Ditch and Smaller South Branching Ditch

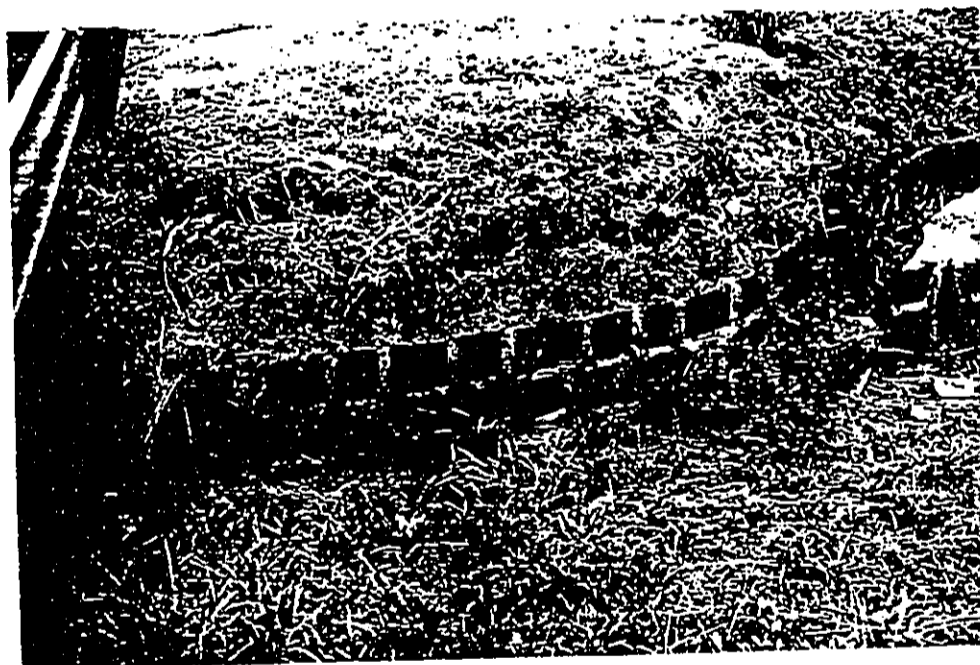


Fig. 9 View of South Side of Ditch Showing Road to Left and
Smaller Branch to Right.

Previous Archaeology Within the Study Area

In 1989 Peter Jensen conducted an archaeological study of the proposed Test Laboratory site that is located within the boundaries of the Waimano Training School and Hospital project area, but is excluded from the present study report herein. No archaeological sites were found by Jensen and he concludes that no further archaeological work is needed in the Test Laboratory site.

RESULTS AND RECOMMENDATIONS

No traditional Hawaiian archaeological sites were located in the study area. It is very probable that this area was a part of the wao kele or wao kanaka, the inland and upland forest regions where people "may live or occasionally frequent" (Pukui and Elbert 1985). Used for its resources of flora and fauna. If isolated occupation sites did exist all surface traces of them have been obliterated by sugar cultivation and/or the building of the Waimano Home in 1919-1921. No Hawaiian archaeological sites were located by Jensen (1989) in the excluded Test Laboratory site. It is not expected that subsurface features or sites will be unearthed during construction. However, if sites are unearthed, an archaeologist at the State Historic Sites Office should be contacted before construction work proceeds.

Only two items of historic interest were found during this study. The most prominent is the dressed-stone irrigation ditch. This ditch appears to be in good condition and is pleasing to the eye and it is, therefore, recommended that it be preserved within the proposed new landscape. Based on the National Register criteria for site significance this site is assigned the criterion code "C" (site is an excellent example of a site type). If preservation is not possible then the individual stones that makeup the ditch should be preserved and utilized in landscaping elsewhere, preferably in the Waimano School and Hospital project. A crude example of such usage is extant on the grounds along the parking lot entrance northwest of Waimano Home Road at the 765' elevation. (Figs. 10-11) These stones are of a similar type to



Fig. 10 Dressed Stones on Mauka side of Parking Lot Entrance.



Fig. 11 Dressed Stones on Makai side of Parking Lot Entrance

those used in the ditch and should be preserved or reused. Also as the technical expertise to produce this material is not readily available today as it was early in this century.

Finally, the graveyard on the ridge above the school buildings must be addressed (Fig. 12). It's somewhat remote and obscure location would seem to facilitate its remaining undisturbed, which is recommended. The National Register criterion code "E" (site has cultural significance. . . burials present) is assigned to this site. The ridge line in this area is generally less than 200' wide and seems best suited to be left as is.



Fig. 12 View of Graveyard, Facing West

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WAIMANO RIDGE MASTER PLAN
Final Environmental Assessment

APPENDIX C: BOTANICAL ASSESSMENT, WAIMANO TRAINING SCHOOL
AND HOSPITAL MASTER PLAN 'EWA DISTRICT, O'AHU

BOTANICAL ASSESSMENT
WAIMANO TRAINING SCHOOL AND HOSPITAL MASTER PLAN
'EWA DISTRICT, O'AHU

by

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Prepared for: AM Partners, Inc.
August 1990

BOTANICAL ASSESSMENT
WAIMANO TRAINING SCHOOL AND HOSPITAL MASTER PLAN
'EWA DISTRICT, O'AHU

INTRODUCTION

A master plan for the development of the Waimano Training School and Hospital (WTSH) site to accommodate the Developmental Disabilities Division programs is proposed. The demolition or renovation of existing buildings and/or construction of new buildings will be required. The WTSH site consists of 246 acres, of which roughly 110 acres are suitable for development; almost all of the 110 acres already support landscaped areas and buildings. About 20 acres, now largely overgrown by guava scrub, are to be used for the State's Department of Health (DOH) Laboratory Facility site and is excluded from this study. The remainder of the 246 acres consists of steep slopes and gulches. No development is planned for these areas.

A field reconnaissance to assess the botanical resources found on the 110-acre WTSH site was made on 24 July 1990. The primary objectives of the survey were to 1) provide a general description of the vegetation and 2) search for threatened and endangered plant species protected by Federal and State laws. In addition, the occurrence of any Exceptional Trees on the site was also checked. The scientific names used in the report are in accordance with Wagner *et al.* (1990) or, for the ornamental species, with St. John (1973).

DESCRIPTION OF THE VEGETATION

The project site is located on the relatively level "plateau" portion of Waimano Ridge; elevation ranges from about 450 ft. by

the administration building to about 800 ft. at the upper end of the property near the HECO powerline easement.

Landscape plantings include a variety of fruit trees such as mango (Mangifera indica), coconut (Cocos nucifera), star fruit (Averrhoa carambola), lychee (Litchi chinensis), avocado (Persea americana), and mountain apple (Syzygium malaccense). A number of different banyan species (Ficus spp.) are found throughout the grounds, especially on the upper half of the property. Many are fine, large, old specimens. Other tree species found on the grounds include monkeypod (Samanea saman), Plumeria hybrids, Java plum (Syzygium cumini), royal palm (Roystonea elata), Norfolk Island pine (Araucaria heterophylla), jacaranda (Jacaranda mimosifolia), and various shower tree hybrids (Cassia spp.). A small orchard of mixed fruit trees is also found on the site; plantings include star fruit, mountain apple, papaya (Carica papaya), calabash tree (Crescentia cujete), and jaboron or pummelo (Citrus grandis).

Shrubs commonly used as foundation plantings or along roadsides and driveways include croton (Codiaeum variegatum), Hibiscus hybrids, various gingers (Hedychium spp., Alpinia spp.), ti (Cordyline fruticosa), and pua-kenikeni (Fagraea berteriana).

The composition of the lawn species changes with increasing elevation and rainfall. On the drier, lower end of the site, typical lawn grasses are Bermuda grass or manienie (Cynodon dactylon) and swollen finger grass (Chloris barbata). Areas with heavy pedestrian traffic support West Indian dropseed grass (Sporobolus indicus). On the wetter, upper elevation portions of the site, common lawn grasses are a mixture of Hilo grass or mau'u-Hilo (Paspalum conjugatum), carpetgrass (Axonopus fissifolius), yellow foxtail (Setaria gracilis), Dallis grass (Paspalum dilatatum), and fimbriate paspalum (Paspalum fimbriatum). Spanish clover (Desmodium incanum) is also common in

these wetter areas.

On the steep slopes which mark the perimeter of the buildable areas, the vegetation consists of scattered stands of Eucalyptus and ironwood (Casuarina equisetifolia) trees in a matrix of Christmas berry (Schinus terebinthifolius) and guava (Psidium guajava) scrub.

DISCUSSION

Because the relatively level, buildable portions of the site have been in use for a long period of time, there are no remnants of any sensitive native plant communities on the site. No officially listed threatened and endangered species, protected by Federal and State endangered species laws, were found during the survey; nor did we encounter any plants proposed or candidate for such status (U. S. Fish and Wildlife Service 1989, 1990). A few of the more common natives, such as 'ohi'a (Metrosideros polymorpha), koa (Acacia koa), and 'akia (Wikstroemia oahuensis), however, can be found on the steep slopes outside of the areas to be developed. These natives can be found in similar environmental habitats throughout the islands. An earlier survey of the DOH Laboratory Facility site (Char 1989) recorded similar findings.

None of the trees on the WTSH are listed on the City and County's Register of Exceptional Trees (Ordinance 78-91, 81-32).

There is very little of botanical interest or concern on the property. The proposed development is not expected to have a significant negative impact on the botanical resources as almost all the vegetation consists of landscape material or weedy species associated with disturbed areas. There are no botanical reasons to impose any restrictions, impediments, or conditions to the development of this site.

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