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EXECUTIVE CHAMBERS
HONOLULU

BENJAMIN J. CAYETANO
GOVERNOR

December 17, 1997

TO: The Honorable Sam Callejo, Comptroller
Department of Accounting and General Services

SUBJECT: Acceptance of the Final Environmental Impact Statement for the University of Hawaii at Hilo University Park

With this memorandum, I accept the Final Environmental Impact Statement for the University of Hawaii at Hilo University Park, the island of Hawaii, as satisfactory fulfillment of the requirements of Chapter 343, Hawaii Revised Statutes. The economic, social and environmental impacts, which will likely occur should this project be implemented, are adequately described in the statement. The analysis, together with the comments made by reviewers, provides useful information to policymakers and the public.

My acceptance of the statement is an affirmation of the adequacy of that statement under the applicable laws but does not constitute an endorsement of the proposed action.

I find that the mitigation measures proposed in the environmental impact statement will minimize the negative impacts of the project. Therefore, if this project is implemented, the Department of Accounting and General Services and/or its agents should perform these or alternative and at least equally effective mitigation measures at the discretion of the permitting agencies. The mitigation measures identified in the environmental impact statement are listed in the attached document.

Benjamin J. Cayetano

BENJAMIN J. CAYETANO

Attachment

c: Honorable Lawrence Miike
Office of Environmental Quality Control

DEC 15 1997

ATTACHMENT TO ACCEPTANCE MEMORANDUM FROM GOVERNOR BENJAMIN CAYETANO TO SAM CALLEJO REGARDING THE UNIVERSITY OF HAWAII AT HILO UNIVERSITY PARK ENVIRONMENTAL IMPACT STATEMENT MITIGATION MEASURES

The following list of mitigation measures identified in the final environmental impact statement will minimize the negative impacts of the project. If the project is implemented, the Department of Accounting and General Services (DAGS) and/or its agents should perform these or alternative and at least equally effective mitigation measures at the discretion of the permitting agencies.

Construction Impacts

Noise

DAGS will reduce noise by using plywood noise barriers where close-in construction work is unavoidable, using mufflers on equipment and vehicles requiring an exhaust of gas or air, and complying with DOH construction noise limits and curfew times.

Air Quality

DAGS will employ frequent watering of unpaved roads and exposed soil surfaces, and accelerate landscaping of completed areas as dust control measures to reduce impacts to air quality.

Water Quality

To prevent impacts to water quality, DAGS will develop an erosion control plan with such measures as:

- hydromulching with seeds or placement of erosion control matting to stabilize slopes and exposed surfaces;
- construction of a graveled site entrance for use by construction vehicles to minimize tracking debris onto paved streets;
- the use of silt fences, berms, and temporary siltation basins;
- and compliance with the conditions of the National Pollutant Discharge Elimination System (NPDES) permit, Section 404 permit, Section 401 Water Quality Certification, Coastal Zone Management Consistency Certification, and Stream Channel Alteration Permit.

Public Safety

DAGS will cover trenches with steel plates during non-working hours, and maintain all walkways and intersections in passable condition to reduce impacts to pedestrian traffic.

Traffic

To reduce impacts to traffic, DAGS will provide access to and from driveways and public streets at all times, open all lanes to motorized traffic during non-working hours, and, as required by the County of Hawaii, hire special duty police officers to direct the flow of traffic.

Archeological and Historical Remains

DAGS will cease all activity and notify the State Historic Preservation Division to prevent impacts to archaeological features unexpectedly discovered during construction.

Flora and Fauna

DAGS will construct the proposed bridge over Waiakea Stream as a span supported on endwalls at or outside of the ordinary high water mark to minimize impacts to aquatic life.

Operational Impacts

Structures

The corrosive nature of the intermittent presence of vog during kona weather conditions will be a consideration during design of the project's buildings and facilities to lessen impacts to the structures.

Traffic

DAGS will reduce the effects of increase in traffic volumes by:

- Providing a left-turn storage lane for motorists entering the campus at the Lanikaula Street Campus Access.
- Providing coning and additional traffic control personnel during large traffic volume special events.

Water Quality

DAGS will employ storm drain drywells and landscaping/grading to provide filtering and detention of runoff to ensure no increase in runoff toward adjacent properties and to minimize impacts to water quality.

Flora and Fauna

DAGS will retain the existing bedrock basalt stream bed during channel alterations to significantly reduce potential impacts to aquatic environments.

View planes

DAGS proposes to install a 17-foot high half-million gallon offsite reservoir for this project on previously undeveloped land. It will maintain the existing vegetation ('Ohi'a trees within the 'ohi'a tree/uluhe fern forest) surrounding the reservoir site to shield the reservoir from public view.

Solid Waste

DAGS or UH Hilo will reduce the impacts of an increase in solid waste generated by the project by:

- Continuing UH Hilo's active recycling program, with construction of additional collection centers within the site;
- Continuing the composting program of green waste for use as gardening material, which involves chipping and stockpiling tree trimmings, and possibly constructing additional composting sites.
- Preparing a solid waste management plan that conforms to the requirements of the Department of Public Works Solid Waste Division.

Energy

DAGS or UH Hilo will minimize the impacts of increased energy use by requiring installation of energy-related equipment and systems with high efficiency levels during the design phase, and applying life cycle cost criteria in the selection of energy-related systems.

Sept. 1997 FEIS
UH of Hi. @ Hilo UH park

UNIVERSITY OF HAWAII AT HILO
UNIVERSITY PARK
Hilo, Hawaii
TMK: 2-4-01: 7, 12, 19, 41 and 2-4-03: 26

Final Environmental Impact Statement

This environmental document has been prepared pursuant to Chapter 343, HRS

Proposing Agency:

Department of Accounting and General Services
State of Hawaii
1151 Punchbowl Street
Honolulu, Hawaii 96813

Prepared by:

Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

September 1997

UNIVERSITY OF HAWAII AT HILO
UNIVERSITY PARK
Hilo, Hawaii

Final Environmental Impact Statement

This environmental document has been prepared pursuant to Chapter 343, HRS

Proposing Agency:

DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
STATE OF HAWAII

Accepting Authority:

GOVERNOR, STATE OF HAWAII

Responsible Official:

Sam Callejo

Sam Callejo, Comptroller

9-11-97

Date

Prepared by:
Engineering Concepts, Inc.

September 1997

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CHAPTER 1

INTRODUCTION AND SUMMARY

1.1 PURPOSE OF THIS DOCUMENT

The University of Hawaii has proposed to develop the University Park, a 116-acre expansion of the University of Hawaii at Hilo (UH Hilo) campus. The project will include academic facilities, recreational facilities and student housing to meet growing campus demands into the next century. The Department of Accounting and General Services (DAGS) functions as the agent for development of the project.

It has been determined that an environmental impact statement (EIS) is required for the proposed University Park development, pursuant to Chapter 343, Hawaii Revised Statutes. This determination has been based primarily on the project's potential short-term impact on the physical environment and long-term impact on the community.

Revisions to the text of the Draft EIS appear in bold italic type.

1.2 SUMMARY OF DEVELOPMENT

Applicant: Department of Accounting and General Services
State of Hawaii
1151 Punchbowl Street
Honolulu, Hawaii 96813

Contact: Ms. Gina Ichiyama
586-0474

Accepting Authority: Office of the Governor
State of Hawaii

Project Title: University of Hawaii at Hilo
University Park

Proposed Action: Development of the University Park, a 116-acre expansion of the UH Hilo campus, including improvements to offsite infrastructure required to support the expansion.

Location: Hilo, Hawaii
TMK: 2-4-01: 7, 12, 19, 41 and 2-4-03: 26

Property Owner: State of Hawaii

Project Area: 116 Acres

Existing Uses: Undeveloped and unimproved land

State Land Use: *University Park site - Urban district*
Offsite water reservoir - Agricultural district

County Zoning: *University Park site - Single Family Residential (RS-10) and Agricultural (A-1a)*
Offsite water reservoir - A-1a

1.3 PROJECT OBJECTIVES

Development of the University Park will expand the existing UH Hilo campus, allowing for growth in enrollment in an effort to achieve the ultimate development goals set forth in the *University of Hawaii at Hilo Long Range Development Plan.*

1.4 PROJECT AND SITE DESCRIPTION

The proposed action is development of the University Park, a 116-acre expansion of the existing UH Hilo campus, and offsite infrastructure improvements which are required to support the campus expansion. The development will include a research and technology park, academic facilities, recreational facilities, and student housing. The project site is located west of the existing UH Hilo campus, separated by Waiakea Stream.

1.5 ALTERNATIVES CONSIDERED

Alternatives to the proposed project were "no action", which would restrict growth of the UH Hilo campus, and construction of the University Park at another location, resulting in a non-contiguous campus. Both alternatives were less desirable than the proposed project.

In addition, the proposed offsite reservoir site was the most favorable location based on the land elevation, land-ownership and minimization of transmission mains.

1.6 SUMMARY OF POTENTIAL IMPACTS

Soils

Unstable thixotropic soils may be present at the project site.

Erosion and Drainage
Soil erosion potential will increase during construction and decrease after development. Degradation of receiving water quality will be minimized by employing best management practices to minimize erosion and offsite sediment transport.

Waiakea Stream

Construction of the bridge will impact the lower end of an extensive group of fresh water pools distributed along the stream bed. Adverse changes in stream hydrology are not anticipated by either the bridge or stream bank stabilization.

Traffic

The project will impact traffic flow at several intersections based on comparison of level-of-service (LOS) results between the 2010 traffic conditions during the weekday peak hours. Construction of the proposed improvements may also result in periodic traffic disruptions to the existing campus and residents in the vicinity of the project.

Air Quality

Construction activity will be the principal source of short-term air quality impact. In addition, there will be offsite impacts due to the operation of concrete and asphalt batching plants needed for construction. No exceedence of State or Federal carbon monoxide standards are predicted for 2010. ***The presence of vog occurs intermittently. Its presence may contribute to acid rain and aggravate certain lung diseases.***

Noise

The greatest increase in traffic noise levels are expected to occur within the project site and along the primary thoroughfare to Lanikaula Street which crosses through the existing campus. However, noise mitigation will not be required by federal and local noise standards for residences, classrooms and offices. In the short term, audible construction noise will be unavoidable during the entire construction period.

Population and Housing

Onsite population is anticipated to increase by 3,625 persons (3,067 students and 558 faculty/staff), which is likely to impact areas nearest to the project site. Similarly, the additional population will increase the housing need in the vicinity.

Character of the Area

The project is consistent with public goals and policies, and is likely to be compatible with community expectations for the future. However, the nearby homes will be impacted by the change in residential character due to increased people, traffic and activity. These residences will also be affected by short-term construction-related impacts, such as dust, noise and construction traffic.

Public Facilities and Services

The additional service population, buildings and traffic will have a potential impact to police protection, fire protection, medical services. Recreational facilities will also be impacted by the population increase.

Views

View planes will be affected due to construction on previously undeveloped lands. The offsite reservoir will be approximately 17 feet high (floor to overflow spillway elevation).

Safety

Public safety during construction is a concern due to the close proximity of existing campus.

Solid Waste

Increase in population and facilities will increase generation of solid wastes.

Energy Consumption

Increase in population and facilities will increase energy consumption.

Seismic Hazard

The project site is located within Seismic Probability Zone 3.

Volcanic Hazard

Lava flows have approached the project site on two known occasions in 1881 and 1984.

1.7 UNAVOIDABLE ADVERSE IMPACTS

The following unavoidable adverse impacts have been identified:

1. Short-term impacts during construction including dust, noise, air quality and traffic.

2. A change in character of the area due to increased people, traffic and activity will be a long-term impact of the project.

1.8 SUMMARY OF PROPOSED MITIGATION MEASURES

Measures to mitigate potential adverse impacts are summarized below.

Soils

- ***Geotechnical investigations will be conducted during design to determine soil types and construction suitability.***

Erosion and Sediment Control

- Compliance with approved erosion control plans and NPDES permit conditions.
- Stabilize exposed surfaces by hydromulching with seeds or placement of erosion control matting.
- Installation of graveled construction vehicle ingress/egress
- Construction of silt fences, berms, temporary sediment basins, etc. to prevent direct discharge of sediment-laden runoff to storm drains and streams.

Drainage

- Construction of drywells.
- Landscaping/grading to filter and detain runoff.

Aquatic Biota and Water Quality

- Compliance with Section 404, Section 401 Water Quality Certification, CZM Consistency Certification, and Stream Channel Alteration Permit conditions.

Archaeological Resources

- Cease construction in area and notify appropriate agencies in the event archaeological features are encountered during construction.

Traffic

- Construction of left turn storage lanes for motorists entering the campus from Kawili Street and Lanikaula Street.
- Coning lanes and hiring traffic control personnel to assist with traffic flow at high-traffic generating functions held at the Multi-Purpose Center.
- Maintain access to and from driveways and public streets at all times during construction.
- Cover trenches with steel plates and keep all traffic lanes open during non-working hours.
- Hire special duty police officers to direct traffic, as required.
- Maintain pedestrian traffic access on all walkways and at all intersections.

Air Quality

- Frequent watering of unpaved roads and exposed soil surfaces, and landscaping of completed areas to control fugitive dust.
- Compliance with regulatory requirements for air pollution sources.
- ***Design buildings/facilities will consider the corrosive nature of the environment.***

Noise

- Compliance with all State and County noise regulations, including HAR 11-46 "Community Noise Control", and the grading permit.
- Installation of plywood noise barriers where close-in construction is unavoidable.
- Schedule noisy construction activities during non-classroom hours.

Housing

- High vacancy rate in current housing market is likely to continue under current economic conditions.
- Additional student housing is proposed near the University Park site.

Change in Character of the Area

- Compliance with public rules and regulations to mitigate construction-related impacts.
- Direct communication between UH Hilo and its neighbors for notification of construction schedules and specific activities, to help residents in forming reasonable expectations of the nature and timing of changes.
- Conduct an informational program to dispense information and respond to community inquiries.

Fire Protection Services

- Compliance with the Fire Code.

Views

- Maintenance of existing vegetation outside the reservoir fence line to provide a visual screen.

Safety

- Compliance with State and County codes and statutes.
- Install barricades around construction activity to protect public.

Solid Waste

- Implementation of recycling, composting, and other measures to reduce the quantity of waste generated and landfill space required.
- Inclusion of waste minimization and recycling infrastructure in the design phase.

Energy Consumption

- ***Design will comply with building code requirements.***

Seismic Hazard

- ***Design will comply with building code requirements.***

1.9 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Short-term uses of man's environment are associated with the urbanization process and include clearing, grubbing, grading and construction of the University Park facilities. Maintenance and enhancement of long-term productivity relates to the contribution of the university campus expansion to society and the general well-being of its residents.

1.10 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible and irretrievable resources committed to the project include funds, labor, energy, and raw materials required to construct and operate the proposed project. Permanent loss of open space would result from development of the project.

1.11 COMPATIBILITY WITH LAND USE PLANS AND POLICIES

The project will be compatible with State of Hawaii and County of Hawaii land use plans and policies.

1.12 UNRESOLVED ISSUES

The following issues remain unresolved:

1. The implication of (all) development upon ceded lands.
2. Purchase of a civil defense warning siren for installation within the project site.
3. Design of facilities to function as civil defense emergency shelters.

4. Resolution of the proposed Ainako Street Extension which is shown to bisect the project site on the present City of Hilo Zone Map.

5. The visual impact of individual facilities may need to be assessed in Supplemental EIS document(s).

1.13 NECESSARY PERMITS AND APPROVALS

The following permits and approvals will be obtained as planning and design of the project proceeds. None of the permit applications have been submitted to the permitting authority for processing to date.

Approval Required	Authority
Building Permit	County Department of Public Works
Grubbing/Grading Permit	County Department of Public Works
Stream Channel Alteration Permit	State Commission on Water Resource Mgmt.
Construction Storm Water NPDES	State Department of Health
Hydrotesting NPDES	State Department of Health
Section 404 Permit	Army Corps of Engineers
CZM Consistency Certification	State Office of Planning
Section 401 Water Quality Cert.	State Department of Health
Variance from Pollution Controls	State Department of Health
Noise Permit	State Department of Health
Permit to Work within State R-O-W	State Department of Transportation
Permit to Work within County R-O-W	***County Department of Public Works***
Letter of Map Revision	***Federal Emergency Management Agency***
Underground Injection Control (UIC) Permit	***State Department of Health***

CHAPTER 2

PROJECT DESCRIPTION

2.1 NEED FOR THE PROJECT

Efforts to master plan the University Park of the University of Hawaii Hilo Campus (UH Hilo) were initiated in 1986, when a conceptual master plan for the Research and Technology Park was prepared by Wilson Okamoto & Associates. Inclusion of a research and technology park was considered an integral part of the campus development plan to accommodate future needs of academic and ancillary programs. Integrating research and technology functions was expected to enhance the attractiveness of UH Hilo and offer community-wide benefits in terms of economic growth and stimulation. Preparation of another planning report, prepared by Media Five, followed in 1989. Based on these master plan reports, mass grading and construction of an access road were completed in 1991. Utility infrastructure to serve existing facilities was constructed in 1994.

A long-range development plan that incorporated the University Park in the UH Hilo overall plan was prepared by PBR Hawaii and Kajioka Okada Yamachi Architects in March 1996. *The University of Hawaii at Hilo Long Range Development Plan* has provided a description of the programs and facility requirements to accommodate 5,000 full time equivalent (FTE) students, and future developments of the University of Hawaii at Hilo and the University Park.

Development of the proposed University Park, bridge, roadway and related infrastructure will expand the existing campus in an effort to achieve the ultimate development goals set forth in the *Long Range Development Plan.*

2.2 PROJECT SITE

The 116-acre project site is located in the city of Hilo on the island of Hawaii, adjacent to the existing UH Hilo campus. Waiakea Stream separates the University Park site from the existing campus. Refer to **Chapter 3** for an expanded description of the affected environment at the project site.

2.3 PROPOSED ACTION

The proposed action is development of the University Park, a 116-acre expansion of the existing UH Hilo campus, including improvements to offsite infrastructure which are required to support the campus expansion. The proposed University Park development is illustrated on **Figures 1 and 2** and will include the following land uses:

- Research and technology park
- Academic facilities

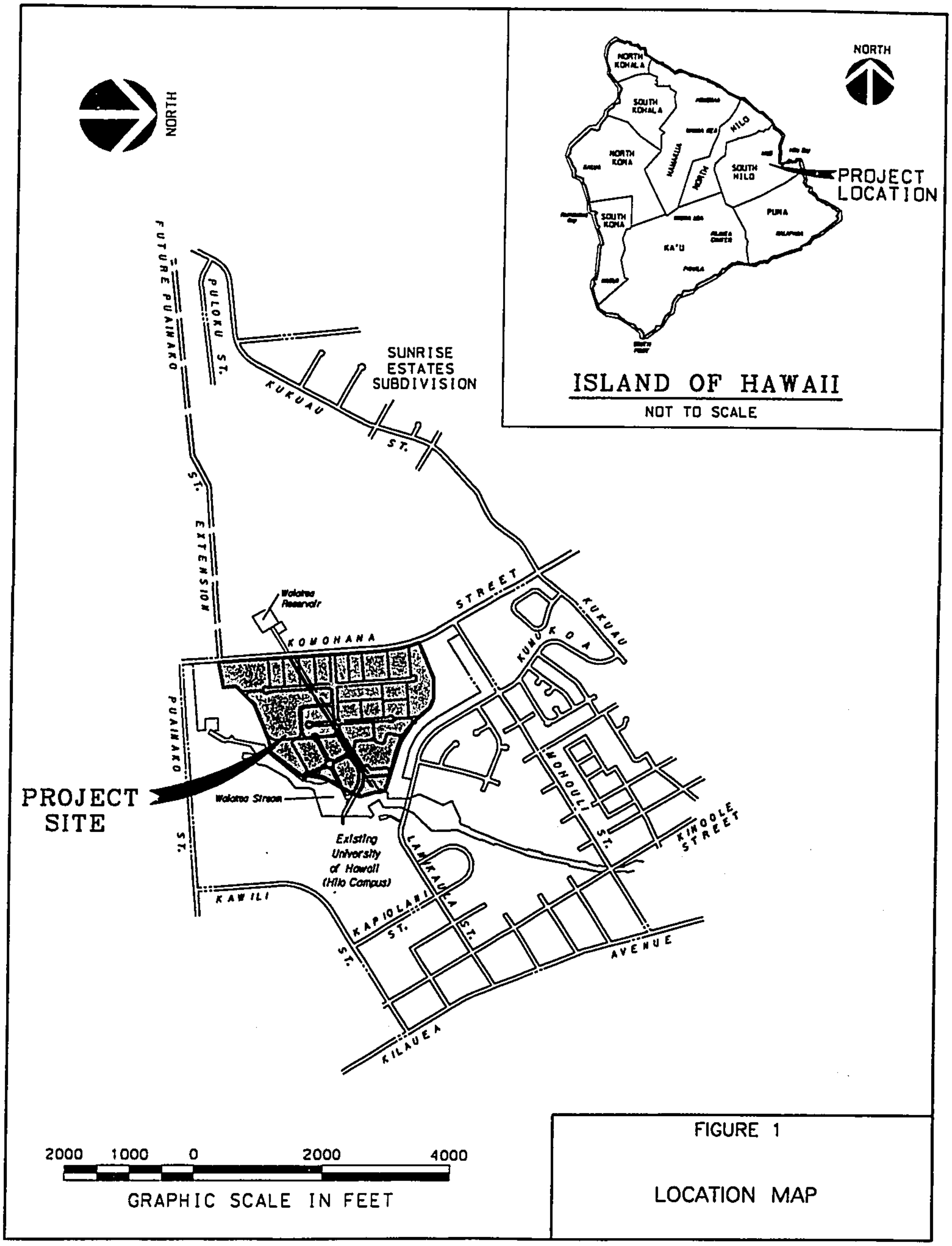

FIGURE 1

LOCATION MAP

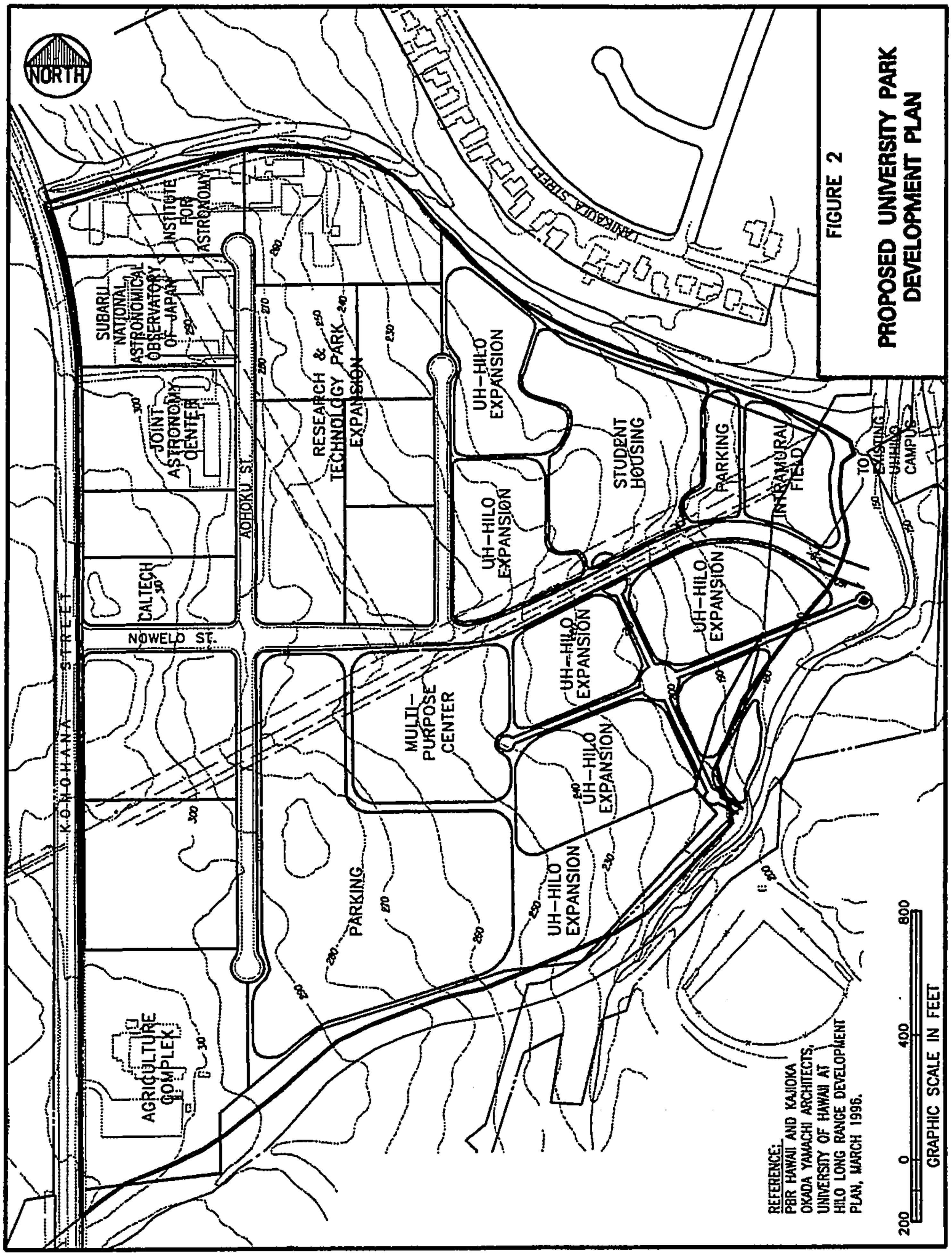

FIGURE 2
PROPOSED UNIVERSITY PARK DEVELOPMENT PLAN

- Recreational facilities
- Student housing

Construction will be phased, to meet the facility requirements of the university. The initial construction phase, comprised of offsite infrastructure required to support the University Park development, is discussed in **Section 2.4**. Future construction phasing has not been specifically defined.

Potable water for domestic use and fire protection will be provided by connection to the municipal water systems. In addition, design of facilities will be in accordance with Fire Code requirements. Wastewater generated by the project will be conveyed to the municipal sewer system for treatment and disposal. Electrical service will be provided by Hawaii Electric Light Company, Inc. Storm runoff will be conveyed to onsite storm drains and drywells to ensure no increase in runoff to adjacent properties after development. A solid waste management plan will be prepared in accordance with the rules and regulations of the County Department of Public Works, Solid Waste Division and submitted for approval.

2.4 INITIAL CONSTRUCTION PHASE

Development of the academic, recreational and dormitory facilities proposed for the University Park *cannot occur until the necessary utility infrastructure* is in place. The initial construction phase will include offsite infrastructure improvements to support the University Park development as illustrated on **Figures 3 and 4**. These offsite improvements include:

- A 0.5 million gallon reservoir and water line to extend potable water service to the University Park site;

- A bridge across Waiakea Stream to provide vehicular and pedestrian access between the University Park and existing UH Hilo campus;

- Waiakea Stream channel improvements to stabilize the stream bank in the vicinity of the bridge crossing;

- Road improvements within the existing UH Hilo campus, including extension of Nowelo Street, widening of an existing service road to Lanikaula Street, modification of the Kawili Street campus entrance, and modifications to the shop building access road and Campus Center parking lot;

- Addition of a left turn storage lane on Kawili Street; and

- A 12-inch water main connecting two ends of the existing onsite water system in association with the Nowelo Street extension and Waiakea Stream bridge.

Each of these proposed offsite infrastructure improvements is discussed below.

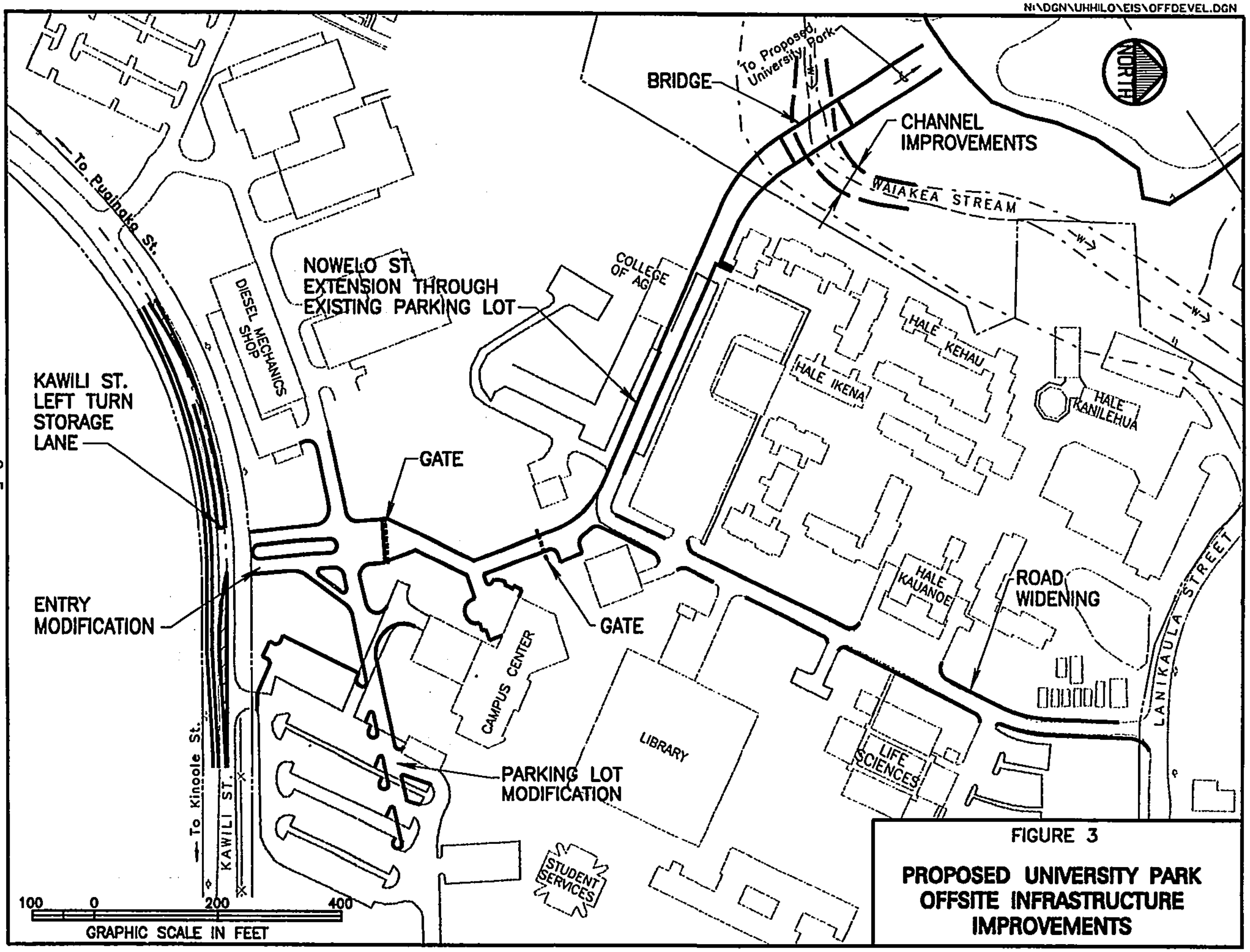

FIGURE 3

PROPOSED UNIVERSITY PARK OFFSITE INFRASTRUCTURE IMPROVEMENTS

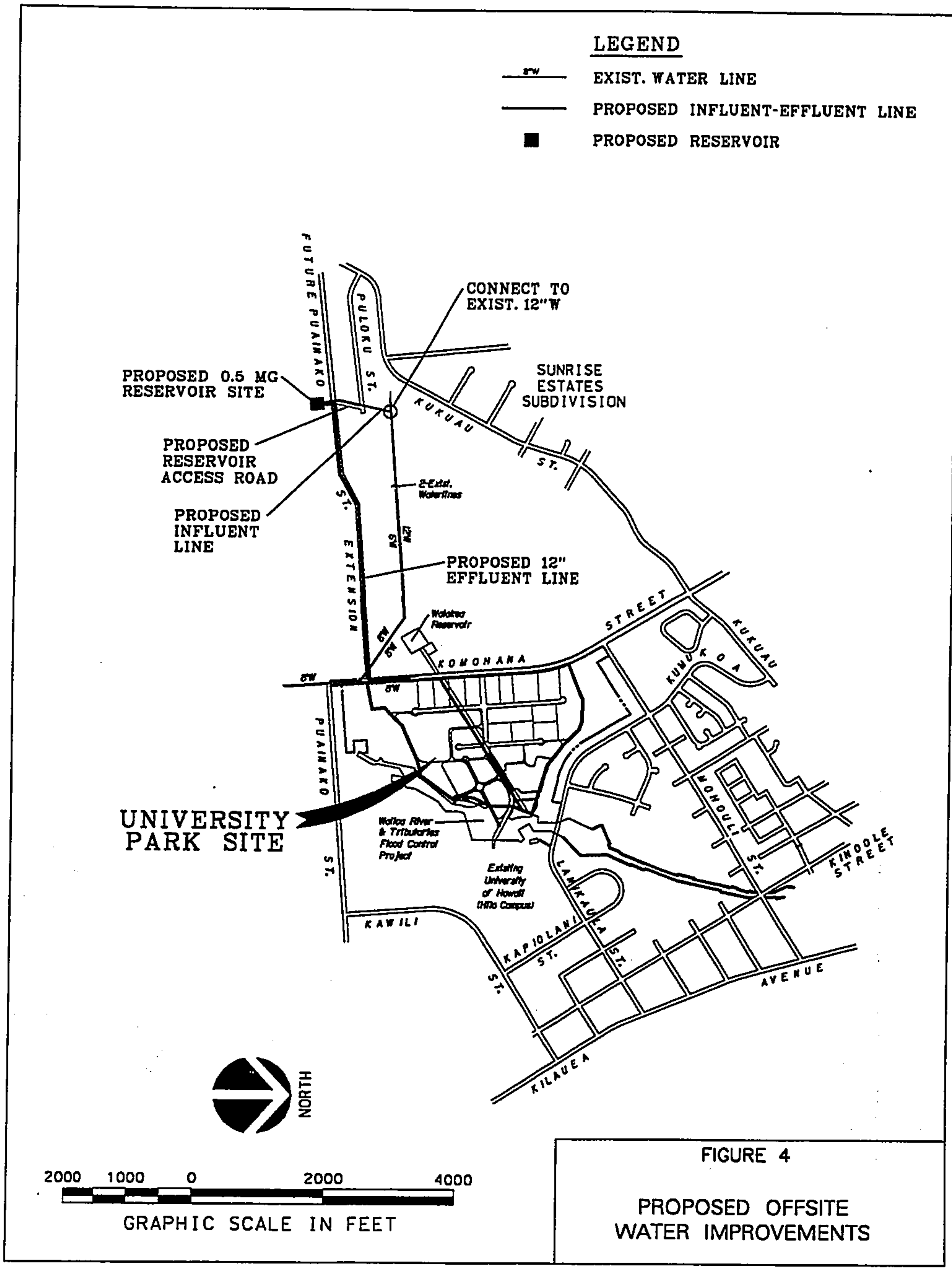

FIGURE 4

PROPOSED OFFSITE
WATER IMPROVEMENTS

2.4.1 Offsite Reservoir and Water Line

Construction of a 0.5 million gallon reservoir is proposed on state land near the Sunrise Estates subdivision located to the west of the University Park site (see **Figure 4**). The proposed reservoir spillway elevation is 479 feet, to correspond with the existing Haihai and Kawailani reservoirs, serving lands located above an elevation of 254 feet. The reservoir will be served by separate influent and effluent lines. The influent line will connect to a 12-inch transmission main which conveys water from an existing pressure breaker tank (spillway elevation = 724 feet). The effluent line is proposed to be constructed within the proposed Puainako Street extension alignment, to Komohana Street which fronts the University Park site. The proposed water facility improvements will be conveyed to the County Water Commission prior to any metered service being granted. Design, construction and conveyance of water facility improvements will be coordinated with the Department of Water Supply to ensure compliance with applicable standards and regulations.

2.4.2 Waiakea Stream Bridge and Bank Stabilization

The proposed bridge is a 95-foot long, single-span crossing with prestressed concrete girders. Bridge abutments will be located outside of the Waiakea Stream floodway. Grouted rip-rap slope paving is proposed to stabilize the west bank of the floodway. The slope paving will extend approximately 80 feet upstream and 180 feet downstream of the bridge, constructed on a 2:1 (horizontal to vertical) slope. Waiakea Stream will be widened approximately 10 feet on the west side of the stream for an approximate length of 45 feet from the upstream end of the proposed slope paving. A concrete rubble masonry (CRM) wall is proposed on the east bank of the stream. The wall will extend approximately 35 feet upstream and 150 feet downstream of the bridge. Upstream of the CRM wall, grouted rip-rap slope paving at a 2:1 slope is proposed, extending for approximately 130 feet. Downstream of the CRM wall, grouted rip-rap slope paving at a 2:1 slope is proposed, extending for approximately 70 feet.

A plan view and a section view of the proposed bridge and stream bank stabilization is illustrated on **Figures 5 and 6**, respectively.

2.4.3 UH Hilo Road Improvements

Several road improvements are proposed within the existing UH Hilo campus to facilitate vehicular and pedestrian access with the proposed University Park development. These road improvements are illustrated on **Figure 3** and are described below:

Nowelo Street Extension. Nowelo Street, presently serving the Research and Technology Park within the University Park site, will be extended into the existing UH Hilo campus in association with the Waiakea Stream bridge construction. Within the University Park site, the road cross section will be reduced from 60 feet (18-foot wide pavement, 2-foot wide gutter, 4-foot wide gravel strip, and 6-foot wide sidewalk on each side of the centerline) to 48 feet (16-foot wide pavement, 2-foot wide gutter and 6-foot wide sidewalk on each side of the centerline). The reduced pavement section will include a 12-foot wide travel lane and 4-foot wide bike lane in each direction. The 48-foot wide road cross section will

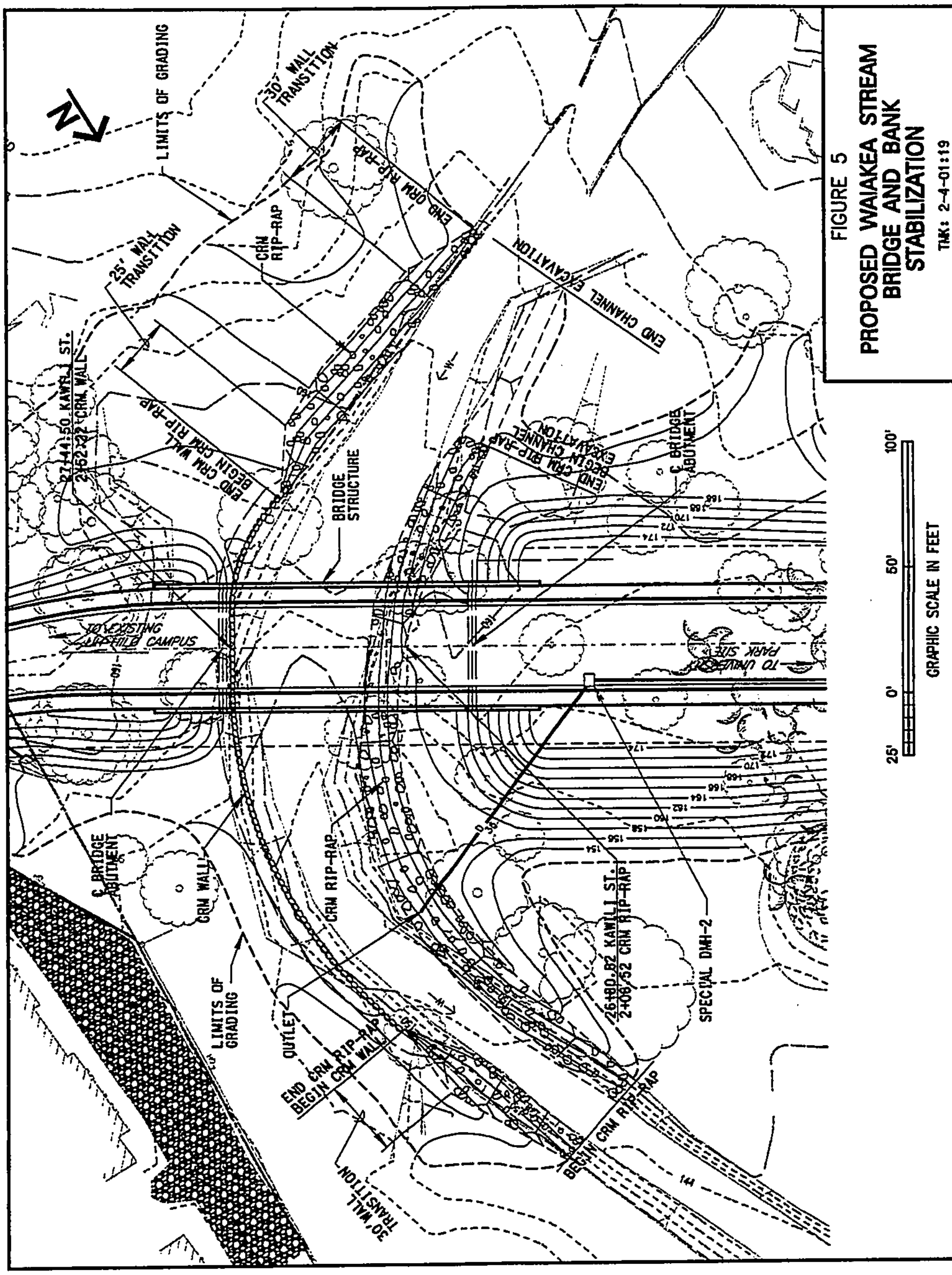

FIGURE 5
PROPOSED WAIAKEA STREAM BRIDGE AND BANK STABILIZATION
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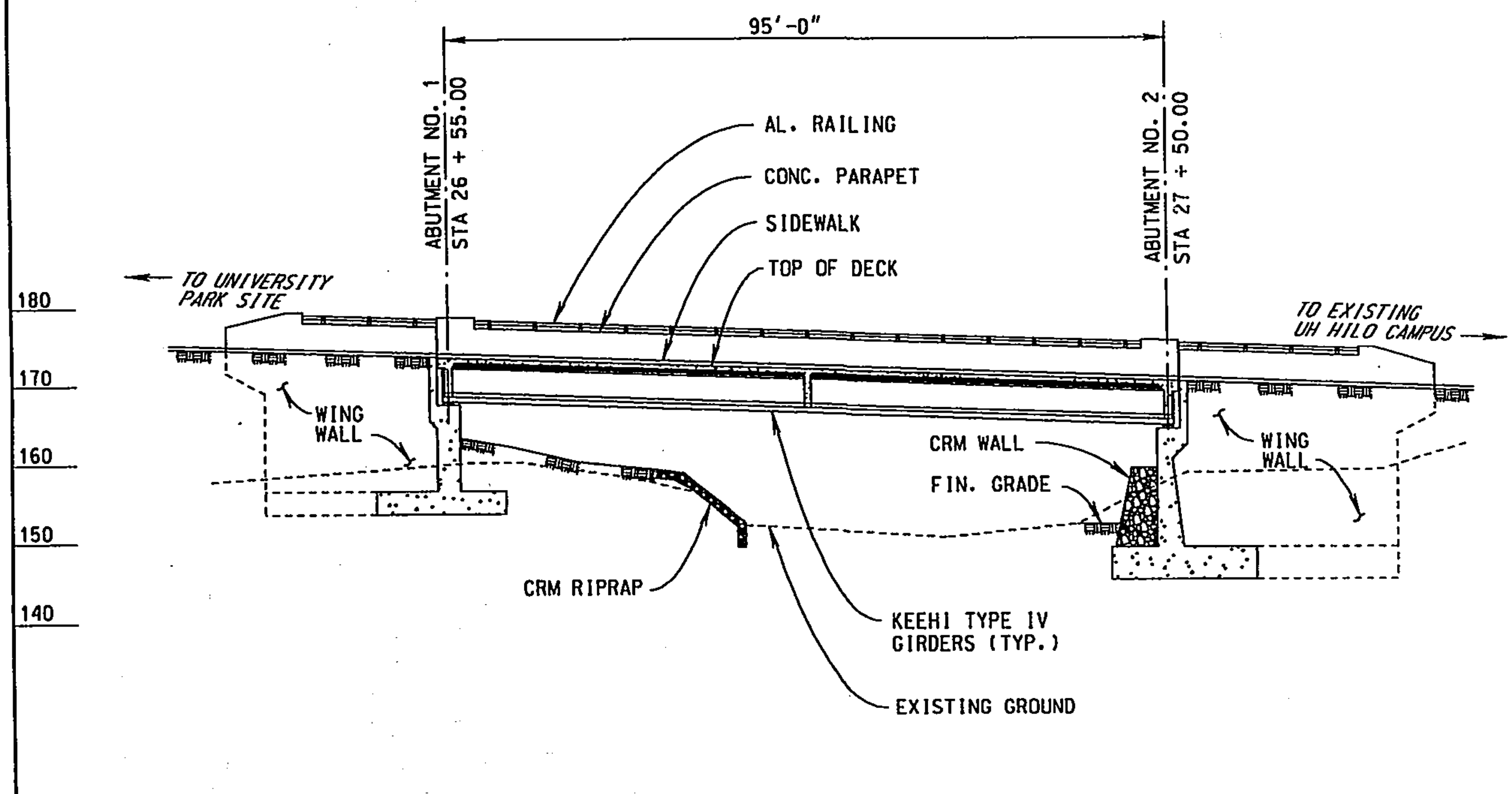


SECTION

NOT TO SCALE

FIGURE 6

PROPOSED BRIDGE SECTION

continue from the University Park site across the bridge to the existing UH Hilo campus where it will transition to a 24-foot wide cross section consisting of two 12-foot wide travel lanes. A gated vehicular access will be provided between the Nowelo Street extension and the Kawili Street entry.

Road Widening. The existing service road extending from Lanikaula Street through the campus will be widened from 20 feet to 24 feet. Curbs will be constructed on both sides of the widened road and a 6-foot wide sidewalk is proposed along the west side. The road widening will connect to the Nowelo Street extension, providing access to the University Park site through the existing UH Hilo campus from Lanikaula Street.

Kawili Street Entry Modification. The western entry from Kawili Street into the existing Campus Center parking lot will be closed and a new Kawili Street entrance will be constructed at a location approximately 220 feet to the west. The proposed campus entry road will be 68 feet wide with two 12-foot wide lanes in each direction and a 20-foot wide median. An additional right-turn lane will be provided for cars entering the Campus Center parking lot. Improvements will also include a road from the main entry to access the shop area located to the west of the new Kawili Street entrance.

Parking Lot Modification. An additional parking bay will be constructed to the west of the existing Campus Center parking lot. The parking lot circulation road will be modified to conform to the proposed campus entry modification.

2.4.4 Kawili Street Left-Turn Lane

A left-turn storage lane on Kawili Street is proposed at the intersection with the new campus entry road. Kawili Street will be widened to accommodate this new turning lane. Grading required for the road widening may extend into the adjacent state lands south of the Kawili Street right-of-way.

2.4.5 12-Inch Onsite Water Line

An existing 8-inch municipal water main which traversed the University Park site between Komohana Street and Waiakea Stream was recently replaced by a new 12-inch main installed in Nowelo Street within the University Park site. Extension of the 12-inch main will continue in association with the proposed Nowelo Street extension and Waiakea Stream bridge. A new 12-inch main will be constructed along the road alignment and will be attached to the bridge to cross the stream. The 12-inch water main will terminate at a connection to the existing campus water system.

2.5 CONSTRUCTION ACTIVITIES

Construction activities are anticipated to include demolition, grading and facilities construction. In all cases, work will not proceed until the appropriate permits and approvals are obtained.

2.5.1 Demolition

Demolition of existing pavement areas will be required particularly in association with the proposed road improvements prior to grading and new construction. Care will be taken to minimize the impact and disruption to neighboring areas.

2.5.2 Grading

All earthwork and grading activities shall be performed in compliance with Chapter 10, Erosion and Sediment Control of the Hawaii County Code.

The contractor will be required to comply with all state and county noise regulations, including those specified in the grading permit.

2.5.3 Facilities Construction

All building construction shall conform to all applicable requirements of code and statutes of the County of Hawaii.

All work within a county road right-of-way shall be in conformance with Chapter 22, Streets and Sidewalks, of the Hawaii County Code.

All work within known watercourses shall be in conformance with Chapter 27, Flood Control, of the Hawaii County Code. In addition, construction of the proposed bridge and bank stabilization will begin only after the necessary permits and approvals are obtained from the appropriate agencies, including the County of Hawaii, Corps of Engineers, Department of Land and Natural Resources, Department of Health and FEMA.

2.6 PROJECT SCHEDULE AND CONSTRUCTION COST

Development of the University Park will proceed in phases. The initial phase will include construction of much of the infrastructure necessary to support the development. The estimated construction cost of this initial phase is approximately $7.0 million, which will be funded entirely by the state. It is estimated that the initial construction phase will begin in 1998 after the necessary permits and approvals are obtained. Construction scheduling of the academic facilities, student housing and other developments will depend largely on available funding after the supporting infrastructure is in place.

CHAPTER 3

ALTERNATIVES CONSIDERED

This chapter discusses alternatives against which the proposed action was evaluated. The alternatives were rejected for their inability to meet the project objectives (no action) or attainment of the objectives at a higher cost or at a less desirable location. The existing UH Hilo campus area is essentially fully developed, resulting in the need to expand the campus on other lands to meet the projected needs.

3.1 NO ACTION

Without development of the University Park site, growth of the UH Hilo campus would be limited to the existing acreage located east of Waiakea Stream. Expansion of academic/instructional facilities and student housing (an immediate need) would be restricted.

3.2 PROPOSED PROJECT

The proposed action, development of the University Park site as presented in the *University of Hawaii at Hilo Long Range Development Plan*, will facilitate expansion of the campus into lands adjacent to and west of Waiakea Stream. Alternatives for growth would not be restricted due to lack of land area. The campus expansion would be contiguous, with the proposed Waiakea Stream bridge providing vehicular and pedestrian access between the existing campus and the University Park.

3.3 ALTERNATIVE UNIVERSITY PARK SITE

There is no formal documentation on consideration to develop the University Park at another site. However, the benefits of maintaining a contiguous campus are overwhelming when compared to the logistics of operating the university at two discrete campus locations.

3.4 ALTERNATIVE OFFSITE RESERVOIR SITE

There is no formal documentation on consideration to develop the 0.5 million gallon reservoir at another site. Site selection criteria for the reservoir included the following:

- Site elevation to meet 479 feet spillway elevation requirement, corresponding to existing County Department of Water Supply reservoir spillways elevations for the service zone;

- Land ownership by the State of Hawaii to minimize land acquisition coordination and expenses; and

- Site location in the vicinity of the University Park site to minimize the length of transmission main piping.

The proposed reservoir site was selected based on its ability to meet the above criteria.

CHAPTER 4

DESCRIPTION OF THE ENVIRONMENTAL SETTING

4.1 PROJECT LOCATION

The proposed project is located in the city of Hilo on the island of Hawaii (TMK: 2-4-01: 7 and 41). Hilo is located on the eastern coast of the island, serves as the center for the County of Hawaii and State of Hawaii government agencies, and is the most populous city on the island, with a population of about 46,000.

The University of Hawaii at Hilo (UH Hilo) is one of the nine campuses that comprise the University of Hawaii system. The campus was established in 1970 and is a comprehensive undergraduate institution that offers certificates in various vocational fields and baccalaureate degrees. The existing campus is located approximately two miles southwest of Hilo airport and occupies about 117 acres. The campus is bound by Lanikaula, Kapiolani, Kawili and Puainako Streets, and the Wailoa Flood Control Channel along Waiakea Stream (see **Figure 1**).

The island of Hawaii possesses natural advantages for scientific research, especially in astronomy and geophysics. One of the best sites in the world for astronomical observation is the summit of Mauna Kea, which rises nearly 14,000 feet above sea level. Various universities, institutions and countries operate telescopes from the observatories situated at the summit. The Hawaiian Volcano Observatory near Kilauea Crater is another prominent research center. Climatological research is conducted at the University of Hawaii's laboratory on the slopes of Mauna Loa.

4.1.1 University Park

The proposed University Park development will encompass an approximate area of 116 acres located west of the existing UH Hilo campus. The site is bound by a localized drainage ditch and the University Heights subdivision to the north, Komohana Street to the west and the Wailoa Flood Control Project (Waiakea Stream) to the east. Two utility easements bisect the site in a northeast to southwest direction.

Two existing roads traverse the project site. Nowelo Street (aligned in an east-west direction), provides the main entry to the University Park site from Komohana Street. Nowelo Street extends approximately 1,150 feet east into the site from the intersection with Komohana Street. Aohoku Street runs parallel to Komohana Street, extending north about 1,250 feet from its intersection with Nowelo Street to a cul-de-sac. Both roads feature asphalt concrete pavements and concrete curbs and gutters.

The two utility easements which presently traverse the site are for electrical and water service. Hawaii Electric Light Company, Inc. (HELCo) maintains a 50-foot wide electrical easement for overhead power lines. The lines provide service from the existing HELCo substation on Komohana Street. The County of Hawaii Department of Water Supply (DWS) maintains a water easement parallel to the electrical easement for an 8-inch transmission main which conveys water from the 0.5 million gallon Waiakea Reservoir, located off of Komohana Street with spillway elevation of 354 feet.

Presently, development along the western portion of the site (fronting Komohana Street) is referred to as the Research and Technology Park. Tenants include the Joint Astronomy Center, CALTECH Submillimeter Observatory, and the Subaru National Astronomical Observatory of Japan. Future tenants include the Institute for Astronomy.

4.1.2 Offsite Reservoir and Water Line

The proposed 0.5 million gallon reservoir site is located on state land near the existing Sunrise Estates subdivision, west of the existing UH Hilo campus (see **Figure 4**). Access to the proposed reservoir site is proposed to be from the planned Puainako Street extension. Should the construction of the reservoir precede extension of Puainako Street, a temporary access road would connect to Puloku Street in the Sunrise Estates subdivision.

4.1.3 Waiakea Stream

Waiakea Stream traverses the southern and eastern boundaries of the University Park site, separating the site from the existing UH Hilo campus. It is one of several streams which feed into Waiakea Pond and the Wailoa River, opening into the southern part of Hilo Bay. Waiakea Stream is essentially a drainage channel from above the UH Hilo campus to Waiakea Pond. Along most of this stream course, portions of the channel have been modified with levees and revetments, but the stream bed remains in a more or less natural state, or at least comprised of a natural bedrock material. No part of Waiakea Stream in the vicinity of the UH Hilo campus is perennial. ***Waiakea Stream is under the jurisdiction of the County of Hawaii. The County has an operation and maintenance agreement with the Corps of Engineers for this tributary.***

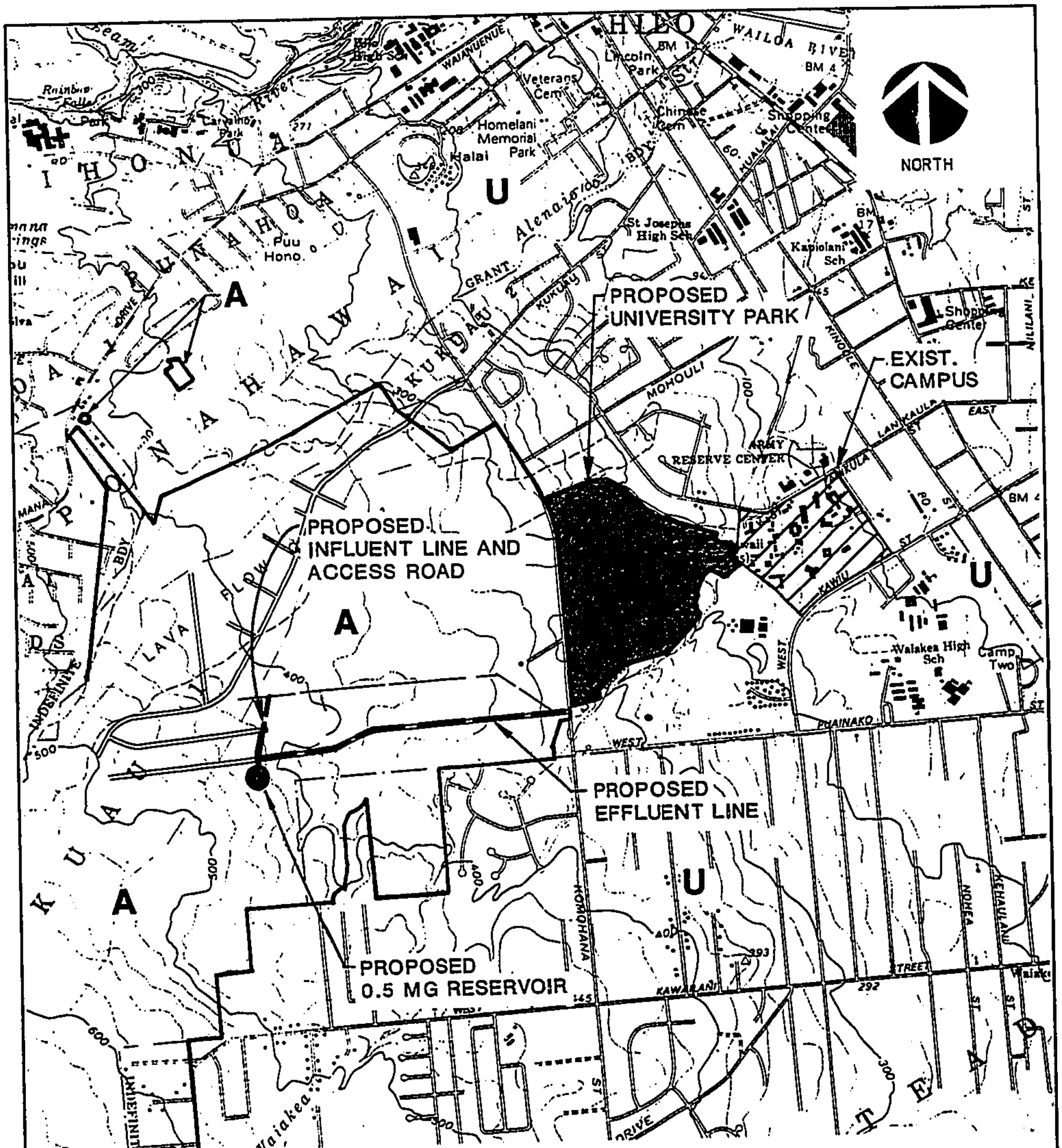
4.2 LAND OWNERSHIP

The University Park project site, existing UH Hilo campus, and the proposed 0.5 million gallon reservoir site are owned by the State of Hawaii. Road work along Kawili Street for construction of the left turn lane may extend into adjacent state lands.

4.3 STATE AND COUNTY LAND USE DESIGNATION

According to State Land Use Commission documents, the entire University Park site is designated as an *Urban District*, and the offsite water improvements are located within the *Agricultural District* ***(see Figure 7)***.

The site is classified as *University* on the Hawaii County General Plan Land Use Pattern Allocation Guide (LUPAG) map. The Hawaii County Zoning maps designate the site as *Single Family Residential District, RS-10* and *Agricultural District, A-1a*. The proposed University



LEGEND:

STATE LAND USE DISTRICT BOUNDARY

A AGRICULTURAL DISTRICT

U URBAN DISTRICT

2000 1000 0 2000 4000

GRAPHIC SCALE IN FEET

REFERENCE: STATE LAND USE COMMISSION

FIGURE 7

STATE LAND USE MAP

Park facilities are a permitted use within the A-1a and RS-10 zoned districts, pursuant to Hawaii County zoning code.

The project site is not situated within the County's Special Management Area.

4.4 TOPOGRAPHY

The University Park project site slopes from west to east. Ground elevations range from about 320 feet mean sea level (MSL) at Komohana Street to about 140 feet MSL at Waiakea Stream. In general, the site slopes range from 6 to 10 percent, while areas along Komohana Street and near the center of the site have slopes between 10 and 15 percent. Isolated areas throughout the site have slopes greater than 15 percent.

The proposed 0.5 million gallon reservoir will be situated at an offsite location at an elevation of about 460 feet, in order to accommodate a spillway elevation of 479 feet.

4.5 GEOLOGY/SOILS

Soil types within the University Park project site are identified in the U.S. Soil Conservation Service Soil Survey as Pahoehoe lava flows (rLW); Keaukaha extremely rocky muck, 6 to 20 percent slopes (rKFD); and Panaewa very rocky silty clay loam, 0 to 10 percent slopes (see **Figure 8**). The proposed 0.5 million gallon offsite reservoir site is characterized as rLW.

Pahoehoe lava flows dominate the western third of the site, fronting Komohana Street. This classification is characterized by a relatively smooth, billowy, glassy surface which has no soil covering and is typically bare of vegetation except for mosses and lichens.

Keaukaha extremely rocky muck is rapidly permeable, dark brown muck underlain by pahoehoe lava bedrock. The soil is strongly acid, with rock outcrops occupying about 25 percent of the area. Runoff is medium and erosion hazard is slight.

Panaewa very rocky silty clay loam is rapidly permeable, consisting of about 12 inches of dark brown silty clay loam at the surface, followed by a 4-inch thick dark brown very cobbly silty clay loam (mottled with yellowish red) subsoil underlain with pahoehoe lava bedrock. Rock outcrops occupy 10 to 25 percent of the surface. Runoff is slow and erosion hazard is slight.

4.6 CLIMATE

Hilo is located on the eastern (windward) side of the island and is usually subjected to northeasterly (onshore) winds during the day. These wind speeds predominately range from 4 to 12 miles per hour. However, diurnal heating and cooling occasionally give rise to offshore (southwesterly) breezes at night.

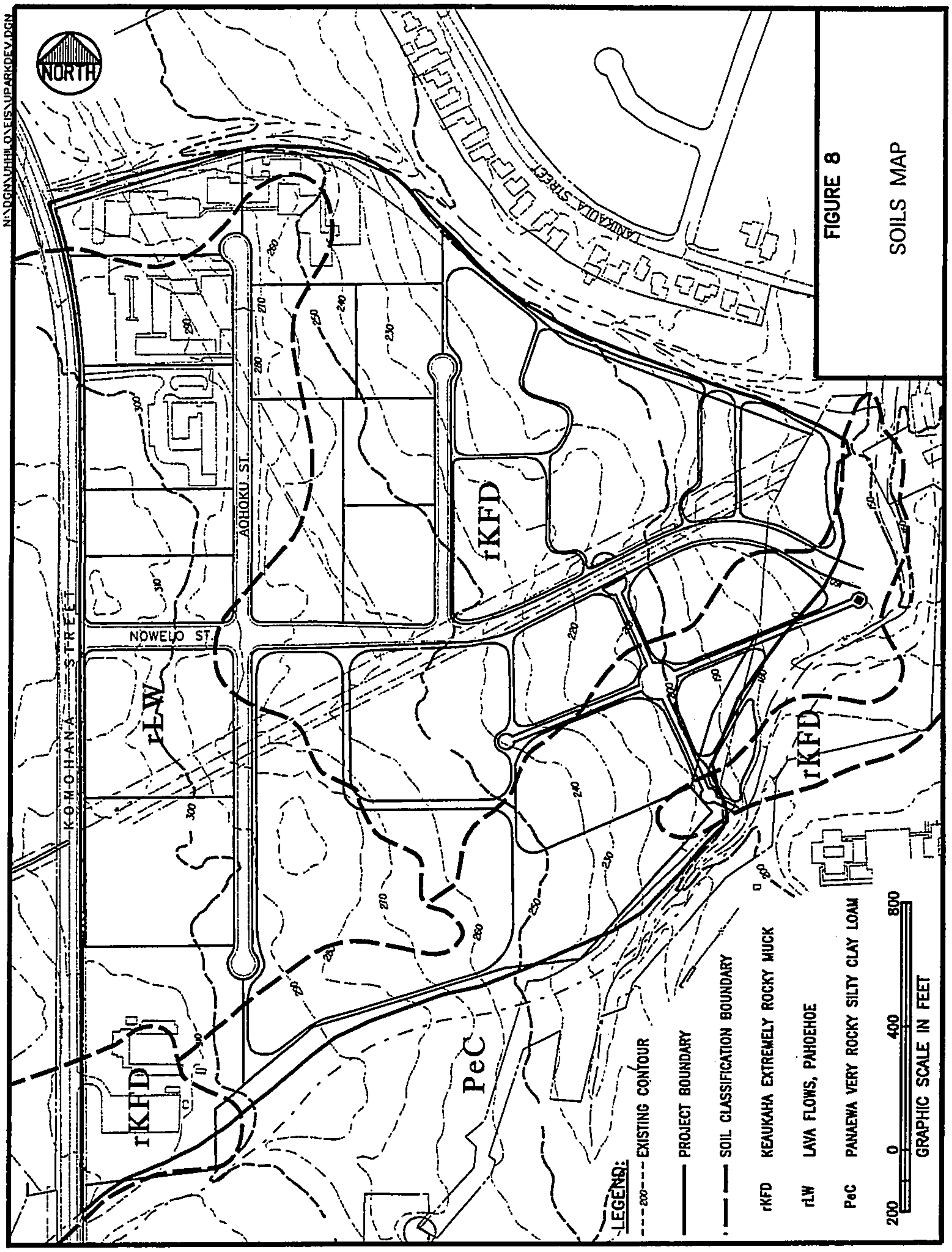


FIGURE 8

SOILS MAP

Daytime temperatures range from the upper 70's to low 80's (degrees Fahrenheit). Temperatures at night range from the low 60's to the upper 70's.

Mean annual rainfall averages about 141 inches. Although the wet season usually occurs from October through April, rain falls approximately 280 days of the year.

4.7 FLOOD HAZARD

According to the Flood Insurance Rate Map, the University Park and offsite reservoir sites appear to be located entirely within Zone X, areas determined to be outside the 500-year flood plain (see **Figure *9***).

However, the University Park site is bordered by Waiakea Stream, a special hazard area inundated by the 100-year flood with base flood elevations determined (Zone AE). A tributary to Waiakea Stream which is located to the south of the project site is also located within Zone AE.

In addition, a localized drainage ditch which discharges to Waiakea Stream and borders the project site to the north is identified as a special hazard area inundated by the 100-year flood, although no base flood elevations have been determined (Zone A).

Although located within Zone X, the project site may be affected by Zones A and AE due to the close proximity of the proposed development to these zones. The proposed Waiakea Stream bridge crossing will span Zones A and AE, and the associated bank stabilization will be located within these zones.

4.8 FLORA

A botanical survey of the proposed University Park site was prepared in December 1992, in association with the *Environmental Assessment for the University of Hawaii at Hilo Infrastructure for Research and Technology Lots*. Botanical assessments of the proposed Waiakea Stream crossing site and the 0.5 MG reservoir site were conducted in April 1996. These studies were conducted for the purpose of identifying the existence of rare or endangered flora.

None of the plants encountered during the surveys were threatened or endangered, or considered rare or vulnerable. In addition, none of the plants surveyed were proposed or candidates for such designation. No wetlands occur within the project site.

The three botanical resources assessments are summarized below. Copies of the reports are included in **Appendix *D***.

4.8.1 University Park

The project site is characterized mainly by two types of vegetal cover: 'ohi'a -uluhe forest and an introduced mixed forest. Along the west and north portions of the project site, native 'ohi'a trees

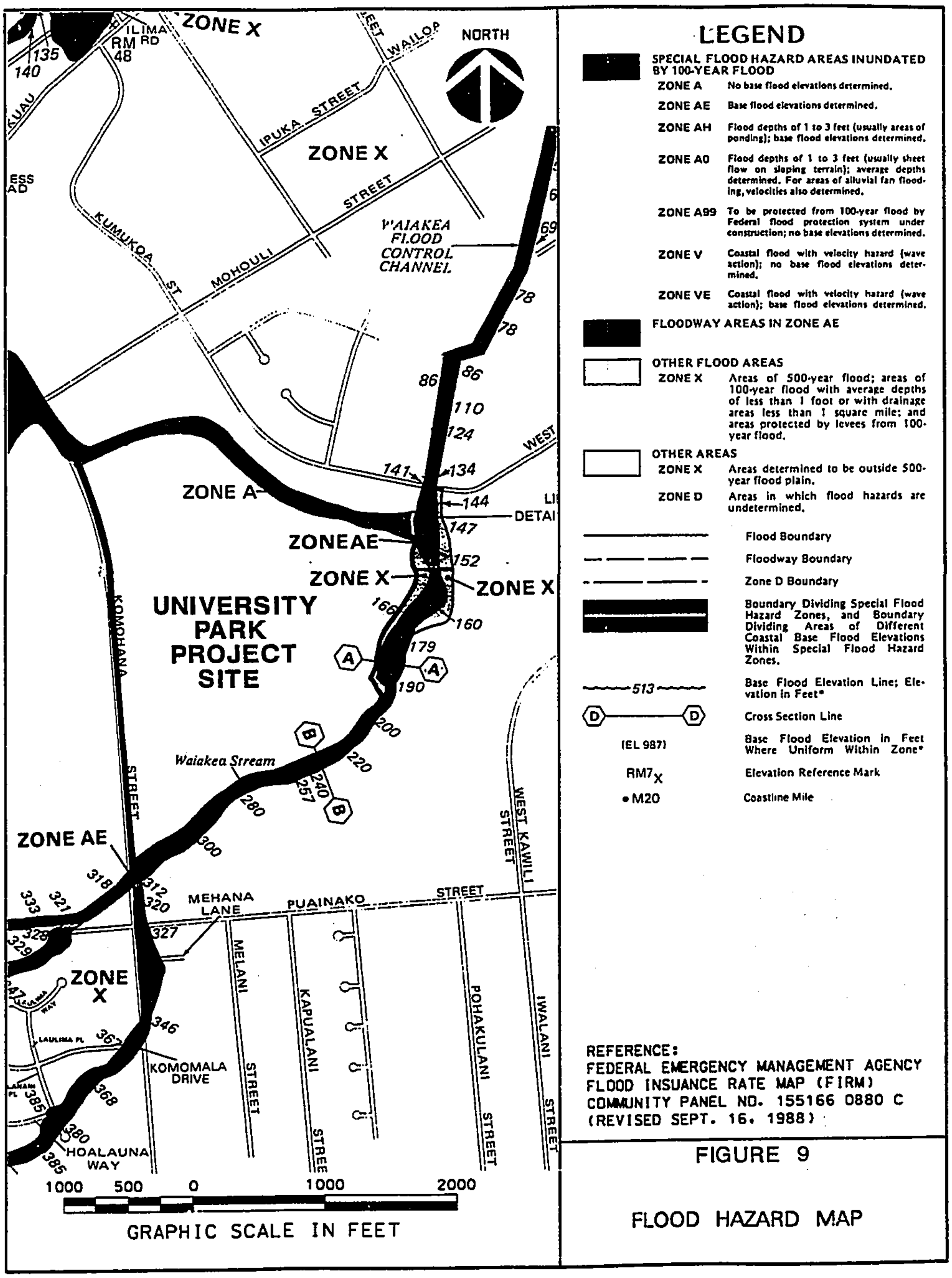


FIGURE 9

FLOOD HAZARD MAP

(*Metrosideros polymorpha*) and dense, matted uluhe ferns (*Dicranopteris linearis*) dominate the landscape. Vegetation along the eastern area is comprised of introduced species, mainly secondary forest trees such as gunpowder tree (*Trema orientalis*), melochia (*Melochia umbellata*) and Chinese banyan (*Ficus microcarpa*).

A total of 122 species were inventoried at the project site. Of this total, 100 (82 percent) were identified as being introduced or alien species, six (5 percent) are originally of Polynesian introduction, and 16 (13 percent) are native. Of the native species, 12 are indigenous or native to the Hawaiian Islands and elsewhere, and four are endemic or native only to Hawaii. The majority of the introduced species are weedy plants which prefer open, disturbed sites. The native species can be found in similar environmental habitats throughout the islands.

Development of the project site is not expected to have a significant impact on the botanical resources. Native plants will be used for landscaping where ever possible, and existing vegetation will remain intact to be incorporated into the landscape design where feasible.

4.8.2 Offsite Reservoir and Water Line

A native-dominated 'ohi'a (*Metrosideros polymorpha*)/uluhe fern (*Dicranopteris linearis*) forest occurs on the proposed reservoir parcel and along the edges of the water line corridor. The 'ohi'a/uluhe forest represents a fairly early stage in plant succession on wet lava flows and does not support a rich diversity of native plant species. Other native species which occur infrequently on the reservoir site are 'ahanui (*Machaerina mariscoides*), hapu'u (*Cibotium glaucum*), *Scleria testacea*, huehue (*Cocculus trilobus*), neneleau (*Rhus sandwicensis*), and 'ama'u (*Sadleria cyatheoides*). The forest supports dense thickets of strawberry guava or waiawi (*Psidium cattleianum*) and melastoma (*Melastoma candidum*), which are alien or introduced plants. Ground cover under the strawberry guava and melastoma thickets is sparse, with much leaf litter and barren lava. A few blechnum fern plants (*Blechnum occidentale*) *form* small clumps, along with seedlings of the two alien shrub species. Ground cover is almost always absent under the dense mats of uluhe.

The water line corridor follows along an old grub line now overgrown by a varied assemblage of mostly weedy, alien grasses, herbs and shrubs. Broomsedge grass (*Andropogon virginicus*), and owi (*Stachytarpheta dichotoma*) are the most abundant components of the weedy vegetation in most places. Hairy swordfern or 'okupukupu (*Nephrolepis multiflora*) is locally abundant where the corridor approaches the end of Puloku Street. Along the northern half of the corridor, sourbush (*Pluchea symphytifolia*) and young strawberry guava and melastoma cover roughly 50 percent of the corridor.

No significant negative impacts to botanical resources are expected and there are no botanical reasons to impose any restrictions, impediments or conditions on the proposed project.

4.8.3 Waiakea Stream

The vegetation at the site proposed for stream channel improvements and the bridge are dominated by alien or introduced plant species. Wedelia (*Wedelis trilobata*), a commonly used ground cover species is abundant along both banks of the stream. California grass (*Brachiaria mutica*) occurs as small scattered patches. Other species occasionally encountered include small clumps of palmgrass (*Setaria palmifolia*), downy woodfern (*Christella parasitica*), and yellow ginger (*Hedychium flavescens*); a few small guava shrubs (*Psidium guajava*); and smaller herbaceous species such as oriental hawksbeard (*Youngia japonica*), bubble-gum plant (*Polygala paniculata*), and maile hohono (*Ageratum houstonianum*). Some of the herbaceous plants and seedlings of the woody components occur in the stream bed where there are small pockets of soil and gravel.

Introduced mixed forest composed primarily of large gunpowder (*Trema orientalis*) and melochia (*Melochia umbellata*) trees, as well as several other tree species in smaller numbers occurs on the University Park site adjacent to the stream channel area. Locally abundant near the study area is a grove of Alexandra or king palm (*Archontophoenix alexandrae*). On the existing campus side, the vegetation consists of mats of California grass with sourbush or pluchea (*Pluchea symphytifolia*) shrubs and small stands of gunpowder and melochia trees.

No significant negative impacts to botanical resources are expected and there are no botanical reasons to impose any restrictions, impediments or conditions on the proposed project.

4.9 FAUNA

An assessment of the probable faunal makeup of the site has been prepared by Rana Productions, Ltd. and is included in **Appendix *J***. No field surveys were undertaken at the project site. The assessment was based on published reports, personal experience and the faunal makeup of similar habitat on the island.

4.9.1 Avifauna

State-wide avifaunal surveys were conducted by the U.S. Fish and Wildlife Service (USFWS) from 1976 to 1983. However, no transects were counted through the project site since the habitat was considered almost completely alien, harboring few native forest bird species. The avifauna currently found below 500 feet in elevation in the Hilo area is dominated by introduced species, as are most of the ecologically disturbed areas in the State. Two extant endemic avian species can be expected to at least occasionally be recorded within the project site, and one additional endangered and one threatened pelagic species probably occasionally overfly the site between the months of April and October. An additional species may occasionally be recorded within the proposed reservoir site. These species are described below.

<u>Hawaiian Hawk</u>
The Hawaiian Hawk or 'Io (*Buteo solitarius*) is the only extant falconiform in Hawaii; it currently is endemic to the Island of Hawaii. Hawaiian Hawks occupy a wide variety of habitats, in fact they are to be found in almost all habitats not lacking trees. Hawaiian Hawks have repeatedly been seen close to the project site. It is probable that they occasionally forage within the site; however, there is little remaining tree cover suitable for nesting within the site.

Short-eared Owl
The Short-eared Owl or Pueo (*Asio flammeus sandwichensis*) is a Hawaiian endemic subspecies of the widely distributed Short-eared Owl (*Asio flammeus*). The Pueo is ubiquitous on the island, being found in almost all habitats. Short-eared owls eat a diet of mice and small rats augmented by large insects and the occasional bird. It is probable that this species forages within the project site at least occasionally.

Dark-rumped Petrel
The Dark-rumped Petrel or Ua'u (*Pterodroma phaeopygia sandwichensis*) is endemic to Hawaii at the subspecies level. This pelagic seabird was formerly very common on the island, but has been listed as endangered since 1967. Seabirds are especially vulnerable to predation by terrestrial mammals. A secondary threat, especially to fledgling birds, is becoming disoriented by lights on their way to sea, causing them to collide with manmade structures. There is no suitable nesting habitat for this species within the site. However, it is probable that small numbers of this species occasionally fly over the site on their way to nesting areas in the mountains between April and October.

Newell's Shearwater
Newell's Shearwaters or 'A'o (*Puffinus newelli*) were listed as threatened in 1975. It is probable that at least a few birds fly over the site during the breeding season. This pelagic species nests high in the mountains in burrows excavated under thick vegetation, especially uluhe fern. Although there is no recent record of nesting Newell's Shearwaters in the immediate vicinity of the project site, there are numerous records of this species being seen, heard or collected close to the Saddle Road. Newell's Shearwaters, like Dark-rumped Petrels, are extremely vulnerable to predation by terrestrial mammals and become disoriented by lights on their way to and from sea.

Hawai'i 'Amakihi
Hawai'i 'Amakihi (*Hemignathus virens virens*) are currently found as low 500 feet and are also found in the highest reaches of vegetation on the island. Although Hawai'i 'Amakihi are not usually encountered below 500 feet in elevation, given the presence of scrub ohia on the reservoir site, it is possible that there is occasional usage of the area by this species.

Given the fact that the avifauna of the project site is dominated by alien species, and that any usage of the site by endemic avian species is best described as incidental-- no impacts are expected to native avian populations due to development.

4.9.2 Mammals

With the lone exception of the Hawaiian hoary bat (*Lasiurus cinereus semotus*) or 'Ope'ape'a, all the terrestrial mammalian species currently on the island are alien species introduced by man. The mammalian species which probably at least occasionally utilize one or both of the sites include:

Common Name	Scientific Name
Hawaiian hoary bat	*Lasiurus cinereus semotus*
Norway rat	*Rattus norvegicus norvegicus*
Roof rat	*Rattus rattus*
Polynesian rat	*Rattus exulans hawaiiensis*
European house mouse	*Mus domesticus*
Domestic dog	*Canis familiaris familiaris*
Small Indian mongoose	*Herpestes auropunctatus auropunctatus*
Cat	*Felis catus*
Horse	*Equus caballus caballus*
Pig	*Sus scrofa scrofa*
Domestic cattle	*Bos taurus*

There have been only four comprehensive bat surveys conducted on the Island of Hawai'i. Two of these surveys addressed lands close to the proposed development site. Originally considered to be a distinct species, the Hawaiian hoary bat is now taxonomically classified as an endemic Hawaiian sub-species of the North American hoary bat. This bat is usually a solitary arboreal rooster and therefore, difficult to study. It is almost certain that this species utilizes the project site at least occasionally. However, taking into consideration the current knowledge and understanding of the abundance, distribution, and biology of the Hawaiian hoary bat, it is unlikely that the proposed project will have a deleterious impact on this endangered mammalian species.

4.10 WAIAKEA STREAM

An assessment of Waiakea Stream was prepared by AECOS, Inc., and is included in **Appendix** *C*. The following sections summarize the stream habitat, biota and water quality in the vicinity of the proposed bridge crossing.

4.10.1 Stream Habitat

Near the proposed bridge site, the stream bed is solid basalt rock with many scattered pools in depressions in the rock. Many of the pools are isolated and seem to be ephemeral. However, in some areas, a small volume of water was flowing between pools, apparently arising as influent from the stream margins. Trees shade parts of the stream just below the bridge crossing point. In the area of most numerous pools immediately upstream from the crossing point, the stream bed is wide and the pools, exposed to the sun, support a dense growth of blue-green algae coating the bottoms.

4.10.2 Aquatic Biota

Field surveys of Waiakea Stream were conducted on October 30, 1993 and August 7, 1996. On both occasions, upstream areas of the stream system were visited where access was possible.

A low escarpment occurs near the centerline of the proposed bridge structure. Above the escarpment, pools of water support a freshwater fauna. Predominant at the time of the 1996 survey was the introduced (non-native) guppy (*Poecilia reticulata*). The introduced swordtail, (*Xiphophorus helleri*), was the next most abundant fish observed. Also observed were crayfish (*Procambarus clarki*), tadpoles (*Bufo marinus* and *Rana catesbeiana*), and dragonfly naiads (*Pantala flavescens*). Adult dragonflys (*Pantala flavescens* and *Anax junius*) were abundant flying back and forth along the stream in this area.

In contrast, the indigenous 'o'opu nakea (*Awaous guamensis*) was abundant during the 1993 survey. Despite a concerted effort to locate native fauna, the 'o'opu could not be found in 1996. A snail listed as *sinistral Lymnaidae* was also observed in 1993 but not 1996.

4.10.3 Water Quality

Water quality was analyzed at a selected pool in the immediate vicinity of the proposed bridge crossing. Selection of the monitoring station pool was based on indication of flowing water, although the flow rate was only on the order of 1 liter per minute. Water quality characteristics are summarized below.

Temperature (°F)	27.7
Dissolved Oxygen (mg/l)	8.95
Conductivity (µmhos/cm)	26.9
Turbidity (ntu)	1.22
Total Suspended Solids (mg/l)	2.0
Nitrate + Nitrite (µg N/l)	1
Ammonia (µg N/l)	5
Total Nitrogen (µg N/l)	292
Total Phosphorus (µg P/l)	18

The relatively high temperature and dissolved oxygen values indicate the pool is a somewhat isolated body of water with considerable algal productivity. Low turbidity and total suspended solids values reflect still water, lack of runoff input, and suggest biological primary productivity dominated by benthic algae. Low nitrate + nitrite and ammonia levels suggest the abundant benthic algae in the unshaded pool utilize available dissolved nutrients to support growth. Total nitrogen and phosphorus values are fairly typical for Hawaiian streams in rural or undeveloped watersheds.

4.11 ARCHAEOLOGICAL RESOURCES

Two archaeological reports for the University Park site were prepared by Cultural Surveys Hawaii in November 1993 in association with the *Environmental Assessment for the University of Hawaii at Hilo Infrastructure for Research and Technology Lots*. In addition, a reconnaissance survey of the 0.5 million gallon reservoir site was conducted by Cultural Surveys Hawaii in November 1996. The State Historic Preservation Division has concurred with the reported conclusions presented in these reports. Copies of the concurrence letters and the three archaeological reports have been included in **Appendix *E***.

4.11.1 University Park

A total of four sites were identified in the southern portion of the parcel. Two of the sites and a mound feature within the third site were excavated to search for cultural remains. Based on the type and age of the sites, as well as the data collected and analyzed, no further work was recommended for the area. In addition, due to the adequacy of the information gathered, archaeological monitoring during construction earthmoving was not recommended.

A supplemental archaeological survey encompassing approximately 11 acres within the adjacent stream channel immediately east of the University Park site was subsequently undertaken. Four mound features and the continuation of a rock wall from the University Park site were identified. It was concluded that these features, like those identified previously, were part of the commercial sugar cane cultivation landscape. The conclusion was based on subsurface testing of the largest, most discernable mound within the stream channel and another large mound within the project site. The four mounds and wall, are component features of the furrowed field given State Site No. 50-10-35-18670, and are included in the same site designation. No further archaeological research is necessary for the features.

4.11.2 Offsite Reservoir and Water Line

An archaeological inventory survey of this site failed to locate any archaeological sites or cultural materials. Since there were no sites or cultural features discovered, no impact to historic sites of any kind is anticipated, and placement of the proposed reservoir can be accomplished without any restrictions due of a cultural or historical nature.

4.12 TRAFFIC

A traffic impact analysis has been prepared by Pacific Planning & Engineering, Inc. and is included in **Appendix *I***. Analyses were conducted at the following intersections to determine the relative impact of the proposed project on the local roadway system.

- Komohana Street with Puainako Street
- Komohana Street with Nowelo Street
- Lanikaula Street Campus Access (Access 6)
- Kinoole Street with Lanikaula Street

These intersections were selected since they represent the areas where project traffic would have the greatest impact in terms of concentration, other traffic streams and major roadways. A summary of the existing traffic conditions at each intersection follows.

Intersection of Komohana Street with Puainako Street. Presently, motorists turning from Puainako Street onto Komohana Street experience level-of-service (LOS) D or E conditions during the morning and afternoon peak hours.

Intersection of Komohana Street with Nowelo Street. Presently, motorists attempting to turn left onto Komohana Street from Nowelo Street experience LOS D conditions during the morning peak hour and LOS C conditions during the afternoon peak hour.

Lanikaula Street Campus Access (Access 6). Presently, all movements operate at LOS A during the morning peak hour. During the afternoon peak hour, exiting motorists experience LOS B conditions.

Intersection of Kinoole Street with Lanikaula Street. Presently, all movements operate at LOS B during both the morning and afternoon peak hours.

4.13 AIR QUALITY

The State Department of Health maintains a limited network of air monitoring stations around the state to gather data on certain regulated pollutants. Currently, no routine ambient air monitoring is conducted by DOH in the Hilo area. Historical monitoring during the 1970's and 1980's indicated very low pollutant levels in Hilo and there is little reason to believe this has changed significantly.

While air quality in the Hilo area is very good for the most part, period degradation occurs naturally due to the active volcano, Kilauea, ***located almost directly south of Hilo.*** This degradation occurs under southerly or "kona" wind conditions when plumes from the volcanic vents are carried toward Hilo. ***In order for volcanic fog (vog) to significantly impact the Hilo area, however, two conditions must prevail-- the winds must be southerly (or kona) and the volcano vents must be active. Since winds from the south occur approximately 7 percent of the time, long-term impacts should be prefaced by the caveat that such impacts are based on intermittent, not continuous, exposure. During two 12-month periods of monitoring in Hilo (J.W. Morrow, et al.), sulfate concentration, which is the best indicator of the presence of vog, averaged 1 to 2 micrograms per cubic meter ($\mu g/m^3$), but showed occasional peak values as high as $15 \mu g/m^3$. During the sampling years, there were four to five sampling days in which 24-hour concentrations were $\geq 5 \mu g/m^3$. Since the sampling schedule was once every three days, this would suggest that total "high" days might have reached twelve to fifteen days per year if monitoring occurred every day. This equates to 3 to 4 percent of the time, which is somewhat less than the 7 percent of the time associated with wind direction alone.***

Onsite carbon monoxide sampling was conducted in February 1997 in the vicinity of the Puainako/Komohana and Lanikaula/Kinoole intersections. These sites were selected based on the results of the traffic impact study which indicated higher traffic volumes and potentially significant impacts at these intersections. Results of this sampling are presented in the air quality assessment prepared by J.W. Morrow, included in **Appendix *H*.**

4.14 NOISE

An evaluation of the potential noise impacts associated with the proposed project has been prepared by Y. Ebisu & Associates and is included in **Appendix *G*.** Traffic and background noise measurements were taken. The existing traffic noise levels in the project environs are in the "Moderate Exposure, Acceptable" and "Significant Exposure, Normally Unacceptable" categories along the right-of-ways of Komohana Street, Lanikaula Street and West Kawili Street. Traffic noise levels along the right-of-way of a roadway generally represent the worst case or highest levels due to the proximity of the right-of-way to the traffic noise sources. Existing traffic noise levels are highest along Komohana Street at approximately 70 Ldn at a distance of 50 feet from the street centerline. Along West Kawili Street, existing traffic noise levels are approximately 67 Ldn at 50 feet from the centerline. Existing traffic noise levels are lower (between 62 and 63 Ldn) along the eastern end of Kawili Street and along Lanikaula Street.

Traffic noise levels at the existing student dormitory buildings along West Kawili Street currently range from approximately 50 to 60 Ldn. On campus, near the Hale Ikena Dormitory, existing background ambient noise levels are in order of 50 Ldn. Current traffic noise levels at the student dormitory buildings are considered to be compatible for residential uses, and are below the FHA/HUD noise abatement standard of 65 Ldn. Existing traffic noise levels at these college dormitory buildings are also less than the FHWA and State DOT noise abatement criteria of 67 Leq and 66 Leq, respectively.

4.15 SOCIAL ENVIRONMENT

A report on the social environment has been prepared by Earthplan and is included in **Appendix *F*.**

A Primary Study Area was selected, based on the proximity to the project site and the likelihood for potential social impacts. The Primary Study Area is comprised of three census tracts (CT) which are generally between Komohana Street and Kanoelehua Avenue in a west to east direction. The project site is located in CT 205 which extends from Mohouli Street to West Puainako Street. The other census tracts are CT 204 (extending north of CT 205 to Ponahawai Street) and CT 207.01 (extending south of CT 205 to Haihai Street).

4.15.1 Population

In 1990, the Primary Study Area had a population of 13,587 persons, which is 36 percent of the Hilo Census Designated Place (CDP) population of 37,728 persons. The Hilo CDP, in turn, accounted for approximately 32 percent of the 120,317 Hawaii County residents.

Hawaii Community College presently occupies a portion of the UH Hilo campus. The Fall 1996 student enrollment figures for UH Hilo and Hawaii Community College were 2,800 and 2,463 students, respectively (for a total student population of 5,263).

4.15.2 Housing

In 1990, the Primary Study Area contained 5,065 housing units. Five percent of the units were reportedly vacant with 49 percent of the occupied units being renter-occupied. In comparison, Hilo CDP and Hawaii County contained 13,327 and 48,253 housing units, respectively.

In general, housing characteristics in the Primary Study Area differed from Hilo CDP and Hawaii County. The Primary Study Area:

- had a higher percentage of renter-occupied units;
- tended to have lower housing costs;
- had a lower median rent; and
- contained proportionally more multi-family units.

4.16 PUBLIC FACILITIES AND SERVICES

4.16.1 Police Protection Services

The project site is located in South Hilo, Patrol District 1. The district extends from Hakalau in the north, to the mid-point of Kanoelehua Avenue between Hilo and Kea'au in the south, to the Saddle Road in the west. The district includes the main police station, located at 349 Kapiolani Street, approximately five minutes travel time from the project site. More than half of the district's patrol officers are assigned to the City of Hilo.

4.16.2 Fire Protection Services

The project site is served by the Kawailani Fire Station located at 411 Kawailani Street. Backup service would be provided by the Central Fire Station, located at 466 Kinoole Street. Travel time from each station to the project site is three to five minutes. Additional backup would be provided by the Waiakea Rescue Station and the Kaumana Station with its HAZMAT team, which would be used in event of a chemical spill.

4.16.3 Medical Services

Hilo Hospital is the major medical facility in the vicinity of the project site. The hospital, located at 1190 Waianuenue Avenue, is approximately 10 minutes travel time from the project site. Ambulance service in Hilo is provided by the Hawaii Fire Department, which can serve the project site from the Central Fire Station in three to five minutes.

4.16.4 Recreational Facilities

The entire South Hilo District contains 54 parks totaling 590 acres. The immediate area of the project site is served by two neighborhood parks, including University Heights Park and Mohouli Park. Both parks are located within walking distance of the UH Hilo campus. The existing campus contains approximately 15 acres of recreational facilities used for basketball, baseball, tennis, volleyball and soccer. It is anticipated that sufficient recreational facilities exist and/or are planned to serve the projected population increase due to the proposed project.

CHAPTER 5

IDENTIFICATION AND SUMMARY OF IMPACTS AND PROPOSED MITIGATION MEASURES

This section identifies the impacts attributable to the proposed project. Impacts are categorized as short-term (normally confined to the construction period), and long-term, resulting from operation of the proposed facilities.

5.1 *SOILS AND SOIL* EROSION

5.1.1 Potential Impacts

Soil types at the project site include Panaewa very rocky silty clay loam (0 to 10 percent slopes) which are known to be thixotropic.

Soil erosion potential will increase during construction and decrease after development of the proposed project. Increase in soil erosion potential will result from removal of existing vegetation during the construction period. The reduction in soil erosion potential expected after development will be due to establishment of permanent landscaping, and increased impervious surfaces (buildings and pavement).

An associated impact of soil erosion is degradation of receiving water quality which may result from sediment transport to storm drains and streams by surface runoff.

5.1.2 Mitigation Measures

Geotechnical investigations will be conducted in the design phase to determine soil types and suitability for proposed construction. If unstable thixotropic soil is encountered, the design will adhere to the recommendations contained in the geotechnical report.

Erosion control plans will be prepared for all construction work. The erosion control plan will identify specific best management practices (BMPs) which will be employed to minimize erosion and offsite sediment transport from the site. In addition, construction activities will be subject to conditions of the National Pollutant Discharge Elimination System (NPDES) permit for discharge of storm water associated with construction activities. Minimizing site erosion and associated sediment transport to state waters is a primary objective of this permit. Proposed mitigation measures may include hydromulching with seeds or placement of erosion control matting to stabilize slopes and exposed surfaces, and construction of a graveled ingress/egress for use by construction vehicles at the entrance of the site to minimize tracking debris onto paved streets. Silt fences, berms, temporary siltation basins and other means of protecting water quality may be employed to prevent direct discharge of sediment-laden storm runoff to municipal storm drains and Waiakea Stream.

5.2 DRAINAGE

5.2.1 Potential Impacts

Development will increase the percentage of impervious surfaces within the project site and thus increase the volume of storm runoff from the site. During construction, temporary siltation basins will be constructed to detain runoff and minimize sediment transport to offsite areas. After development, the drainage system will be designed to ensure no increase in runoff toward adjacent properties.

5.2.1 Mitigation Measures

Onsite measures will be employed to detain any increase in runoff due to development. Storm drain drywells and landscaping/grading to provide filtering and detention of runoff are mitigation measures that will be employed on a long-term basis.

5.3 WAIAKEA STREAM

5.3.1 Potential Impacts

The site of the proposed bridge is located at the lower end of an extensive group of fresh water pools distributed along the basal stream bed. These pools could represent the best "permanent" aquatic habitat in Waiakea Stream between Kupulau Road (Waiakea Homesteads) and Waiakea Pond (downtown Hilo). Another grouping of pools occurs about 50 feet downstream of the proposed bridge crossing in a somewhat different geological setting. The proposed bridge construction will have direct impact on only a few of the pools in the upper group, which extends 200 to 300 feet upstream from the proposed crossing point. Due to location of most of the pools upstream from the proposed bridge, long term impacts resulting from the potential runoff of street pollutants into the pools is not anticipated.

The proposed bridge will be constructed as a span supported on endwall supports at or outside of the ordinary high water mark. Therefore, minimal impacts are anticipated. Addition of a center support would not substantially increase the impacts given the nature of the stream bed in this area, although the present bridge design concept does not include such a support. The proposed channel alterations will retain the existing bedrock basalt stream bed, which will significantly reduce potential adverse impacts of the project on aquatic environments.

The associated stream bank stabilization proposed above and below the bridge crossing are structural changes which represent mostly extensions of existing revetted slopes. Some widening of the stream bed is also proposed. The proposed bridge and stream bank modifications do not represent potentially adverse changes in hydrology since the stream is confined to a channel with steep banks and the stream gradient is moderately steep. In this area, freshets fill the existing channel and do not spread beyond the banks as a matter of course. In part, this is due to historical alterations of the stream (including a levee on the existing campus side) and downstream where the stream passes through residential developments. Thus, the ecological impact on the aquatic environment due to the proposed bank stabilization structures is anticipated to be minimal.

Some reduction of shading will result from the loss of trees presently growing above the stream bank. However, once constructed, the bridge will shade at least some of the pools during part of each day. Neither of these changes is anticipated to be significant.

5.3.2 Mitigation Measures

Several environmental permits and approvals will be required in order to construct the proposed bridge and stream bank stabilization. These permits include: Section 404 permit, Section 401 Water Quality Certification, Coastal Zone Management Consistency Certification, and Stream Channel Alteration Permit. The contractor will be required to comply with the conditions of these permits and approvals to minimize any short-term impacts to aquatic biota and water quality during construction.

5.4 ARCHAEOLOGICAL RESOURCES

5.4.1 Potential Impacts

Impact to archaeological resources is anticipated to be minimal.

There were no archaeological sites or cultural materials discovered during reconnaissance of the reservoir and water line project site, and no impact to historic sites of any kind is anticipated.

Within the proposed University Park site, archaeological monitoring was not recommended during construction activities.

5.4.2 Mitigation Measures

The State Historic Preservation Division will be notified in the event archaeological features are encountered during construction. Construction operations will cease in the affected area until an appropriate course of action is determined by the agency.

5.5 TRAFFIC

5.5.1 Potential Impacts

The project will have some impact on traffic flow at several intersections based on comparison of level-of-service (LOS) and delay results between the 2010 traffic conditions during the weekday peak hours with and without the project.

Even without the project, the increase in traffic volumes require certain roadway improvements. *The Island of Hawaii Long Range Highway Plan* describes the following roadway improvements for the year 2010:

- Komohana Street: Widen Komohana Street from Ainaola Drive to Puainako Street to provide a two-way left turn lane. Widen Komohana Street from two lanes to four lanes from Puainako Street to Waianuenue Avenue. Provide dedicated turn lanes at major intersections.

- Puainako Street: Extend Puainako Street mauka of Komohana Street to connect with Kaumana Drive. Widen Puainako Street from two lanes to four lanes from Komohana Street to Kinoole Street.

- Kinoole Street: Widen Kinoole Street from two to four lanes from Ponahawai Street to Olona Street.

With the project, results of the analyses indicate decreased LOS for several traffic movements. These impacts are summarized below:

<u>Intersection of Komohana Street with Puainako Street</u>. There are plans to widen Komohana Street to four lanes with dedicated turn lanes and signalization at the intersection by the year 2010. Without the project, the intersection would operate at LOS D during both the morning and afternoon peak hours. With the project, the intersection would still operate at LOS D for both the morning and afternoon peak hours, but with increases in delay. Although the LOS drops with the project, the intersection would still operate satisfactorily at LOS D.

<u>Intersection of Komohana Street with Nowelo Street</u>. By the year 2010, Komohana Street is planned to be widened to four lanes with signalization of the intersection. Without the project, the intersection would operate at LOS A for both the morning and afternoon peak hours. With the project, the intersection would operate at LOS B for both the morning and afternoon peak hours. No additional intersection improvements are necessary.

<u>Lanikaula Street Campus Access (Access 6)</u>. Without the project, all movements would continue to operate at essentially the same LOS as the existing conditions. With the project, motorists exiting the driveway will experience a drop in LOS from B to C during the afternoon peak hour. During the morning peak hour, motorists making left-turns into the driveway will experience a drop in LOS from A to B.

<u>Intersection of Kinoole Street with Lanikaula Street</u>. Kinoole Street is planned to be widened from two to four lanes by the year 2010. Without the project, during the morning peak hour, several movements drop in LOS from B to C or D. During the afternoon peak hour, all movements drop to LOS C or D. With the project, during the morning peak hour, all movements operate at LOS C or D conditions, with the overall intersection operating at LOS D. During the afternoon peak hour, the LOS for all movements remain the same except for increases in delay. Although the LOS drops with the project, the intersection would still operate satisfactorily at LOS D.

Multi-Purpose Center. The proposed Multi-Purpose Center may generate large traffic volumes during special events. However, it is not expected to occur on a frequent basis, and less frequently during peak traffic hours.

Short-Term Construction Impacts. Construction of the proposed improvements may result in periodic traffic disruptions to the existing campus and residences in the vicinity of the project.

5.5.2 Mitigation Measures

Measures proposed to mitigate traffic impacts resulting from development of the project include:

Mitigation of Lanikaula Street Campus Access (Access 6) Impacts. A left-turn storage lane for motorists entering the campus is recommended to provide smoother traffic flow. The storage lane will be provided when warranted by the University Park development.

Mitigation of Multi-Purpose Center Impacts. Depending on the event, it may be necessary to provide additional measures (i.e. coning and traffic control personnel) similar to measures currently used at the Special Events Arena on the UH Manoa campus.

Mitigation of Short-Term Construction Impacts. The contractor shall conform to the safety precautions and requirements of the *Rules and Regulations Governing the Use of Traffic Control Devices at Work Sites on or Adjacent to Public Streets and Highways*, adopted by the Highway Safety Coordinator, and the U.S. Federal Highway Administration's *Manual on Uniform Traffic Control Devices for Streets and Highways, Part VI, Traffic Controls for Highway Construction and Maintenance Operations*. Other conditions to be imposed on the contractor to minimize traffic disruptions include:

(1) Access to and from driveways and public streets shall be provided at all times.

(2) During non-working hours, trenches shall be covered with steel plates and all lanes shall be open to traffic.

(3) As required by the County of Hawaii, special duty police officers shall be hired to direct the flow of traffic.

(4) All walkways and intersections shall be maintained in passable condition for pedestrian traffic.

5.6 AIR QUALITY

5.6.1 Potential Impacts

Construction activity will be the principal source of short-term air quality impact. Construction vehicle activity will increase automotive pollutant concentrations along the existing roadways as well as on the project site. Site preparation, earth moving, and building and road construction will create particulate emissions. Movement of construction vehicles on unpaved surfaces will also generate particulate emissions. Studies by the EPA on fugitive dust emissions from construction sites indicate that about 1.2 tons per acre per month of activity may be expected under conditions of medium activity, moderate soil silt content (30 percent) and a precipitation/evaporation (P/E) index of 50. While some onsite soils are silty clay loams with a substantially higher silt content than the "moderate" silt content in the EPA studies, the wet local climate (P/E index of 213), would more than offset this, thus suggesting a much lower fugitive dust emissions than estimated by EPA. The predominance of low wind speeds also suggests reduced fugitive dust potential.

In addition, there will be offsite impacts due to the operation of concrete and asphalt batching plants needed for construction. Such plants routinely emit particulate matter and other gaseous pollutants. The batch plants must be permitted by the State Department of Health Clean Air Branch, and must demonstrate their ability to continuously comply with both emission and ambient air quality standards.

No exceedance of State or Federal carbon monoxide standards are predicted for 2010. Predicted concentrations increase with or without the project due to increased traffic volumes, reduced average speed, and queuing at signalized intersections.

As presented in Section 4.13, the existing presence of vog within the Hilo area is intermittent, occurring only during "kona" wind conditions when the volcanic vents are active. Acidic sulfate aerosols such as vog may exacerbate the condition of persons with pre-existing pulmonary diseases such as asthma, bronchitis and emphysema. Anecdotal data in Hawaii suggest that this is the case during vog episodes in areas that are not routinely exposed to vog (e.g. Hilo, where air quality is normally quite pristine, but degrades visibly when the winds turn "kona" and the volcano is active). As noted above, these are not chronic exposures, but rather acute exacerbations from which the patients recover when the winds and air quality return to normal.

5.6.2 Mitigation Measures

Although the potential for fugitive dust seems low due to the wet climate and low wind speeds, adequate dust control will be employed, particularly during dry periods. Dust control will be accomplished by frequent watering of unpaved roads and areas of exposed soil surfaces. The EPA estimates that twice daily watering can reduce fugitive dust emissions by as much as 50 percent. Accelerated landscaping of completed areas will also be employed. Due to the proximity of existing residences and other occupied structures, dust control should be implemented as required based on weather conditions.

The offsite impacts associated with preparation of construction materials (asphalt and concrete batching) will be controlled by the existing regulatory requirements for air pollution sources which will ensure that they remain in compliance with health and environmental standards.

The corrosive nature of the climate will be a consideration in design of buildings and facilities.

5.7 NOISE

5.7.1 Potential Impacts

Existing noise sensitive dwelling units along the west and east sections of Kawili Street are not expected to be adversely impacted by the project, since traffic volumes and noise levels along Kawili Street are not anticipated to increase significantly as a result of the project. The resulting traffic noise levels along Kawili Street are anticipated to increase by 0.5 dB or less, which are considered to be insignificant. Further, traffic noise levels at these dwellings are not predicted to exceed federal or local noise standards and criteria.

The greatest increase in traffic noise levels are expected to occur within the University Park project site and along the primary thoroughfare to Lanikaula Street which crosses through the existing campus. Traffic noise levels at the student dormitory, classroom, and office buildings along the campus road toward Lanikaula Street are expected to increase by approximately 3 to 10 dB as a result of project and non-project traffic. Although this degree of increase is large, traffic noise mitigation is not required by federal and local noise standards for residences, classrooms and offices.

Audible construction noise will probably be unavoidable during the entire construction period. The actual length of exposure to construction noise at any receptor location will probably be less that the total construction period for the entire project. Adverse impacts from construction noise are not expected to affect public health and welfare due to the temporary nature of the work and the administrative controls available for its regulation. Instead, these impacts will probably be limited to temporary degradation of the quality of the acoustic environment in the immediate vicinity of the new and improved interior roadways.

5.7.2 Mitigation Measures

Mitigation of construction noise to inaudible levels will not be practical in all cases due to the intensity of construction noise sources (80 to 90+ dB at 50-foot distance), and due to the exterior nature of the work (e.g. rock breaking, grading and earth moving, trenching, concrete pouring, hammering). The use of plywood noise barriers will be employed where close-in construction work is unavoidable.

Compliance with State Department of Health construction noise limits and curfew times, which are now applicable on the island of Hawaii, is another noise mitigation measure which will be employed. Construction activities will be in compliance with the provisions of Hawaii Administrative Rules, Chapter 11-46, "Community Noise Control":

- The contractor will obtain a noise permit if the noise levels from the construction activities are expected to exceed the allowable levels of the regulations as stated in Section 11-46-6(a);

- Construction equipment and onsite vehicles requiring an exhaust of gas or air will be equipped with mufflers as stated in Section 11-46-6(b)(1)(A);

- No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels on Sundays and on holidays as stated in Section 11-46-7(3); and

- The contractor must comply with the conditional use of the permit as specified in the regulations and conditions issued with the permit as stated in Section 11-46-7(d)(4).

The contractor shall also comply with County noise regulations, including those specified in the grading permit.

In addition, the noisier portions of the construction work will be scheduled during non-classroom hours to minimize disruption to students.

5.8 POPULATION AND HOUSING

5.8.1 Potential Impacts

Population

The proposed project will provide facilities to allow an increase in student enrollment at the UH Hilo campus. In addition, increased enrollment will generate additional positions for university faculty and staff, further increasing the onsite population. The increase in onsite population is likely to affect the areas nearest the project site. A net addition of 3,625 persons is estimated after development of the University Park, which will increase the Primary Study Area population by a maximum of 21 percent. This increase in population considers 3,067 students and 558 faculty/staff positions. The population increase due to the proposed project will have a minor impact on Hawaii County and South Hilo, with a maximum of one percent and four percent increase, respectively. These projections are based on students and faculty originally residing outside of Hawaii County. The level of increase will lessen, depending on the number of students and faculty originating from Hawaii County.

Housing

The net addition of student population will increase the need for housing, primarily in the immediate vicinity of the project site. The increase in students will increase competition for housing rentals.

5.8.2 Mitigation Measures

It is expected that the impact of increased demand for housing will be mitigated by development of student housing within the University Park and the current economic conditions. Specifically:

- The *Long Range Development Plan* has designated space for student housing within the University Park. New residence hall(s) will be part of the project. Construction schedules will be driven by funding and demand.

- There is high vacancy in the current housing market. Realtors have indicated the housing market in the Hilo area has become a renter's market. The high vacancy rate reported last year resulted in rent reductions of up to $100 per month. Under the current economic conditions, high vacancies will likely continue and future students will have a choice of rental units.

In addition, plans to build student housing near the University Park site will also offset long-range impacts. Preliminary discussions between UH Hilo and private developers are underway to build additional student housing on Kawili Street adjacent to Waiakea School. The total number of units would exceed 1,000 with construction phasing based on need and market.

5.9 CHARACTER OF THE AREA

5.9.1 Potential Impacts

Relationship to Long-Range Objectives for the Area
The proposed project is consistent with public goals and policies for the future of the project site and the areas surrounding the University Park. The Hawaii County General Plan calls for establishment and expansion of the UH Hilo campus, as well as support facilities such as student housing. In addition to the project site, the lands west of Komohana Street are also designated for university use. Since the project is consistent with public policies for the area, it is likely to be compatible with community expectations for the future. No significant impact is anticipated relative to long-range objectives.

Nearby Uses
Nearby residences are located to the north and south of the project site. Specifically, homes along Puainako Street to the south and homes along West Lanikaula Street in the University Heights subdivision located to the north.

Both short and long term impacts to these residences may result from the proposed project.

- Potential increase of dust and noise due to construction activity. Generation of dust and noise due to construction activities will be a short term impact. The level and significance of this impact is related to the proximity of individual residences to the construction activity. The houses along Puainako Street may be minimally impacted since a buffer zone of vacant land will remain between the homes and the construction activities. Similarly, in the University Heights subdivision, a buffer zone will exist between the project site and most of the homes. However, approximately 15 homes are separated from the project site by only the localized drainage ditch leading to Waiakea Stream.

- Change in residential character due to increased people and activity. This long term impact will affect residences on a daily basis due to increased vehicular and pedestrian traffic through the area. From a social perspective, increased traffic can be translated into inconvenience, and if there is a significant increase, higher levels of stress. Noise levels, in particular, would be expected during gatherings at the proposed intramural field and multi-purpose center. The level of impact to residences due to noise will once again depend on the relative location of the residence to the project site. This change in character is an inevitable and irreconcilable impact.

5.9.2 Mitigation Measures

- Construction-related impacts. Mitigation of construction-related impacts will include compliance with public rules and regulations governing such activities. Additional mitigation will involve direct communication between the university and its neighbors, including notification of construction schedules and specific activities which may cause temporary increase dust, noise or other problems.

- Change in character of the area. In order to lessen impacts to residences, the university will inform neighbors of major activities to help residents form reasonable expectations of the nature and timing of changes. An informational program will be conducted to provide project-related information and respond to community inquiries.

5.10 PUBLIC FACILITIES AND SERVICES

Police Protection Services
The proposed project will impact police protection services due to the additional population and traffic generation. Traffic safety will be a primary concern. However, the Police Department expects the road improvements included in the proposed project will mitigate most of the problems associated with the increased traffic, and the current level of personnel will provide adequate service for the area where the project is completed. No mitigation is required.

Fire Protection Services
The proposed project will impact fire protection services due to the additional population and structures proposed for the service area. However, the proposed project will be constructed in accordance with the applicable sections of the Fire Code, and the Fire Department anticipates that their facilities and existing personnel levels will provide adequate services to the project site.

Medical Services
The proposed project will impact medical and emergency services due to the increase in service population. However, it is anticipated that the project can be adequately served by the existing hospital and ambulance service without mitigation.

Recreational Facilities
Increased competition for parks and recreational space is anticipated due to the population increase resulting from the project development. However, it is anticipated that sufficient recreational facilities exist and/or are planned to serve the anticipated population increase, including development of the onsite intramural field.

5.11 VIEWS

5.11.1 Potential Impacts

View planes may be affected due to construction of the University Park site and offsite reservoir. However, it is not possible to address the visual impact of development at the University Park until more detailed information on building elevations, heights and landscaping becomes available.

The 0.5 million gallon offsite reservoir will be approximately 17 feet high (floor to overflow spillway elevation), and will impact view planes of previously undeveloped land.

5.11.2 Mitigation Measures

Maintenance of existing vegetation outside the fence line of the reservoir site will be the primary mitigation of its visual impact. 'Ohi'a trees within the 'ohi'a tree/uluhe fern forest which surrounds the proposed reservoir site may grow up to 40 feet tall. In addition, strawberry guava and melastoma shrubs form 6 to 12 feet tall thickets throughout the 'ohi'a/uluhe forest. These trees and shrubs will provide a visual screen around the reservoir site.

5.12 SAFETY

5.12.1 Potential Impacts

Public safety will be a concern during construction. Due to the location of construction activities adjacent to the existing campus, the contractor will need to provide construction barricades around work areas for the protection of the general public.

5.12.2 Mitigation Measures

Construction activities shall conform to all requirements of codes and statutes of the State of Hawaii and County of Hawaii.

5.13 SOLID WASTE

5.13.1 Potential Impacts

The proposed project will increase generation of solid waste due to the increased population and facilities. According to the Department of Public Works Solid Waste Division, the existing municipal landfill has adequate capacity for disposal of solid wastes. However, there are plans to close the landfill and operate a solid waste transfer station in its place for processing and recompaction, prior to hauling wastes to the Pu'uanahulu landfill.

5.13.2 Mitigation Measures

Mitigation measures will be implemented to reduce the quantity of waste generated and minimize landfill space requirements. These measures may include recycling and composting. UH Hilo has an active recycling program. Numerous recyclable material collection stations have been placed throughout the existing campus with collection service provided through contract with a private refuse hauling company. The university plans to continue the recycling program and construct additional collection centers within the University Park site. The university has also implemented composting of green wastes for use as gardening material. Tree trimmings are chipped and stockpiled at designated composting sites. Construction of additional composting sites will be considered as part of this project.

A solid waste management plan will be prepared and shall conform to the rules and regulations of the Department of Public Works Solid Waste Division. Waste minimization and recycling infrastructure will be included in the design phase.

5.14 ENERGY CONSUMPTION

5.14.1 Potential Impacts

Development of the proposed project will result in increased energy consumption due to the increase in population and facilities.

5.14.2 Mitigation Measures

The project will be subject to the provisions of the energy section of the Hawaii County Building Code. During the design phase, appropriate mitigation measures will be considered to reduce energy consumption over and above code requirements. These measures may include installation of energy-related equipment and systems with high efficiency levels that qualify for utility rebates for new commercial construction, including utility customized incentive programs. In addition, application of life cycle cost criteria will be considered in selection of energy-related systems.

5.15 SEISMIC HAZARD

5.15.1 Potential Impacts

According to *The Uniform Building Code*, 1994, the island of Hawaii is in Seismic Probability Zone 3. Discussions have been held on raising the seismic zone to 4, but no decision has yet been made.

5.15.2 Mitigation Measures

Buildings and infrastructure will be designed in conformance with prevailing building codes of the County of Hawaii.

5.16 VOLCANIC HAZARD

5.16.1 Potential Impacts

Lava flows have approached the project site on two known occasions in 1881 and 1984. There is a possibility that future lava flows may cause damage at the project site.

5.16.2 Mitigation Measures

State government officials recognize the potential for lava flow damage at the project site and are aware of the two near approaches to the site. They also recognize that it is not possible to determine the path of future volcanic eruptions.

5.17 OTHER PROJECTS

In addition to potential impacts due to the proposed project, potential cumulative impacts associated with future development of other proposed projects have been considered. These geographically-related and reasonably foreseeable future actions include:

> <u>Puainako Street Extension and Widening</u>. Puainako Street, located south of the project site, will be widened to a four-lane roadway between Kilauea Avenue and Komohana Street, and a new two-lane road will be constructed between Komohana Street and Country Club Road.
>
> <u>Mohouli Street Extension, Komohana Street to Kaumana Drive</u>. Mohouli Street, located north of the project site, will be extended approximately 1.26 miles between Komohana Street and Kaumana Drive. Construction will last about one year and could begin in mid-1998 if approvals are obtained.
>
> <u>Lanakila Homes</u>. Lanakila Homes is an existing low-income public housing project located north of the project site. The Hawaii Housing Authority project proposes to demolish 230 existing units and replace them with 220 new residential townhouse units, a community center and training center. Construction will be segmented into four phases, starting as early as 1998.
>
> <u>Hilo Judiciary Complex</u>. The State of Hawaii is evaluating several sites in Hilo to construct a new judiciary complex. One site under consideration is located on the corner of Kawili and Kapiolani Streets, adjacent to the existing University of Hawaii at Hilo campus.
>
> <u>Hilo Scattered Lots Residential Development</u>. The Department of Hawaiian Homes Lands is proposing development of residential lots in Hilo as homestead lots under the Hawaiian Homes Commission Act. One parcel encompassing approximately 16,000 sq.ft. is located north of Mohouli Street, approximately 500 ft mauka of the intersection with Kinoole

Street. Construction will include improvement of existing infrastructure to accommodate the residential development. Construction is tentatively scheduled to begin in spring 1998 with a duration of six to eight months.

Offsite Student Housing. The University of Hawaii is considering development of housing facilities on Kawili Street adjacent to Waiakea High School. Construction of this offsite student housing will be related to increased student population associated with construction of the University Park.

5.17.1 Potential Impacts

Potential short-term cumulative impacts associated with the projects described above will be related to construction activities. It is possible that concurrent construction of two or more projects may occur, resulting in short-term noise, dust and traffic impacts on nearby residents, businesses and students.

Potential long-term cumulative impacts were considered. The only long-term impact foreseen is an anticipated increase in overall traffic flow in the vicinity. However, the proposed roadway extension projects should improve overall traffic efficiency and safety.

5.17.2 Mitigation Measures

Coordination of construction activities with other projects may reduce the short-term cumulative impacts to the community.

CHAPTER 6

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

Short-term uses of man's environment are associated with the urbanization process and include clearing, grubbing, grading and construction of the University Park facilities. Maintenance and enhancement of long-term productivity relates to the contribution of the university campus expansion to society and the general well-being of its residents.

Construction-related activities may result in short-term adverse environmental impacts including generation of dust and noise, and disruption of traffic. The potential for onsite soil erosion may also increase during grading operations. Completion of the project in accordance with appropriate State of Hawaii and County of Hawaii standards will mitigate those temporary construction-related conditions.

Construction of the project is a commitment to develop the present open space which will eliminate other uses, including residential and agriculture. Development of the University Park is an essential requirement to serve the growing student enrollment at UH Hilo.

Positive impacts on the economy and employment are expected as a result of the project in both the short- and long-term. The economy and employment will be stimulated in the short-term due to purchasing of construction materials and generation of construction-related jobs. Employment opportunities will also increase in the long-term due to growth within the university. Enhancement of long-term productivity will be realized due to education of the people.

CHAPTER 7

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES THAT WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

Development of the University Park and its associated offsite infrastructure will result in an irreversible commitment of approximately 116 acres of land, much of which is undeveloped open space. Construction materials will be irretrievably committed with a limited salvage value expected. Monetary funds, human resources, time and energy will also be irretrievably committed to the project. The State of Hawaii will have a long-term public and financial commitment to maintain the University Park facilities once they are constructed.

CHAPTER 8

RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS FOR THE AFFECTED AREA

8.1 STATE LAND USE LAW

The State Land Use Law (Chapter 205, Hawaii Revised Statutes), adopted in 1961, establishes the framework of land use management in Hawaii. All lands in the State are classified into one of four land use districts: Urban, Rural, Agricultural or Conservation. ***Pursuant to §205-4, Hawaii Revised Statutes (HRS), the Land Use Commission acts on boundary amendment petitions involving lands over 15 acres in the Agricultural, Rural and Urban Districts, and all petitions for reclassification of lands in the Conservation District. The counties, pursuant to §205-3.1, HRS, process petitions involving lands 15 acres or less in the Agricultural, Rural and Urban Districts.***

The University Park project site is situated on land classified as Urban (U). The Urban classification generally includes land characterized by a city-like concentration of people, structures and services, including vacant areas for future development. The counties primarily have jurisdiction over urban lands through their ordinances and regulations.

The reservoir site is located within the Agricultural District (A). The Agricultural classification primarily includes lands for the cultivation of crops, aquaculture, raising livestock, wind-farming, forestry, agriculture-supported activities and land with significant potential for agricultural uses.

The proposed facilities are consistent with existing land use designations.

8.2 HAWAII STATE PLAN

The Hawaii State Plan (Chapter 226, HRS) establishes a system for the planning, coordination and integration of major state and county activities. Part I of the Plan lists the State's long-range goals, objectives, policies and priorities. Part II establishes a statewide planning system to coordinate and implement the plan. Part III establishes priority guidelines to address areas of statewide concern. Applicable sections are discussed below.

Section 226-10 Objective and policies for the economy--potential growth activities.

(a) *Planning for the State's economy with regard to potential growth activities shall be directed towards achievement of the objective of development and expansion of potential growth activities that serve to increase and diversify Hawaii's economic base.*

- *(8)* *Develop, promote and support research and educational and training programs that will enhance Hawaii's ability to attract and develop economic activities of benefit to Hawaii.*

Discussion: The proposed project will expand the existing UH Hilo campus, promoting research and educational opportunities and allowing for growth in enrollment.

Section 226-21 Objective and policies for socio-cultural advancement--education.

(a) Planning for the State's socio-cultural advancement with regard to education shall be directed towards achievement of the objective of the provision of a variety of educational opportunities to enable individuals to fulfill their needs, responsibilities, and aspirations.

(b) To achieve the education objective, it shall be the policy of this State to:

(2) Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.

(5) Provide higher educational opportunities that enable Hawaii's people to adapt to changing employment demands.

(9) Support research programs and activities that enhance the education programs of the State.

Discussion: Development of the University Park will expand the educational facilities of the UH Hilo campus, allowing for increased enrollment and providing higher education opportunities for the people.

Section 226-103 Economic priority guidelines.

(a) Priority guidelines to stimulate economic growth and encourage business expansion and development to provide needed jobs for Hawaii's people and achieve a stable and diversified economy:

(2) Encourage expansion of technological research to assist industry development and commercialization of technological advancements.

Discussion: A Research and Technology Park is part of the proposed development. Tenants include the Joint Astronomy Center, CALTECH Submillimeter Observatory, and the Subaru National Astronomical Observatory of Japan. Future tenants include the Institute for Astronomy.

Section 226-107 Quality Education.

Priority guidelines to promote quality education:

(6) Pursue the establishment of Hawaii's public and private universities and colleges as research and training centers of the Pacific.

Discussion: The proposed project is a step toward achieving this objective.

8.3 HAWAII COASTAL ZONE MANAGEMENT PROGRAM

The objectives of the Hawaii Coastal Zone Management Program (Section 205A-2, HRS) are to protect valuable and vulnerable coastal resources such as coastal ecosystems, special scenic and cultural values, and recreational opportunities. The objectives of the program are also to reduce coastal hazards and to improve the review process for activities proposed within the coastal zone.

The relationship of the proposed project to the program objectives and policies is summarized below.

Section 205A-2(c)(1) Recreational Resources

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

Discussion: N/A

Section 205A-2(c)(2) Historic Resources

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

Discussion: Archaeological studies conducted at the project site identified features and concluded that no further work or monitoring during construction would be required.

Section 205A-2(c)(3) Scenic and Open Space Resources

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

Discussion: The University Park project site and the proposed offsite reservoir will be located inland, and will not impact coastal open spaces. The structures will be designed with consideration for the visual environment.

Section 205A-2(c)(4) Coastal Ecosystems

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

Discussion: Construction activities within Waiakea Stream will be performed in compliance with conditions of the various environmental permits, including a Section 401 Water Quality Certification and NPDES permit. The proposed stream bank stabilization structures will minimize erosion which will promote long term water quality.

Section 205A-2(c)(5) Economic Uses

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

Discussion: N/A

Section 205A-2(c)(6) Coastal Hazards

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

Discussion: The long term impact of the project will be a reduction of onsite erosion potential due to reduction of erodible surfaces. Storm drain systems will be constructed to convey runoff and prevent flooding. After development, there will be no increase in runoff toward any adjacent properties. Onsite measures will be employed to detain any increase in runoff due to development.

Section 205A-2(c)(7) Managing Development

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

Discussion: N/A

Section 205A-2(c)(8) Public Participation

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

Discussion: N/A

Section 205A-2(c)(9) Beach Protection

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

Discussion: N/A

Section 205A-2(c)(10) Marine Resources

Objective: *Implement the State's ocean resources management plan.*

Discussion: N/A

8.4 HAWAII COUNTY GENERAL PLAN

The General Plan, was originally adopted in 1971 and comprehensively revised in 1989 through County Ordinance 89-142.

The General Plan states courses of action for each of the island's districts. For South Hilo, the general course of action is encouragement of some commercial endeavors. The Plan also encourages development of UH Hilo, but warns that development relies on State funds which will be subject to competition from other counties.

Several courses of action refer specifically to the proposed project:

- Economic Development. The General Plan directs the county to encourage the State to provide necessary funds for the development of the university complex, and to provide necessary support services and facilities to aid the development of these complexes.

- Housing. The General Plan encourages the State to provide student, faculty and staff housing for UH Hilo.

- Public Facilities. The General Plan directs the County to actively participate in the development of student and faculty housing for the university. It also directs the County to support the expansion of the university system, specifically as related to the campus master plan.

- Land Use. The General Plan directs the County to support UH Hilo and aid in its development of programs which assist agriculture. Further, the commercial zoned lands near the UH Hilo shall be allocated as the need arises.

The project site is designated for "University" use on the General Plan map.

CHAPTER 9

UNRESOLVED ISSUES

This environmental impact statement has disclosed potential impacts associated with the project and mitigation measures to alleviate public concerns relating to these potential impacts. The purpose of the EIS process is disclosure of information. Resolution of issues and concerns will be addressed as the project proceeds with the planning, permitting and design phases. Several issues remain unresolved.

9.1 CEDED LANDS

The Office of Hawaiian Affairs (OHA) has stated that the proposed development is on ceded lands. Coordination with OHA officials will be required to discuss the implications of this issue on the proposed development and other developments on ceded lands.

9.2 CIVIL DEFENSE SIREN

The project site does not have an existing civil defense siren. The State Civil Defense has requested that space be allotted within the University Park site for installation of a single 121 Db omnidirectional solar powered siren and siren support infrastructure.

State Civil Defense suggested location of the siren between the proposed Student Housing parking lot and the Intramural Field. This location will not be practical due to the 250-foot residential buffer zone required around the siren. The buffer zone requirement would restrict residential development within the Student Housing site. To minimize the impact on housing, the siren would need to be located in the middle of the Intramural Field, which may restrict use of the field for athletic events.

An alternate location suggested by State Civil Defense was location of the siren within the proposed Multi-Purpose Center parking lot. This location would be more acceptable since the buffer zone could be contained entirely within the parking lot. Purchase and installation of the siren will be discussed further with the State Civil Defense as design of the project proceeds.

9.3 CIVIL DEFENSE EMERGENCY SHELTERS

Another concern of the State Civil Defense was use of building(s) within the project site for emergency shelters. There is a shortage of convenient public shelters for disaster relief. Location of the project site on high ground (beyond the limit of tsunami inundation) is a favorable factor. The appropriateness of buildings within the site for emergency shelters would need to be determined on a case by case basis during planning and design of each facility. ***State Civil Defense will be contacted to initiate discussions on the potential for use of proposed buildings***

as emergency shelters, and the County of Hawaii Civil Defense Agency will be notified due to their role in designating buildings as shelters.

9.4 AINAKO STREET EXTENSION

The County Planning Department has identified a proposed extension of Ainako Street which is illustrated on the present City of Hilo Zone Map. This 80-foot wide future road right-of-way bisects the project site and disrupts the conceptual layout of the University Park. The University of Hawaii at Hilo will work with the Department of Public Works and Planning Department to resolve this issue and ultimately revise the zone map.

9.5 VISUAL IMPACT

The visual impact of the project on the surrounding community cannot be addressed at this time since the structural and architectural details of the University Park facilities were not determined in the *University of Hawaii at Hilo Long Range Development Plan.* The specific impacts of an individual facility, including the visual impact on the surrounding community, may need to be addressed in Supplemental EIS document(s) as planning and design of the project proceeds.

CHAPTER 10

CONSULTATION

10.1 PARTICIPANTS

The environmental impact statement was prepared for the Department of Accounting and General Services, State of Hawaii, by Engineering Concepts, Inc. The following individuals and organizations were also involved in preparation of this report.

Organization	Area of Expertise
AECOS, Inc.	Aquatic Habitat/Water Quality
Char & Associates	Flora
Cultural Surveys Hawaii	Archaeology
Earthplan	Social Impact
Y. Ebisu & Associates	Noise
J.W. Morrow	Air Quality
Pacific Planning & Engineering	Traffic Engineering
Rana Productions, Ltd.	Fauna

10.2 PARTIES CONSULTED DURING PREPARATION OF THE DRAFT EIS

Fifty (50) copies of the EIS Preparation Notice were mailed to agencies, organizations and other interested parties. A complete listing of these consulted parties is included in **Sections 10.2.1** through **10.2.4**.

Availability of the EIS Preparation Notice was published in the January 23, 1997 edition of *The Environmental Notice* by the Office of Environmental Quality Control. A total of *19* comment letters were received as of March 15, 1997 (the public the review period ended on February 24, 1997). Agencies and organizations responding *to* the request for comments are marked with an asterisk (*) in *the* lists which follow. Those who responded with no comments are marked with a plus (+). The U.S. Fish and Wildlife Service relayed their "no comment" statement in a telephone conversation with the Department of Accounting and General Services staff.

10.2.1 Federal Government

Department of Agriculture, Natural Resources Conservation Service
* Department of the Army, Corps of Engineers
Department of Commerce, National Marine Fisheries Service
Department of the Interior:
\+ Fish and Wildlife Service
\+ Geological Survey
National Park Service

+ Department of Transportation, Federal Aviation Administration

10.2.2 State Government

State Senator, District 1
State Representative, District 1
Department of Accounting and General Services, Division of Public Works
Department of Agriculture
Department of Business Economic Development and Tourism:
Energy Resources and Technology Division
* Land Use Commission
* Office of Planning
* Department of Defense
+ Department of Education
+ Department of Hawaiian Home Lands, Hawaiian Homes Commission
* Department of Health, Environmental Planning Office
Department of Land and Natural Resources:
+ Historic Preservation Division
* Land Division
* Department of Transportation
* Office of Environmental Quality Control
* Office of Hawaiian Affairs
University of Hawaii:
Environmental Center
Water Resources Research Center

10.2.3 County Government

Council Member, District 1
* Fire Department
Department of Parks and Recreation
* Planning Department
+ Police Department
* Department of Public Works
Department of Research and Development
* Department of Water Supply

10.2.4 Other Interested Parties

American Lung Association
GTE Hawaiian Telephone Company
Hawaii Electric Light Company, Inc.
Nelson Ho

10.2.5 Libraries

In addition, copies of the EIS Preparation Notice were distributed to the following libraries for public review:

- University of Hawaii:
  - Hamilton Library
  - Hilo Campus Library
- Hawaii State Library, Main Branch
- Hilo Public Library
- Lapahoehoe Community School Library

10.3 COMMENTS ON THE EIS PREPARATION NOTICE

Reproduced in **Appendix A** are letters commenting on the EIS Preparation Notice and letters by the Department of Accounting and General Services responding to the comments.

10.4 PARTIES CONSULTED DURING PREPARATION OF THE FINAL EIS

Seventy (70) copies of the Draft EIS were mailed to agencies, organizations and other interested parties. A complete listed of these consulted parties is included in **Sections 10.4.1** through **10.4.4.**

Availability of the Draft EIS was published in the May 23, 1997 edition of *The Environmental Notice* by the Office of Environmental Quality Control. A total of 18 comment letters were received as of July 11, 1997 (the 45-day public review period ended on July 7, 1997). Agencies and organizations responding to the request for comments are marked with an asterisk (*) in the lists which follow. Those who responded with no comments are marked with a plus (+). Copies of selected text from the Final EIS relevant to respondents questions were sent on October 29, 1997.

10.4.1 Federal Government

- Department of Agriculture, Natural Resources Conservation Service
- Department of the Army:
  - * U.S. Army Engineer District, Honolulu
  - Directorate of Facilities Engineer
- Department of the Navy, Naval Base Pearl Harbor
- Department of the Interior:
  - Fish and Wildlife Service
  - \+ Geological Survey
- Department of Transportation, 14th Coast Guard District
- Environmental Protection Agency, Region IX

10.4.2 State Government

State Senator, District 1
State Representative, District 1
Department of Accounting and General Services, Division of Public Works
Department of Agriculture
Department of Business Economic Development and Tourism:
  Energy Resources and Technology Division
* Land Use Commission
\+ Office of Planning
* Department of Defense
Department of Education
\+ Department of Health, Environmental Planning Office
Department of Land and Natural Resources:
\+ Historic Preservation Division
\+ Land Division
* Department of Transportation
\+ Housing Finance and Development Corporation
* Office of Environmental Quality Control
Office of Hawaiian Affairs
University of Hawaii:
* Environmental Center
  Water Resources Research Center

10.4.3 County Government

Council Member, District 1
\+ Fire Department
Department of Parks and Recreation
* Planning Department
* Police Department
* Department of Public Works
* Department of Research and Development
\+ Department of Water Supply

10.4.4 Other Interested Parties

American Lung Association
Hawaii Electric Light Company, Inc.
Honolulu Star Bulletin
Honolulu Advertiser
Sun Press
Hawaii Tribune Herald
West Hawaii Today
Sidney Fuke & Associates

10.4.5 Libraries

In addition, copies of the Draft EIS were distributed to the following libraries for public review:

- Department of Business, Economic Development and Tourism Library
- State Archives
- Legislative Reference Bureau
- Kaimuki Regional Library
- Kaneohe Regional Library
- Pearl City Regional Library
- Wailuku Public Library
- Kauai Regional Library
- University of Hawaii:
  - Hamilton Library
  - Hilo Campus Library
- Hawaii State Library, Main Branch
- Hilo Public Library
- Lapahoehoe Community School Library

10.5 COMMENTS ON THE DRAFT EIS

Comment letters received during public review of the Draft EIS and responses prepared by the Department of Accounting and General Services have been included in **Appendix B**.

CHAPTER 11

REFERENCES

Engineering Concepts, Inc., *Environmental Assessment for the University of Hawaii at Hilo Infrastructure for Research and Technology Lots, Hilo, Hawaii, TMK: 2-4-01:7 and 41*, November 1993.

Engineering Concepts, Inc., *Preliminary Engineering Report for the Proposed UH Hilo University Park, Hilo, Hawaii*, November 1993.

Group 70 International, Inc., Final Environmental Impact Statement and Site Selection Study for Hilo Judiciary Complex, South Hilo District, Island of Hawaii, prepared for State of Hawaii Department of Accounting and General Services, February 1997.

Morrow, J. W., E. J. Morgan, A. N. Furuike, Characterization of Volcanic Aerosol in Two Populated Areas on the Island of Hawaii: First Year Findings of a 3-Year Investigation, Paper No. 91-89.2, Air & Waste Management Association Annual Meeting, Vancouver, B.C., June 1991.

Morrow, J. W. and A. N. Kodama, Characterization of VOG and LAZE in Three Communities on the Island of Hawaii, 1 Oct 90 - 30 Sep 91, Summary Report, 1 July 1994.

Okahara and Associates, Inc., Revised Environmental Impact Statement Notice of Preparation for Puainako Extension and Widening, South Hilo, Island of Hawaii, July 14, 1995.

PBR Hawaii and Kajioka Okada Yamachi Architects, *University of Hawaii at Hilo, Long Range Development Plan*, March 1996.

R.M. Towill Corporation, Final Environmental Assessment for Hilo Scattered Lots Residential Development, Hilo, Island of Hawaii, State of Hawaii, prepared for State of Hawaii Department of Hawaiian Home Lands, September 1997.

State of Hawaii Department of Human Services Hawaii Housing Authority, Draft Environmental Assessment for Lanakila Homes, August 11, 1997.

U.S. Department of Agriculture, Soil Conservation Service, *Soil Survey of Island of Hawaii, State of Hawaii*, December 1973.

U.S. Department of Transportation Federal Highway Administration, State of Hawaii Department of Transportation Highways Division, and County of Hawaii Department of Public Works, Environmental Assessment for Mohouli Street Extension, Komohana Street to Kaumana Drive, South Hilo, Hawaii, September 1997.

Wilson Okamoto & Associates, Inc. in cooperation with Megumi Kon, Incorporated, <u>Research & Technology Park Conceptual Master Plan for the University of Hawaii at Hilo</u>, May 1986.

APPENDIX A

EIS PREPARATION NOTICE COMMENTS AND RESPONSES

BENJAMIN J. CAYETANO
GOVERNOR
STATE OF HAWAII

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

KALI WATSON
CHAIRMAN
HAWAIIAN HOMES COMMISSION

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

RECEIVED
FEB 5 1997
ENGINEERING CONCEPTS

February 3, 1997

The Honorable Benjamin J. Cayetano, Governor
c/o Office of Environmental Quality Control
235 South Beretania Street
State Office Tower, Suite 702
Honolulu, Hawaii 96813

Dear Governor Cayetano:

Subject: EIS Preparation Notice for University of Hawaii at Hilo, University Park Proposal, Hilo, Hawaii, TMK 2-4-01:7&41

Thank you for requesting our review of the report for the proposed University Park development.

We have no objections to the project as proposed.

If you have any questions, please call Joe Chu of our Planning Office at 586-3838.

Warmest aloha,

Kali Watson

Kali Watson, Chairman
Hawaiian Homes Commission

4242L14

cc: Department of Accounting and General Services
✓Engineering Concepts, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1049.7

MAR 7 1997

RECEIVED
MAR 8 1997
ENGINEERING CONCEPTS

TO: The Honorable Kali Watson, Chairman
Hawaiian Homes Commission
Department of Hawaiian Home Lands

Kali

SUBJECT: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo
University Park, Infrastructure Improvements
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of February 3, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and acknowledge that you have no objections to the project as proposed.

Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Sam

SAM CALLEJO
State Comptroller

c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

Benjamin J. Cayetano
GOVERNOR

HERMAN M. AIZAWA, Ph.D.
SUPERINTENDENT
[redacted]

RECEIVED
OFFICE OF THE
DEPT OF

'97 FEB 12 P2:24

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

OFFICE OF THE SUPERINTENDENT

February 3, 1997

MEMO TO: Honorable Benjamin J. Cayetano, Governor
State of Hawaii

F R O M: Herman M. Aizawa, Ph.D., Superintendent
Department of Education

SUBJECT: EISPN for University of Hawaii Hilo
University Park
TMK 2-4-1:7 and 41

The Department of Education has no comment on the subject Environmental Impact Statement Preparation Notice.

Thank you for the opportunity to respond.

HMA:SB:hy

cc: Alfred Suga, OBS
Gina Ichiyama, DAGS
Gary Gill, OEQC
Ken Ishizaki, Engineering Concepts, Inc.

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 1

To Ken I	From Nancy/OEQC
Co.	Co.
Dept.	Phone # 586 4155
Fax # 591 4010	Fax # 586 4186

TO: Stanley, OBS
☐ PLEASE COORDINATE with

FOR
✓ Comment/Recommendation (required)
Appropriate attention
Direct reply (cc/bcc: Governor)
Your information/file
Draft reply for Governor's signature
Follow up/report
Submit copy of response (if any)
Keep enclosure(s)
Return enclosure(s)
Other

DUE 15 working days from FEB 12 1997
(If delay is encountered in meeting suspense date, please advise by telephone immediately) In reply, please refer to
97:590426/40180

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

2. Impact of Volcanic Activity, Seismic Activity and Tropical Cyclone Force Winds

   The 0.5 million gallon offsite reservoir will be designed to Department of Water Supply standards and in compliance with the latest edition of the *Uniform Building Code*. In the unlikely event of structural failure, water would flow toward Waiakea Stream. There are no homes located along the flow path directly downstream of reservoir.

   Campus buildings will also be constructed to meet the applicable building codes. The potential use of buildings as public shelters in the event of disasters will be considered on a case-by-case basis during planning and design of each facility, and will be listed as an unresolved issue in the Draft EIS.

   The reservoir site will not be suitable as a public shelter since the structure will be filled with potable water, and the associated buildings will house instrumentation and equipment.

A copy of your comment letter and this response will be included in the Draft EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
cc: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

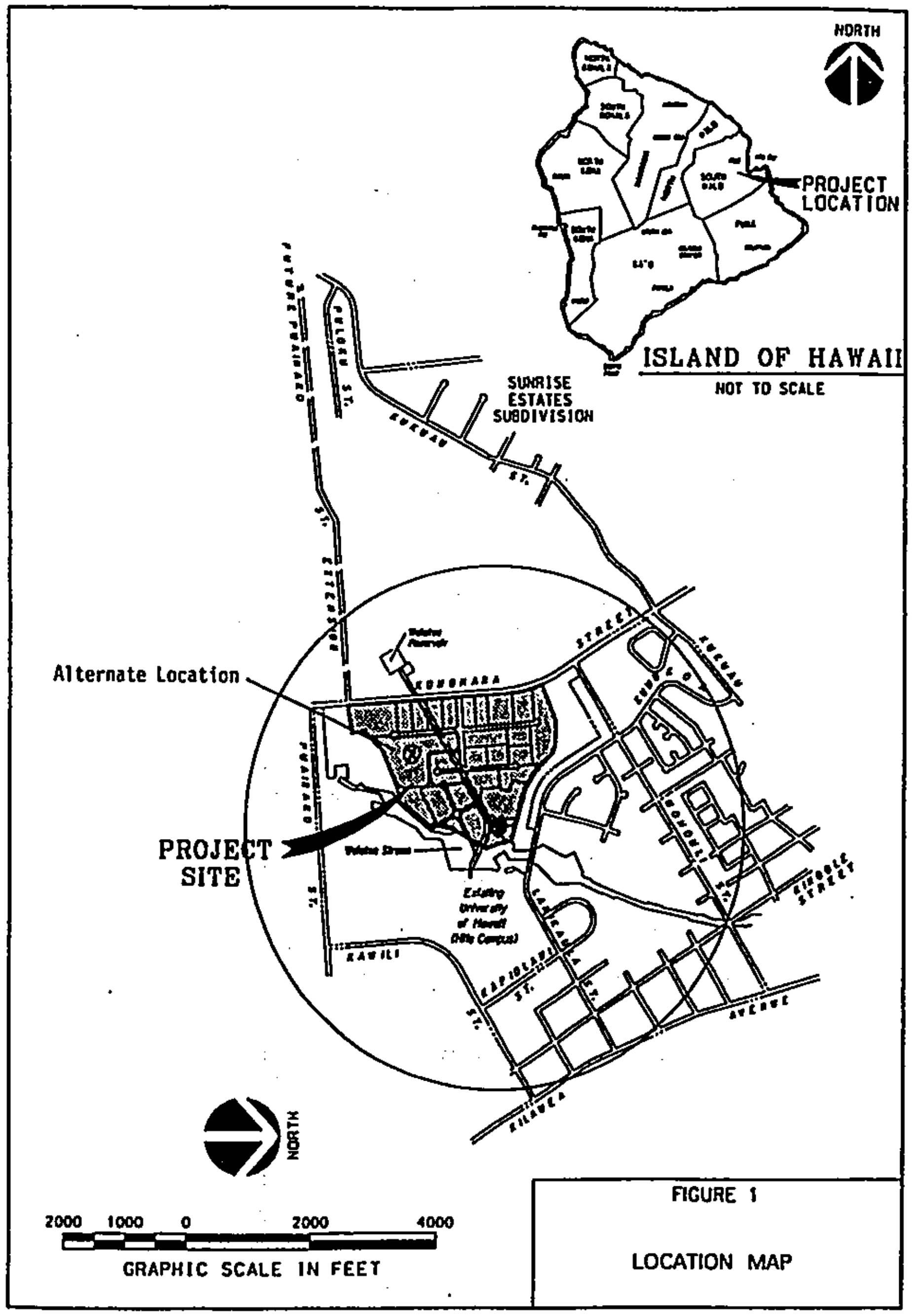


FIGURE 1

LOCATION MAP

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

RECEIVED
APR 9 1997

LETTER NO. PM-1074.7

APR 8 1997

Mr. Roy C. Price, Sr.
Vice-Director of Civil Defense
Department of Defense
3949 Diamond Head Road
Honolulu, Hawaii 96816

Dear Mr. Price:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of February 21, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and offer the following response to your comments:

1. Civil Defense Siren

The suggested siren location between the proposed Student Housing parking lot and Intramural Field will not be practical due to the 250-foot buffer zone requirement. The buffer zone will restrict residential development within the Student Housing site. Due to the buffer zone restriction, a siren in this vicinity would need to be located in the middle of the Intramural Field, which may restrict use of the field for athletic events.

The alternate siren location within the Multi-Purpose Center parking lot would be more acceptable since the buffer zone could be contained entirely within the parking lot. Location of the siren in this area will be a consideration during the design phase. Installation of a civil defense siren will be listed as an unresolved issue in the Draft EIS.

BENJAMIN J. CAYETANO
GOVERNOR

MAJOR GENERAL EDWARD V. RICHARDSON
DIRECTOR OF CIVIL DEFENSE

ROY C. PRICE, SR.
VICE DIRECTOR OF CIVIL DEFENSE

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

PHONE (808) 733-4300
FAX (808) 733-4287

February 21, 1997

RECEIVED
FEB 2 2 1997
ENGINEERING CONCEPTS

TO: Benjamin J. Cayetano, Governor, State of Hawaii
c/o Office of Environmental Quality Control
235 South Beretania Street
State Office Tower, Suite 702
Honolulu, Hawaii 96813

FROM: Roy C. Price, Sr.
Vice Director of Civil Defense

SUBJECT: UNIVERSITY OF HAWAII AT HILO (UH-HILO) UNIVERSITY PARK; ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN)

State Civil Defense (SCD) appreciates this opportunity to comment on the EISPN for the UH-Hilo University Park, Hilo, island of Hawaii, Hawaii; Tax Map Key: 2-4-01:7 and 41.

The proposed University Park area does not have any existing civil defense sirens. This may be mitigated through the purchase and installation of one (1) 121 Db omnidirectional solar powered siren and siren support infrastruc- ture by the applicant of this project. The suggested location of this siren is between the Student Housing parking and the Intramural Field. This siren will require a 250-foot buffer zone. An alternate location for this siren would be the parking complex adjacent to the Multi-Purpose Center. The estimated coverage area and location are annotated in red on Figure 1, Proposed University Park Development Plan.

Chapter 2, DESCRIPTION OF PROPOSED ACTION, subsection 2.2.1, Offsite Reservoir and Water Line and Chapter 3, SUMMARY DESCRIPTION OF THE AFFECTED ENVIRONMENT, subsections, 3.1.2, 3.4 and 3.7 cover Offsite Reservoir and Water Line, TOPOGRAPHY and FLOOD HAZARD respectively. While the initial construction phase comprises offsite infrastructure to support future expansion of the UH Hilo campus, the sections cited above have a role in the siting, design and construction of facilities as the expansion is phased in and defined. The proposed 0.5 million gallon reservoir will be sited at an elevation of 460 feet with the spillway elevation of 479 feet. The topography of the proposed University Park site ranges in elevation from 320 feet above mean sea level (MSL) to 140 feet MSL with slopes ranging from

6-15 percent in isolated areas. Flood Hazards are addressed. Volcanic, seismic and the impact of tropical cyclone force winds (orographic amplification) should also be addressed and evaluated. Facilities within the total project area must be favorably sited, designed and constructed to mitigate these conditions at the project elevations. Structures can then be evaluated and surveyed for use as public shelters in disasters.

Our SCD planners and technicians are available to discuss this further if there is a requirement. Please have your staff call Mr. Mel Nishihara of my staff at 733-4300.

Enc.

c: Ms. Gina Ichiyama
Dept. of Accounting and
General Services
1151 Punchbowl Street, Room 427
Honolulu, Hawaii 96813

✓Mr. Ken Ishizaki
Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

A copy of your comment letter and this response will be included in the Draft EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

BENJAMIN J. CAYETANO
GOVERNOR
SEIJI F. NAYA
DIRECTOR
RICK EGGED
DIRECTOR, OFFICE OF PLANNING

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

OFFICE OF PLANNING
235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804
Telephone: (808) 587-2846
Fax: (808) 587-2824

Ref. No. P-6476

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MAR 1 1997
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February 20, 1997

MEMORANDUM

TO: Gary Gill, Director
Office of Environmental Quality Control

FROM: Rick Egged *Rick Egged*
Director, Office of Planning

SUBJECT: Environmental Impact Statement Preparation Notice (EISPN) for the University of Hawaii at Hilo, University Park

We have reviewed the EISPN for the University of Hawaii at Hilo, University Park, and have the following comments.

The draft Environmental Impact Statement (EIS) should be expanded to include an assessment of the project site's conformance with the objectives and policies of Chapter 205A, HRS. The proposed bridge and bank stabilization at Waiakea Stream may directly affect Coastal Zone Management (CZM) policies protecting Coastal Ecosystems, Section 205A-2(4), HRS, through silt runoff into the stream and Hilo Bay. Further, the offsite reservoir and water line traverses through a native-dominated *ohialuluhe* forest and may affect CZM Scenic and Open Space Resources, Chapter 205A-2(3), HRS, as well as the aforementioned Coastal Ecosystems. As such, the project's conformance with objectives and policies of Chapter 205A, HRS, should be addressed in the EIS.

Thank you for the opportunity to comment. If you have any questions, please call Rebecca Alakai of our CZM Program at 587-2806.

cc: Dept. of Accounting and General Services
Attn: Gina Ichiyama

✓Engineering Concepts, Inc.
Attn: Ken Ishizaki

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER
MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1067.7

APR 1 1997

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Mr. Rick Egged, Director
Office of Planning
Department of Business, Economic
Development and Tourism
235 South Beretania Street, 6th Floor
Honolulu, Hawaii 96813

Dear Mr. Egged:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of February 20, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and offer the following response to your comments:

1. The Draft EIS will address conformance of the project with the objectives and policies of Chapter 205A, HRS.

2. The impact of the proposed bridge and bank stabilization at Waiakea Stream on policies protecting Coastal Ecosystems will be addressed in a Coastal Zone Management Consistency Certification which is anticipated to be required in association with the Department of the Army permit.

3. The impact of the offsite reservoir and water line on CZM Scenic and Open Space Resources will be addressed in the Draft EIS.

BENJAMIN J. CAYETANO
GOVERNOR

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

ESTHER UEDA
EXECUTIVE OFFICER

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January 27, 1997

Mr. Gary Gill, Director
Office of Environmental Quality
Control
State Office Tower, Room 702
235 South Beretania Street
Honolulu, Hawaii 96813

Dear Mr. Gill:

Subject: Environmental Impact Statement Preparation Notice (EISPN) for University of Hawaii at Hilo University Park, Hilo, Hawaii, TMK 2-4-01: 7 and 41

We have reviewed the EISPN for the subject project and confirm that the project site, as represented in Figure 1, is located within the State Land Use Urban District. We note that the proposed offsite water improvements west of Komohana Street, as represented in Figure 4, are located within the State Land Use Agricultural District.

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

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

Sincerely,

ESTHER UEDA
Executive Officer

EU:rg

cc: Gina Ichiyama
Ken Ishizaki

BENJAMIN J. CAYETANO
GOVERNOR

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

RECEIVED
MAR 8 1997
ENGINEERING CONCEPTS

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

PM-1048.7

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

Dear Ms. Ueda:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo
University Park, Infrastructure Improvements
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of January 27, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document.

The Draft EIS will incorporate your comment that the proposed offsite water improvements located west of Komohana Street are located within the State Land Use Agricultural District.

A copy of your comment letter and this response will be included in the Draft EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/sl
c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

U.S. Department of Transportation
Federal Aviation Administration

Western-Pacific Region
Box 50109
Honolulu, HI 96850-4983

RECEIVED
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ENGINEERING CONCEPTS

February 6, 1997

The Honorable Benjamin J. Cayetano
Governor of Hawaii
c/o Office of Environmental Quality Control
235 South Beretania Street
State Office Tower, Suite 702
Honolulu, HI 96813

Dear Governor Cayetano:

By letter from the State of Hawaii, Department of Accounting and General Services of January 23, 1997, the "Environmental Impact Statement Preparation Notice for University of Hawaii at Hilo University Park" dated January 1997, was forwarded for our review and comments.

The Federal Aviation Administration has no objection to this proposed facility.

We appreciate this opportunity to comment on your project. Please contact me at 541-1236, if there any questions or ways we may be of assistance.

Sincerely,

Darice B. N. Young
Realty Contracting Officer, AHNL-54B

cc: Department of Accounting and General Services
State of Hawaii
Attn: Gina Ichiyama
1151 Punchbowl Street, Room 427
Honolulu, HI 96813

Office of Environmental Quality Control
235 South Beretania Street
State Office Tower, Suite 702
Honolulu, HI 96813

Engineering Concepts, Inc. ✓
Attn: Ken Ishizaki
250 Ward Avenue, Suite 206
Honolulu, HI 96814

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

RECEIVED
MAR 8 1997
ENGINEERING CONCEPTS

LETTER NO. PM-1047.7

U.S. Department of Transportation
Federal Aviation Administration
Western-Pacific Region
Box 50109
Honolulu, Hawaii 96850-4983

Attention: Darice B. N. Young
Realty Contracting Officer, AHNL-54B

Gentlemen:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo
University Park, Infrastructure Improvements
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of February 6, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and acknowledge that you have no comments or objections to offer at this time.

Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

United States Department of the Interior

U.S. GEOLOGICAL SURVEY

WATER RESOURCES DIVISION
677 Ala Moana Boulevard, Suite 415
Honolulu, Hawaii 96813

RECEIVED
JAN 29 1997
ENGINEERING CONCEPTS

January 27, 1997

Benjamin J. Cayetano, Governor
State of Hawaii
c/o Office of Environmental Quality Control
235 South Beretania St.
State Office Tower, Suite 702
Honolulu, Hawaii 96813

Dear Governor Cayetano:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
for University of Hawaii at Hilo, University Park
Hilo, Hawaii
Tax Map Key: 2-4-01: 7 and 41

The staff of the U.S. Geological Survey, Water Resources Division, Hawaii District, has reviewed the Environmental Impact Statement Preparation Notice, and we have no comments to offer at this time.

We are returning the report for your future use. Thank you for allowing us to review the EISPN.

Sincerely,

William Meyer
William Meyer
District Chief

Enc.

cc: Gina Ichiyama, Dept. of Accounting & General Services, State of Hawaii
Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

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

RECEIVED
MAR 8 1997
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SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1046.7

MAR 6 1997

Mr. William Meyer, District Chief
Water Resources Division
U.S. Geological Survey
677 Ala Moana Boulevard, Suite 415
Honolulu, Hawaii 96813-5412

Dear Mr. Meyer:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo
University Park, Infrastructure Improvements
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of January 27, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and acknowledge that you have no comments to offer at this time.

Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

Gordon Matsuoka
GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

RECEIVED
MAR 8 1997
ENGINEERING CONCEPTS

LETTER NO. PM-1045.7

MAR 6 1997

Mr. Paul Mizue, Acting Chief
Planning and Operations Division
Department of the Army
Pacific Ocean Division, Corps of Engineers
Fort Shafter, Hawaii 96858-5440

Dear Mr. Mizue:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo
University Park, Infrastructure Improvements
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of January 29, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and provide the following response to your comments:

a) Our engineering consultant, Engineering Concepts, Inc., will contact the Regulatory Branch for further information on the Department of the Army permit requirements for the project (file no. 970000083). This information will be incorporated into the Draft EIS.

b) We acknowledge your confirmation that the flood hazard information provided on page 3-3 of the EISPN is correct.

A copy of your comment letter and this response will be included in the Draft EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

January 29, 1997

RECEIVED
JAN 30 1997
ENGINEERING CONCEPTS

Planning and Operations Division

Mr. Gary Gill
Office of Environmental Quality Control
State of Hawaii
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Mr. Gill:

Thank you for the opportunity to review and comment on the Environmental Impact Statement Preparation Notice (EISPN) for the University of Hawaii at Hilo University Park, Hilo, Hawaii (TMK 2-4-1: 7 and 41). The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act:

a. According to the information provided, the project may involve work within waters of the U.S.; therefore, a DA permit will be required. Please contact Mr. Farley Watanabe of our Regulatory Branch at 438-9258 (extension 14) for further information and refer to file number 970000083.

b. The flood hazard information provided on page 3-3 of the EISPN is correct.

Sincerely,

Paul Mizue, P.E.
Acting Chief, Planning
and Operations Division

Copies Furnished:

Ms. Gina Ichiyama
Department of Accounting and General Services
State of Hawaii
1151 Punchbowl Street, Room 427
Honolulu, Hawaii 96813

Mr. Ken Ishizaki
Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

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

LAWRENCE MIIKE
DIRECTOR OF HEALTH

In reply, please refer to:

RECEIVED
MAR 15 1997
ENGINEERING CONCEPTS

March 10, 1997

97-008/epo

To: The Honorable Benjamin Cayetano
Governor, State of Hawaii
c/o Director, Office of Environmental Quality Control
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

From: Lawrence Miike [signature] for
Director of Health

Subject: Environmental Impact Statement Preparation Notice
University of Hawaii at Hilo University Park
Hilo, Hawaii
TMK: 2-4-01: 7 & 41

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

Water Pollution

1. The applicant should contact the Army Corps of Engineers to identify whether a federal permit (including a Department of Army permit) is required for this project. If a federal permit is required, then a Section 401 Water Quality Certification is required from the State Department of Health, pursuant to Section 401 (a)(1) of the federal Water Pollution Control Act (commonly known as the Clean Water Act).

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

   a. Storm water discharges relating to construction activities for projects equal to or greater than five acres;

   b. Storm water discharges from industrial activities;

   c. Construction dewatering activities;

   d. Cooling water discharges less than one million gallons per day;

   e. Groundwater remediation activities; and

   f. Hydrotesting water.

   Any person requesting to be covered by a NPDES general permit for any of the above activities should file a Notice of Intent with the Department's Clean Water Branch at least 30 days prior to commencement of any discharge to waters of the State.

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

Wastewater

Please discuss wastewater disposal in the Draft Environmental Impact Statement (DEIS). If the project is located within a public sewer system, then connection to the sewer system will be required.

Noise

1. Potential long-term noise impacts and mitigation measures will be addressed in detail in the Draft EIS.

2. Potential short-term noise mitigation measures for construction activities addressed in section 4.3.1, paragraph (2), page 4-2, which states that no construction activities shall exceed 95 dBA noise level on Saturdays, Sundays and on holidays, should be corrected. Hawaii Administrative Rules, Chapter 11-46, "Community Noise Control", Section 11-46-7(3) states "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels on Sundays and on holidays."

3. Construction activities must comply with the provisions of Chapter 11-46, Hawaii Administrative Rules, "Community Noise Control."

   a. The contractor must obtain a noise permit if the noise levels from the construction activities are expected to exceed the allowable levels of the regulations as stated in Section 11-46-6(a).

b. Construction equipment and on-site vehicles requiring an exhaust of gas or air must be equipped with mufflers as stated in Section 11-46-6(b)(1)(A).

c. The contractor must comply with the conditional use of the permit as specified in the regulations and conditions issued with the permit as stated in Section 11-46-7(d)(4).

Should there be any questions on this matter, please call Jerry Haruno, Environmental Health Program Manager, Noise, Radiation and Indoor Air Quality Branch at 586-4701.

<u>Solid Waste</u>

The DEIS should address how the new development would impact existing municipal solid waste disposal practices and landfill capacity. The DEIS should also discuss what practices would be adopted to reduce the volume of solid waste generated by the site. Chapter 342G, HRS, directs state and county agencies to implement a recycling program and formally have established a goal of 50% waste diversion by the year 2000 for the State of Hawaii. Therefore, any new development should include waste minimization and recycling infrastructure within the design phase. Adequate space for the segregation of recyclable materials should also be provided. A list of Waste Minimization Measures is attached for consideration during development of the DEIS. The County of Hawaii may require a solid waste management plan be developed prior to the commencement of construction.

Considering that this is a State of Hawaii project, it is especially relevant that the development address every opportunity to include recycling, composting and waste reduction in the construction and use of the proposed University Park Extension. We recommend that recycled content building materials are used wherever feasible. Glasphalt is available for paving purposes and locally-produced compost for landscaping purposes. Recycled plastic lumber is available in Hawaii and provides a weather resistant alternative to traditional lumber.

Should you have any questions on this matter, please contact Ms. Carrie McCabe of the Office of Solid Waste Management at 586-4243.

<u>Polluted Runoff Control</u>

Please address in the DEIS polluted runoff control measures that will be implemented during construction activities and during the use of the completed facility.

<u>General Comments</u>

On page 4-2, Section 4.3.2, Air Pollution, 2nd paragraph, a correction needs to be made to Chapter <u>60</u>, "Air Pollution Control".. This chapter is now numbered 60.1.

Attachment

c: CWB
WWB
NR&IAQB
OSWM
DAGS
OEQC
Engineering Concepts, Inc.✓

ATTACHMENT

THE FOLLOWING ARE A FEW WASTE MINIMIZATION MEASURES FOR IMPLEMENTATION IN DESIGN AND CONSTRUCTION OF NEW DEVELOPMENTS:

I. WASTE REDUCTION DURING CONSTRUCTION/DEMOLITION

GREENWASTE - SOD AND TOP SOIL COMPOSTING
CONCRETE OR ASPHALT RECYCLING - ROCK & BOULDER SEPARATION
SALVAGE OF DIMENSIONAL LUMBER
METALS RECOVERY

WASTE MINIMIZATION PLAN - USUAL PRACTICE BUT EMPHASIZE
SALVAGE BY LOCAL NON-PROFIT
HAZWASTE MINIMIZATION - ESPECIALLY SUB-CONTRACTORS

II. USE OF RECYCLED MATERIALS

LOCAL COMPOST - SOIL AMENDMENTS
CRUSHED GLASS IN PAVING - BASE - BACKFILL
CONSTRUCTION BOARD WITH RECYCLED CONTENT
RECYCLED CONCRETE OR ASPHALT IN BASE
RECYCLED PLASTIC "LUMBER" IN OUTDOOR FURNITURE, FENCING, ETC.

III. DESIGN AND OPERATIONAL REQUIREMENTS

CONSIDER SPACIAL REQUIREMENTS AT INTERNAL COLLECTION AND EXTERNAL STORAGE AREAS
REVIEW OPERATIONAL REQUIREMENTS WITH MAINTENANCE AND CUSTODIAL STAFF
PROVIDE COLLECTION CAPABILITIES FOR SEPARATED GREENWASTE
DISCUSS EQUIPMENT AND CONTAINER REQUIREMENTS WITH HAULERS AND VENDORS
MULTI-MATERIAL CHUTES IN HIGH RISES
CONVENIENT DROP-OFF SITES IN TOWN HOUSES
INTERNAL TENANT RECYCLING IN SHOPPING CENTERS

BENJAMIN J. CAYETANO
GOVERNOR

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

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SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1072.7

APR 8 '97

TO: The Honorable Lawrence Miike, Director
Department of Health

SUBJECT: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of March 10, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and offer the following response to your comments:

Water Pollution

1. Our engineering consultant, Engineering Concepts, Inc., will contact the Army Corps of Engineers to discuss the need for a federal permit. The associated Section 401 Water Quality Certification permit requirements will be coordinated with the department's Clean Water Branch.

2. A Notice of Intent will be filed with the department's Clean Water Branch at least 30 days prior to the commencement of any discharge to waters of the state.

Wastewater

Wastewater from the project site will be directed to the municipal sewer system serving the project vicinity.

Noise

1. Potential long-term noise impacts and mitigation measures will be addressed in the Draft EIS.

2. Potential short-term noise mitigation measures for construction activities will be revised in the Draft EIS to comply with Chapter 11-46, Section 11-46-7(3).

3. The Draft EIS will state construction activity compliance with the provisions of Chapter 11-46, Sections: 11-46-6(a), 11-46-6(b)(1)(A), and 11-46-7(d)(4).

Solid Waste

1. The Draft EIS will discuss practices to reduce solid waste disposal requirements to minimize the impact on municipal landfills.

2. The use of recycled content building materials will be considered during the design of the University Park facilities.

Pollution Runoff Control

Erosion control plans will be prepared for all construction work which will call for silt fences, berms, temporary siltation basins and other water quality measures to prevent direct discharges of storm runoff into streams. Storm drain drywells and landscaping/grading to provide detention basins and filtering are water quality measures that will be implemented to control polluted runoff after construction.

General Comments

The Draft EIS will correctly refer to Chapter 60.1 "Air Pollution Control".

A copy of your comment letter and this response will be included in the Draft EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

SAM CALLEJO
State Comptroller

c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
ENGINEERING BRANCH
P.O. BOX 373
HONOLULU, HAWAII 96809

MAR 12 1997

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MAR 13 1997
ENGINEERING CONCEPTS

Ms. Gina Ichiyama
State of Hawaii
Department of Accounting and General Services
11 51 Punchbowl Street, Room 427
Honolulu, Hawaii 96813

Dear Ms. Ichiyama:

Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo University Park
Hilo, Island of Hawaii

Thank you for the opportunity to review and comment on the subject document.

We confirm that the proposed project site is located in Zone X, an area determined to be outside the 500-year flood plain and is bordered by Waiakea Stream, a special hazard area inundated by the 100-year flood. A tributary to Waiakea Stream borders the southern part of the project site. This southern area can also be identified as a special hazard area inundated by the 100-year flood. Base flood elevations have been determined for both the stream and its tributary. The EISPN incorrectly states that "no base flood elevations have been determined for the tributary.

The proposed improvements to Waiakea Stream may require a stream channel alteration permit, therefore, this portion of the project should be coordinated with the Commission on Water Resource Management.

Should you have any questions, please contact Mr. Dennis Imada of the Project Planning Section at 587-0257.

Sincerely,

Andrew M. Monden

ANDREW M. MONDEN
Chief Engineer

DI:lk
c: Ken Ishizaki, Engineering Concepts
OEQC

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER
MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1069.7

RECEIVED
MAR 25 1997
ENGINEERING CONCEPTS

Mr. Andrew M. Monden, Chief Engineer
Engineering Branch
Land Division
Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Monden:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of March 12, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and offer the following response to your comments:

1. The Draft EIS will state that the tributary to Waiakea Stream which is located to the south of the project site is a special hazard area inundated by the 100-year flood, with base flood elevations determined.

2. The Draft EIS will clarify the statement that "no base flood elevations have been determined for the tributary" refers to the localized drainage ditch discharging to Waiakea Stream which is adjacent to the northern border of the project site.

3. Our engineering consultant, Engineering Concepts, Inc., will coordinate the application for a stream channel alteration permit with the Commission on Water Resource Management.

Mr. Andrew M. Monden
Letter No. PM-1069.7
Page 2
JAN 2 1997

A copy of your comment letter and this response will be included in the Draft EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

COPY

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FEB 5 1997
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES
GILBERT COLOMA-AGARAN

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

February 4, 1997

MEMORANDUM

LOG NO: 18825 ✓
DOC NO: 9701PM13

TO: Governor Benjamin J. Cayetano
c/o Office of Environmental Quality Control

FROM: Don Hibbard, Administrator
State Historic Preservation Division

SUBJECT: University of Hawaii at Hilo University Park
Hilo, South Hilo, Hawaii Island
TMK: 2-4-01: 7 and 41

It appears from the information presented in the Environmental Impact Statement Preparation Notice (EISPN) that there are no significant historic sites in the proposed project area. The project is thus likely to have "no effect" on significant historic sites. We will wait for the Draft EIS containing all of the archaeological survey reports before making final comment.

c. Gina Ichiyama, DAGS
Ken Ishizaki, Engineering Concepts, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

RECEIVED
MAR 8 1997
ENGINEERING CONCEPTS

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1050.7

MAR 5

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

Dear Mr. Hibbard:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo
University Park, Infrastructure Improvements
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of February 4, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and acknowledge your decision to wait for the Draft EIS before making final comments on the impact of the project on historic sites.

Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/sl
c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

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

RECEIVED
FEB 2 1 1997
ENGINEERING CONCEPTS

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
JERRY M. MATSUDA
GLENN M. OKIMOTO

IN REPLY REFER TO:
STP 8.7764

February 19, 1997

TO: THE HONORABLE BENJAMIN J. CAYETANO, GOVERNOR
STATE OF HAWAII
C/O OFFICE OF ENVIRONMENTAL QUALITY CONTROL

FROM: KAZU HAYASHIDA
DIRECTOR OF TRANSPORTATION

SUBJECT: UNIVERSITY OF HAWAII AT HILO UNIVERSITY PARK
ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (EISPN)
TMK: 2-4-01: 7 & 41

Thank you for your transmittal of January 23, 1997, requesting our comments on the subject EISPN.

Our comments are as follows:

1. The Preparation Notice indicates that a Traffic Impact Analysis Report (TIAR) will be included in the Draft EIS. The traffic report should include an assessment of the traffic impacts to the State facilities, particularly at the intersections of Puainako Street and Komohana Street, and Kawili Street and Kanoelehua Avenue.

2. No direct access to Puainako Street will be permitted from the proposed development.

3. Plans for any construction work within the State highway right-of-way must be submitted for our review and approval. These improvements should be at no cost to the State.

We will defer further comments until we have had the opportunity to review the Draft EIS.

c: Gina Ichiyama, Department of Accounting and General Services
Gary Gill, Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES

RECEIVED
APR 9 1997
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SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

PM-1073.7

TO: The Honorable Kazu Hayashida, Director
Department of Transportation

SUBJECT: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41
(Reference: STP 8.7764)

Thank you for your letter of February 19, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and offer the following response to your comments:

1. *The Preparation Notice indicates that Traffic Impact Analysis Report (TIAR) will be included in the Draft EIS. The traffic report should include an assessment of the traffic impacts to the State facilities, particularly at the intersections of Puainako Street and Komohana Street, and Kawili Street and Kanoelehua Avenue.*

   The traffic report addresses local traffic impacts due to the proposed project. Since the main entrance to the University Park site is from Komohana Street, the intersection of Puainako Street and Komohana Street will be addressed.

   The project will provide a new main entrance to the university off Kawili Street, replacing the existing Campus Center entrance. To mitigate serious safety concerns raised by students, faculty, staff and the planning consultant, UH Hilo will limit access between Komohana Street and Kawili Street for maintenance vehicles and emergency use only. For this reason, detailed analysis of the Kanoelehua Avenue and Kawili Street traffic with Puainako Street has not been included in the traffic report.

It is anticipated that the University Park development will have minimal impact on the Kanoelehua/Puainako and Kawili/Puainako intersections, based on a cursory evaluation. The percentage of project traffic entering each intersection was estimated based on historical traffic volumes at each intersection (1994 DOT data) and conservative forecasts of project traffic at each intersection:

Intersection	Morning Peak Hour	Afternoon Peak Hour
Kanoelehua/Puainako	8 %	7 %
Kawili/Puainako	9 %	9 %

When the University Park project is completed, the ambient traffic volumes will be higher than the 1994 volumes used in the calculations, and, therefore, the percentage of project traffic entering each intersection will be lower than shown.

2. *No direct access to Puainako Street will be permitted from the proposed development.*

   There are no plans for direct access to Puainako Street from the proposed University Park development located east of Komohana Street. However, location of a 0.5 million gallon reservoir which will serve the University Park development has been proposed along the future Puainako Street extension. Periodic access to the reservoir site from the proposed Puainako Street extension will be required for maintenance by the Department of Water Supply. Selection of this reservoir site was based on its proximity to the University Park site, location within state lands, and the ability to meet the spillway elevation requirements (to correspond with other reservoirs in the service zone). Location of the reservoir north of the proposed Puainako Street extension will not meet the elevation requirement. There are no nearby roads south of Puainako Street which can provide alternate access to the reservoir site.

3. *Plans for any construction work within the State highway right-of-way must be submitted for our review and approval. These improvements should be at no cost to the State.*

   Construction plans will be submitted for review and approval if work within the state highway right-of-way is required.

A copy of your comment letter and this response will be included in the Draft EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

SAM CALLEJO
State Comptroller

c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

GARY GILL
DIRECTOR

RECEIVED
FEB 5 1997
ENGINEERING CONCEPTS

February 3, 1997

Sam Callejo
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaii 96810

Attention: Gina Ichiyama

Dear Mr. Callejo:

Subject: Environmental Impact Statement (EIS) Preparation Notice for University Park, University of Hawaii at Hilo

We have the following comments to offer:

1. It is difficult to evaluate the impact the planned additional student population will have on the community without first knowing the *current student population*. Please include this figure, along with any pertinent discussion, in the draft EIS.

2. The discussion of short-term impacts and their mitigation measures (Sections 4.1 and 4.3) did not include *safety issues*. Please include this discussion in the draft EIS.

3. In the section on long term impacts (Chapter 4), discussions on *water quality* issues, *visual impacts* to the surrounding communities, and a *fauna* survey were not included.

4. Are bikeways planned for the new portion of the campus? If so please describe them.

5. In Section 6.2, Findings and Reasons Supporting Determination, the following criteria need to be evaluated and discussed more fully:

   a. Regarding *curtailment of the range of beneficial uses* of the environment (# 2), include in your discussion a comparison of both beneficial and detrimental impacts of current use versus projected use.

   b. For *substantial effects on the economic and social welfare of the community* and *substantial secondary impacts, such as population changes or effect on public facilities* (#s 4 and 6), fully evaluate both positive and negative impacts the additional student body and expanded facilities will have.

   c. Fully discuss the rationale for the "No" response that's given for (#8), *impacts limited individually but having a cumulative effect upon the environment or involving a commitment for larger actions.*

If you have any questions please call Nancy Heinrich at 586-4185.

Sincerely,

Gary Gill

GARY GILL
Director

c: Ken Ishizaki, Engineering Concepts

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1068.7

MAR 24 1997

RECEIVED
MAR 25 1997
ENGINEERING CONCEPTS

Mr. Gary Gill
Director
Office of Environmental Quality Control
State Office Tower, Suite 702
235 South Beretania Street
Honolulu, Hawaii 96813

Dear Mr. Gill:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of February 3, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and offer the following response to your comments:

1. Student Population

Hawaii Community College presently occupies a portion of the UH Hilo campus. The Fall 1996 student enrollment figures for UH Hilo and Hawaii Community College were 2,800 and 2,463 students, respectively (for a total student population of 5,263). In comparison, the existing UH Hilo campus can accommodate a student population of approximately 5,000 full-time equivalent students (FTE). This information will be included in the Draft EIS.

The impact of the additional student population on the community will be addressed in a socioeconomic assessment which is being prepared for the Draft EIS.

2. Short-term Impacts and Mitigation Measures

Additional short-term impacts and mitigation measures, including safety issues, will be addressed in the Draft EIS.

3. Long-term Impacts and Mitigation Measures

Water Quality. The impact of the project on water quality, specifically Waiakea Stream, will be addressed in the Draft EIS.

Visual Impact. The visual impact of the project on the surrounding community cannot be addressed at this time since structural and architectural details of proposed buildings have not been developed. A supplemental EIS will be prepared to address the specific impact of each building/facility (including visual impact on the surrounding community) as planning and design of the University Park facilities proceeds.

Fauna Survey. A report on the anticipated impact of the proposed project on birds and mammals will be included in the Draft EIS.

Discussion of these and other long-term impacts and their proposed mitigation measures will be included in the Draft EIS.

4. Bikeways

The Nowelo Street extension and bridge crossing at Waiakea Stream will incorporate bicycle lanes on two sides of the road within the University Park site. The bike lanes will be four feet wide.

5. Findings and Reasons Supporting Determination

a. Curtailment of the range of beneficial uses of the environment.

Current Use: Vacant, undeveloped site

Beneficial impacts: Open space

Detrimental impacts: Separates existing UH Hilo campus from Research and Technology Park along Komohana Street. No direct vehicular access presently permitted.

Projected Use: Educational facilities; including research, residential and recreational uses.

Beneficial impacts: Expanded educational facilities to support growing student population.

Detrimental impacts: Loss of open space, loss of natural habitat.

b. Substantial effects on the economic and social welfare of the community and substantial secondary impacts, such as population changes or effect on public facilities.

Effects will be described in the Draft EIS.

c. Impacts limited individually but having a cumulative effect upon the environment or involving a commitment for larger actions.

The proposed project addressed in the EIS is presented in its entirety. There are no other (larger) actions proposed or anticipated to result from this project. Supplemental documents will be submitted, as required, for construction of individual buildings and facilities as planning and design proceeds.

A copy of your comment letter and this response will be included in the Draft EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc. ✓

02/20/97 13:59 DAGS DPW PROJ MGMT 002

'97 FEB 24 AM 10:30

STATE OF HAWAII

OFFICE OF HAWAIIAN AFFAIRS
711 KAPIOLANI BOULEVARD, SUITE 500
HONOLULU, HAWAII 96813-5249
PHONE (808) 594-1888
FAX (808) 594-1865

February 10, 1997

Feb 21 1997

97:220411

40911

Governor, State of Hawaii
c/o Office of Environmental Quality Control
235 South Beretania Street
Honolulu, HI 96813

Dear Sir/Madam:

Thank you for the opportunity to review the Environmental Impact Statement (EIS) Preparation Notice for the University of Hawaii at Hilo University Park, Island of Hawaii. The project's objective is the development of an 116-acre University Park that will accommodate a research and technology park as well as academic, recreation, and student housing facilities.

The Office of Hawaiian Affairs (OHA) has no objections at this time to the Preparation Notice. But OHA intends to thoroughly review the EIS once the document is available for public review. Also OHA wishes to clearly express from the onset of the process that the proposed development is on ceded lands. OHA urges the preparers to (i) include this fact as an outstanding issue in the EIS, and (ii) work closely with OHA officials on the use of ceded lands for the proposed development. Please contact Lynn Lee, Acting Officer of the Land and Natural Resources Division, or Luis Manrique, should you have any questions on this matter.

Sincerely yours,

Martha Ross
Deputy Administrator

DIVISION OF PUBLIC WORKS

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1997 FEB 28 A 9:32

BENJAMIN J. CAYETANO
GOVERNOR

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MAR 8 1997
ENGINEERING CONCEPTS

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1051.7

MAR 6 1997

Ms. Martha Ross, Deputy Administrator
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813-5249

Dear Ms. Ross:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo
University Park, Infrastructure Improvements
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of February 10, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and acknowledge that you have no objections to the EISPN.

We also acknowledge your comment that the proposed development is located on ceded lands. The Draft EIS will include a statement on this subject in the "Unresolved Issues" section.

A copy of your comment letter and this response will be included in the Draft EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

Stephen K. Yamashiro
Mayor

RECEIVED
FEB 15 1997
ENGINEERING CONCEPTS

Nelson M. Tsuji
Fire Chief

Edward Bumatay
Deputy Fire Chief

County of Hawaii
FIRE DEPARTMENT
777 Kilauea Avenue • Mall Lane, Room 6 • Hilo, Hawaii 96720-4339
(808) 961-8297 • Fax (808) 961-8296

February 13, 1997

Honorable Benjamin J. Cayetano
Governor, State of Hawaii
c/o Office of Environmental Quality Control
235 South Beretania Street
State Office Tower, Suite 702
Honolulu, HI 96813

Dear Governor Cayetano:

Re: University of Hawaii at Hilo University Park
Hilo, Island of Hawaii
Tax Map Key: 2-4-01:7 and 41

Minimum requirements as stated in the Fire Code are:

"Fire Apparatus Access Roads

"Sec. 207. (a) General. Fire apparatus access roads shall be provided and maintained in accordance with the provisions of this section.

"(b) Where Required. Fire apparatus access roads shall be required for every building hereafter constructed when any portion of an exterior wall of the first story is located more than 150 feet from fire department vehicle access as measured by an unobstructed route around the exterior of the building.

"EXCEPTIONS: 1. When buildings are completely protected with an approved automatic fire sprinkler system, the provisions of this section may be modified.

"2. When access roadways cannot be installed due to topography, waterways, nonnegotiable grades or other similar conditions, the chief may require additional fire protection as specified in Section 10.301 (b).

"3. When there are not more than two Group R, Division 3 or Group M Occupancies, the requirements of this section may be modified, provided, in the opinion of the chief, fire-fighting or rescue operations would not be impaired.

"More than one fire apparatus road may be required when it is determined by the chief that access by a single road may be impaired by vehicle congestion, condition of terrain, climatic conditions or other factors that could limit access.

"For high-piled combustible storage, see Section 81.109.

"(c) Width. The unobstructed width of a fire apparatus access road shall meet the requirements of the appropriate county jurisdiction.

"(d) Vertical Clearance. Fire apparatus access roads shall have an unobstructed vertical clearance of not less than 13 feet 6 inches.

"EXCEPTION: Upon approval vertical clearance may be reduced, provided such reduction does not impair access by fire apparatus and approved signs are installed and maintained indicating the established vertical clearance.

"(e) Permissible Modifications. Vertical clearances or widths required by this section may be increased when, in the opinion of the chief, vertical clearances or widths are not adequate to provide fire apparatus access.

"(f) Surface. Fire apparatus access roads shall be designed and maintained to support the imposed loads of fire apparatus and shall be provided with a surface so as to provide all-weather driving capabilities." (20 tons)

"(g) Turning Radius. The turning radius of a fire apparatus access road shall be as approved by the chief." (45 feet)

"(h) Turnarounds. All dead-end fire apparatus access roads in excess of 150 feet in length shall be provided with approved provisions for the turning around of fire apparatus.

"(i) Bridges. When a bridge is required to be used as access under this section, it shall be constructed and maintained in accordance with the applicable sections of the Building Code and using designed live loading sufficient to carry the imposed loads of fire apparatus.

"(j) Grade. The gradient for a fire apparatus access road shall not exceed the maximum approved by the chief." (15%)

"(k) Obstruction. The required width of any fire apparatus access road shall not be obstructed in any manner, including parking of vehicles. Minimum required widths and clearances established under this section shall be maintained at all times.

"(l) Signs. When required by the fire chief, approved signs or other approved notices shall be provided and maintained for fire apparatus access roads to identify such roads and prohibit the obstruction thereof or both."

"INSTALLATION AND MAINTENANCE OF FIRE-PROTECTION, LIFE-SAFETY SYSTEMS AND APPLIANCES

"Installation

"Sec. 10.301. (c) Water Supply. An approved water supply capable of supplying required fire flow for fire protection shall be provided to all premises upon which buildings or portions of buildings are hereafter constructed, in accordance with the respective county water requirements. There shall be provided, when required by the chief, on-site fire hydrants and mains capable of supplying the required fire flow.

"Water supply may consist of reservoirs, pressure tanks, elevated tanks, water mains or other fixed systems capable of providing the required fire flow.

"The location, number and type of fire hydrants connected to a water supply capable of delivering the required fire flow shall be protected as set forth by the respective county water requirements. All hydrants shall be accessible to the fire department apparatus by roadways meeting the requirements of Section 10.207."

A fire hydrant with sufficient fire flow is also required.

Sincerely,

NELSON M. TSUJI
Fire Chief

NMT/mo

cc: DAGS
OEQC
✓Engineering Concepts, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

MAR 8 1997
ENGINEERING CONCEPTS

LETTER NO. PM-1052.7

MAR 6 1997

Mr. Nelson M. Tsuji, Fire Chief
Fire Department
County of Hawaii
Mall Lane, Room 6
777 Kilauea Avenue
Hilo, Hawaii 96720-4239

Dear Chief Tsuji:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo
University Park, Infrastructure Improvements
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of February 13, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document.

We will comply with the Fire Code requirements during design of the University Park facilities.

A copy of your comment letter and this response will be included in the Draft EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

Stephen K. Yamashiro
Mayor

County of Hawaii
PLANNING DEPARTMENT
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720-4252
(808) 961-8288 • Fax (808) 961-9615

Virginia Goldstein
Director

Norman Olesen
Deputy Director

RECEIVED
FEB 25 1997
ENGINEERING CONCEPTS

February 20, 1997

Honorable Benjamin J. Cayetano
Governor
c/o Office of Environmental Quality Control
235 South Beretania Street
State Office Tower, Suite 702
Honolulu, HI 96813

Dear Governor Cayetano:

Environmental Impact Statement Preparation Notice (EISPN)
Project: Proposed Development of the 116-acre University Park
TMK: 2-4-01: Portion of 7 and 41

Thank you for providing our office with the opportunity to offer comments regarding the preparation of an environmental impact statement for the proposed development of the 116-acre University Park as an expansion of the University of Hawaii at Hilo complex. We have completed our review and have the following comments to offer:

1. The proposed University Park project site is situated within an area designated as Urban by the State Land Use Commission and zoned Agricultural-1 acre (A-1a) and Single Family Residential (RS-10) by the County. The project site is not situated within the County's Special Management Area.

2. The establishment of the proposed University Park to accommodate research, technology, and academic pursuits as well as to provide for recreational and student housing facilities is a permitted use within the A-1a and RS-10 zoned district pursuant to Section 25-4-11(c) of the Hawaii County (Zoning) Code.

3. According to the City of Hilo Zone Map, the project site is bisected by an 80-foot wide future road right-of-way to accommodate the future expansion of Ainako Street. This future roadway alignment is not reflected on site plans included within the EISPN and will severely disrupt the conceptual layout of the University Park parcels

and facilities. Enclosed is copy of portion of the City of Hilo Zone Map depicting the project site and the proposed Ainako Street Extension alignment.

Once again, thank you for allowing our office the opportunity to comment. Should you have any questions, please feel free to contact us.

Sincerely,

VIRGINIA GOLDSTEIN
Planning Director

DSA:pak
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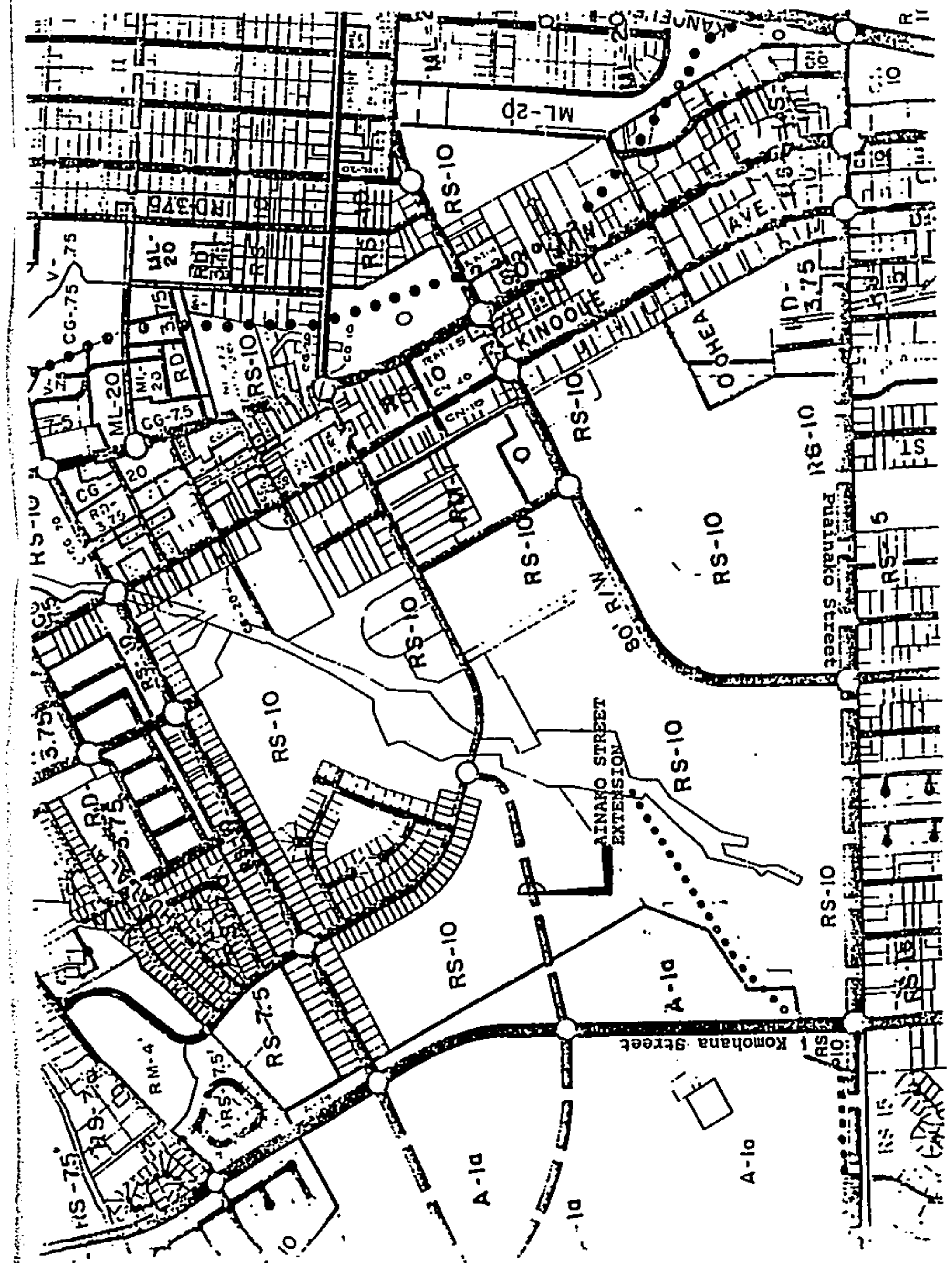
Attachment (City of Hilo Zone Map-Por)

xc w/attach: Ms. Gina Ichiyama, DAGS-HNL
Mr. Gary Gill, OEQC
Mr. Ken Ishizaki, Engineering Concepts, Inc.
County Department of Public Works-Engineering



BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1070.7

MAR 24 1997

RECEIVED
MAR 25 1997
ENGINEERING CONCEPTS

Ms. Virginia Goldstein
Planning Director
Planning Department
County of Hawaii
25 Aupuni Street, Room 109
Hilo, Hawaii 96720-4252

Dear Ms. Goldstein:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of February 20, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and offer the following response to your comments:

1. We acknowledge your comments that the project site:

   a. is situated within an area designated as Urban by the State Land Use Commission;

   b. is zoned Agricultural-1 acre (A-1a) and Single Family Residential (RS-10) by the County; and

   c. is not situated within the County's Special Management Area.

2. We acknowledge your comment that the facilities proposed for the University Park are a permitted use within the A-1a and RS-10 zoned district pursuant to Section 25-4-11(c) of the Hawaii County (Zoning) Code.

Ms. Virginia Goldstein
Letter No. PM-1070.7
Page 2
MAR 24 1997

3. Resolution of the future Ainako Street extension which is shown on the City of Hilo Zone Map, will be listed as an unresolved issue in the Draft EIS. The University of Hawaii at Hilo will work with the Department of Public Works and your department in order to revise to the zone map.

A copy of your comment letter and this response will be included in the Draft EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc. ✓

Stephen K. Yamashiro
Mayor

Wayne G. Carvalho
Police Chief

James S. Correa
Deputy Police Chief

County of Hawaii
POLICE DEPARTMENT
349 Kapiolani Street • Hilo, Hawaii 96720-3998
(808) 935-3311 • Fax (808) 961-2702

RECEIVED
FEB 1 1997
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January 30, 1997

The Honorable Benjamin J. Cayetano
Governor, State of Hawaii
c/o Office of Environmental Quality Control
235 South Beretania Street
State Office Tower, Suite 702
Honolulu, Hawaii 96813

Dear Governor Cayetano:

SUBJECT: UNIVERSITY OF HAWAII AT HILO
UNIVERSITY PARK PROJECT
HILO, ISLAND OF HAWAII
TAX MAP KEY: 2-4-01:7 AND 41

Staff reviewed the Environmental Impact Statement Preparation Notice (EISPN) for the above-referenced project and has no objections to offer at this time.

Traffic is usually the concern with a development of this magnitude, but the proposed road improvements should alleviate congestion.

Thank you for the opportunity to comment.

Sincerely,

WAYNE G. CARVALHO
POLICE CHIEF

JAMES S. CORREA
DEPUTY POLICE CHIEF
ACTING POLICE CHIEF

CMC:lk

cc: Ms. Gina Ichiyama, Dept. of Accounting and General Services
Office of Environmental Quality Control
Mr. Ken Ishizaki, Engineering Concepts, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

RECEIVED
MAR 8 1997
ENGINEERING CONCEPTS

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

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

LETTER NO. PM-1053.7

MAR 6 1997

Mr. James S. Correa, Acting Police Chief
Police Department
County of Hawaii
349 Kapiolani Street
Hilo, Hawaii 96720-3998

Dear Acting Chief Correa:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo
University Park, Infrastructure Improvements
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of January 30, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and acknowledge that you have no objections to the project at this time.

Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

Stephen K. Yamashiro
Mayor

County of Hawaii
DEPARTMENT OF PUBLIC WORKS
25 Aupuni Street, Room 202 • Hilo, Hawaii 96720-4252
(808) 961-8321 • Fax (808) 961-8630

Donna Fay K. Kiyosaki
Chief Engineer

Jiro A. Sumada
Deputy Chief Engineer

RECEIVED
FEB 13 1997
ENGINEERING CONCEPTS

February 11, 1997

BENJAMIN J CAYETANO GOVERNOR STATE OF HAWAII
C/O OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
STATE OFFICE TOWER SUITE 702
HONOLULU HAWAII 96813

SUBJECT : ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE
The University of Hawaii at Hilo, University Park
Waiakea, South Hilo, Hawaii
TMK: 3 / 2-4-01: 07 & 41

We acknowledge receipt of your submittal concerning the subject matter, and provide you with our comments as follows:

1. Any building construction shall conform to all requirements of code and statutes of the County of Hawaii.

2. All development generated runoff shall be disposed on site and shall not be directed toward any adjacent properties.

3. All earthwork and grading shall be in conformance with Chapter 10, Erosion and Sediment Control, of the Hawaii County Code.

4. Any work within a County road right-of-way shall be in conformance with Chapter 22, Streets and Sidewalks, of the Hawaii County Code. Particularly the proposed connections and channelization on Kawili Street, and the proposed road widening at the existing service road.

5. Any construction within known watercourses shall be in conformance with Chapter 27, Flood Control, of the Hawaii County Code. A flood study, along with a Letter of Map Revision (LOMR) through FEMA, maybe required to evaluate the effects to the

improvements proposed in Waiakea Stream and possibly other inundation areas. The proposed Waiakea Stream bridge and bank stabilization shall meet with the approval of the COH, DLNR, FEMA, and COE. The COH may wish to transfer the maintenance responsibilities of the proposed improvements to the University of Hawaii.

The subject properties are affected by Flood Zones "X", "A", & "AE", according to the Flood Insurance Rate Map dated September 16, 1988.

6. Sewer line connections shall conform to the rules and regulations of the County of Hawaii, Wastewater Division.

7. A solid waste management plan shall conform to the rules and regulations of the County of Hawaii, Solid Waste Division.

8. Construction activity noise, as noted in Section 4.31, should be limited between the hours of 8:00a.m. thru 4:30p.m., as required under a required grading permit.

9. The University should provide and plan adequate off-street parking for the campus. Some problems are occurring along Kawili Street, Lanikaula Street, and Kapiolani Street.

10. DPW recommends that a through-road connection be provided for the public, from Komohana Street to Lanikaula Street and Kawili Street. The unimproved existing stubout roads along Lanikaula Street could be used.

Should there be any questions concerning this matter, please feel free to contact Mr. Casey Yanagihara in our Engineering Division at (808)961-8327.

Galen M. Kuba, Division Chief
Engineering Division

CKY

copy: Planning Department
DAGS (Gina Ichiyama)
Engineering Concepts, Inc. (Ken Ishizaki)

BENJAMIN J. CAYETANO
GOVERNOR

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

RECEIVED
APR 9 1997
ENGINEERING

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1075.7

Mr. Galen M. Kuba, Division Chief
Engineering Division
Department of Public Works
County of Hawaii
25 Aupuni Street, Room 202
Hilo, Hawaii 96720-4252

Dear Mr. Kuba:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of February 11, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and offer the following response to your comments:

1. *Any building construction shall conform to all requirements of code and statutes of the County of Hawaii.*

   This statement will be incorporated in the Draft EIS.

2. *All development generated runoff shall be disposed on site and shall not be directed toward any adjacent properties.*

   The Draft EIS will state that after development, there will be no increase in runoff toward any adjacent properties. Onsite measures will be employed to detain any increase in runoff due to development.

3. *All earthwork and grading shall be in conformance with Chapter 10, Erosion and Sediment Control, of the Hawaii County Code.*

   This statement will be incorporated in the Draft EIS.

4. *Any work within a County road right-of-way shall be in conformance with Chapter 22, Streets and Sidewalks, of the Hawaii County Code. Particularly the proposed connections and channelization on Kawili Street, and the proposed road widening at the existing service road.*

   This statement will be incorporated in the Draft EIS.

5. *Any construction within known watercourses shall be in conformance with Chapter 27, Flood Control, of the Hawaii County Code. A flood study, along with a Letter of Map Revision (LOMR) through FEMA, may be required to evaluate the effects to the improvements proposed in Waiakea Stream and possibly other inundation areas. The proposed Waiakea Stream bridge and bank stabilization shall meet with the approval of the COH, DLNR, FEMA, and COE. The COH may wish to transfer the maintenance responsibilities of the proposed improvements to the University of Hawaii.*

   A Conditional Letter of Map Revision (CLOMR) is presently being prepared for FEMA. The LOMR will be prepared after construction of the channel improvements have been completed, in accordance with the applicable regulations. Construction of the proposed bridge and bank stabilization will begin only after the necessary permits and approvals are obtained from the County of Hawaii, DLNR, FEMA, Corps of Engineers, and other agencies. We acknowledge your statement that the county may wish to transfer maintenance responsibilities of the proposed improvements to the University of Hawaii.

   The subject properties are affected by Flood Zones "X", "A", & "AE", according to the Flood Insurance Rate Map dated September 16, 1988.

   The proposed University Park development is located within Zone X. However, we acknowledge that the site may be "affected" by Zones A and AE due to the close proximity of the development. The proposed Waiakea Stream Bridge crossing will span Zones A and AE, and the associated bank stabilization will be located within the these zones.

6. *Sewer line connections shall conform to the rules and regulations of the County of Hawaii, Wastewater Division.*

   This statement will be incorporated in the Draft EIS.

7. *A solid waste management plan shall conform to the rules and regulations of the County of Hawaii, Solid Waste Division.*

   This statement will be incorporated in the Draft EIS.

8. *Construction activity noise, as noted in Section 4.3.1, should be limited between the hours of 8:00 a.m. thru 4:30 p.m., as required under a required grading permit.*

   The Draft EIS will include a statement that the contractor must comply with all state and county noise regulations, including those specified in the required grading permit.

9. *The University should provide and plan adequate off-street parking for the campus. Some problems are occurring along Kawili Street, Lanikaula Street, and Kapiolani Street.*

   Off-street parking is presently available at the existing campus. Additional off-street parking is proposed within the University Park project, which should have a positive impact on the off-street parking concerns. However, some students prefer to park on the street rather than pay the off-street parking fee.

10. *DPW recommends that a through-road connection be provided for the public, from Komohana Street to Lanikaula Street and Kawili Street. The unimproved existing stubout roads along Lanikaula Street could be used.*

The proposed project will provide road connections between Komohana, Kawili and Lanikaula streets. However, the UH Hilo and Hawaii Community College Student Governments, faculty and staff members, and the UH Hilo Long Range Development Plan consultant have expressed serious safety concerns if through traffic is allowed through the center of the campus. To reduce crime and activities threatening student safety, the UH Hilo Housing Office has been controlling Lanikaula Street access at night. Uncontrolled public through traffic will create unmanageable security problems for the student dormitories. Installation of gates and access control devices on the roadways have been proposed to ensure a safe environment for the students.

UH Hilo had considered utilizing the stub-out roads along Lanikaula Street. However, the connections have been deferred until further evaluation is conducted to minimize the impact to the residential areas along Lanikaula Street.

A copy of your comment letter and this response will be included in the Draft EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

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

February 12, 1997

RECEIVED
FEB 14 1997
ENGINEERING CONCEPTS

The Honorable Benjamin J. Cayetano
Governor of the State of Hawaii
c/o Office of Environmental Quality Control
235 South Beretania Street
State Office Tower, Suite 702
Honolulu, HI 96813

ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE
UNIVERSITY OF HAWAII AT HILO UNIVERSITY PARK
TAX MAP KEY 2-4-001:007 AND 041

We have reviewed the Environmental Impact Statement Preparation Notice.

Water system improvements necessary to provide water to the University Park includes:

1. Onsite distribution facilities to accommodate domestic and fire protection needs.

2. Offsite storage reservoir and necessary transmission pipelines.

The above improvements, together with all necessary easements and sites, shall be conveyed to the Water Commission of the County of Hawaii prior to any metered water services being granted. Design, construction, and conveyance shall be closely coordinated with the Department of Water Supply to insure compliance with applicable standards and regulations.

Milton D. Pavao, P.E.
Manager

WA:gms

copy - Department of Accounting and General Services, State of Hawaii
Office of Environmental Quality Control
Engineering Concepts, Inc. ✓

... Water brings progress...

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

RECEIVED
MAR 8 1997
ENGINEERING CONCEPTS

LETTER NO. PM-1054.7

MAR 6 1997

Mr. Milton D. Pavao, Manager
Department of Water Supply
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Pavao:

Subject: Environmental Impact Statement Preparation Notice (EISPN)
University of Hawaii at Hilo
University Park, Infrastructure Improvements
D.A.G.S. Job No. 11-31-7601
TMK: 2-4-01:7 and 41

Thank you for your letter of February 12, 1997, regarding the EISPN for the University Park project. We appreciate your efforts in reviewing the document and acknowledge your comments:

- Onsite distribution facilities to accommodate domestic and fire protection needs as well as offsite storage reservoir and necessary transmission pipelines are necessary to provide water to the University Park. These facilities have been described in the Preliminary Engineering Report by Engineering Concepts, Inc. (November 1993).

- The proposed water facility improvements will be conveyed to the Water Commission of the County of Hawaii prior to any metered service being granted.

- Design, construction and conveyance of water facility improvements will be coordinated with the Department of Water Supply to ensure compliance with applicable standards and regulations.

A copy of your comment letter and this response will be included in the Draft EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Ken Ishizaki, Engineering Concepts, Inc.

APPENDIX B

DRAFT EIS COMMENTS AND RESPONSES

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

REPLY TO ATTENTION OF

June 23, 1997

RECEIVED
JUN 24 1997
ENGINEERING CONCEPTS

Planning and Operations Division

Mr. Gary Gill
State of Hawaii
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Mr.Gill:

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement (DEIS) for the University of Hawaii at Hilo, University Park Project, South Hilo, Hawaii (TMK 2-4-1: 7, 12, 19, and 41; 2-4-3: 26).

a. The DEIS acknowledges that a Department of the Army permit will be required for work proposed at Waiakea Stream. Please refer to file number 970000083 for further inquiries on this project.

b. The flood hazard information provided on page 4-5 of the DEIS is correct.

Sincerely,

Paul Mizue, P.E.
Acting Chief of Planning
and Operations Division

Copies Furnished:

Ms. Gina Ichiyama
Department of Accounting and General Services
State of Hawaii
1151 Punchbowl Street, Room 427
Honolulu, Hawaii 96813

✓Mr. Kenneth Ishizaki
Engineering Concepts Incorporated
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1152.7

Mr. Paul Mizue
Acting Chief
Planning and Operations Division
Department of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

Dear Mr. Mizue:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of June 24, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and provide the following response to your comments:

a) We will refer to file number 970000083 in future correspondence relating to Department of the Army permit requirements for the project.

b) We acknowledge your confirmation that the flood hazard information provided on page 4-5 of the DEIS is correct.

A copy of your comment letter and this response will be included in the Final EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

United States Department of the Interior

U.S. GEOLOGICAL SURVEY

WATER RESOURCES DIVISION
677 Ala Moana Boulevard, Suite 415
Honolulu, Hawaii 96813

May 28, 1997

RECEIVED
MAY 30 1997
ENGINEERING CONCEPTS

The Honorable Benjamin J. Cayetano
Governor
State of Hawaii
c/o Office of Environmental Quality Control
235 South Beretania St.
State Office Tower, Suite 702
Honolulu, Hawaii 96813

Dear Governor Cayetano:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
South Hilo, Island of Hawaii
2-4-01:7, 12, 19, 41 and 2-4-03:26

The staff of the U.S. Geological Survey, Water Resources Division, Hawaii District, has reviewed the Draft Environmental Impact Statement, and we have no comments to offer at this time.

We are returning the report for your future use. Thank you for allowing us to review the DEIS.

Sincerely,

William Meyer
District Chief

Enclosure

cc: Ms. Gina Ichiyama, Dept. of Accounting & General Services, State of Hawaii
Mr. Kenneth Ishizaki, Engineering Concepts, Inc.
Mr. Lo-Li Chih, University of Hawaii at Hilo, State of Hawaii

---

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1153.7

Mr. William Meyer
District Chief
Water Resources Division
U.S. Geological Survey
677 Ala Moana Boulevard, Suite 415
Honolulu, Hawaii 96813-5412

Dear Mr. Meyer:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of May 28, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and acknowledge that you have no comments to offer at this time.

Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

BENJAMIN J. CAYETANO
GOVERNOR

ESTHER UEDA
EXECUTIVE OFFICER

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

RECEIVED
MAY 30 1997

May 28, 1997

Benjamin J. Cayetano, Governor,
State of Hawaii
c/o Office of Environmental
Quality Control
235 South Beretania Street
State Office Tower, Suite 702
Honolulu, Hawaii 96813

Dear Governor Cayetano:

Subject: Draft Environmental Impact Statement (DEIS) for the University of Hawaii at Hilo University Park, Hilo, Hawaii, TMKs 2-4-01: 7, 12, 19, 41 and 2-4-03:26

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

1) As stated in our letter dated January 27, 1997, on the Environmental Impact Statement Preparation Notice, the project site is located within the State Land Use Urban District. The offsite water related improvements, west of Komohana Street, are located within the State Land Use Agricultural District. We suggest that the Final EIS include a map showing the project site in relation to the State Land Use Districts.

2) On page 8-1, section 8.1, the DEIS states that district boundary amendments may be obtained by petition to the Land Use Commission (LUC). We would like to clarify that pursuant to §205-4, Hawaii Revised Statutes (HRS), the LUC acts on boundary amendment petitions involving lands over 15 acres in the Agricultural, Rural, and Urban Districts, and all petitions for reclassification of lands in the Conservation District. The counties, pursuant to §205-3.1, HRS, process petitions involving lands 15 acres or less in the Agricultural, Rural, and Urban Districts.

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

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

Sincerely,

ESTHER UEDA
Executive Officer

EU:th

cc: Gina Ichiyama
Kenneth Ishizaki
Lo-Li Chih

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

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

LETTER NO. PM-1157.7

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

Dear Ms. Ueda:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of May 28, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and offer the following response to your comments:

1. The Final EIS will include a figure indicating the State Land Use Districts in relation to the University Park project site and associated offsite water improvements.

2. The Final EIS will include your clarification of Section 8.1, regarding processing of land use boundary amendment petitions.

A copy of your comment letter and this response will be included in the Final EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/sl
c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

07/09/97 17:06 DAGS DPW PROJ MGMT 004

BENJAMIN J. CAYETANO
GOVERNOR

MAJOR GENERAL EDWARD V. RICHARDSON
DIRECTOR OF CIVIL DEFENSE

ROY C. PRICE, SR.
VICE DIRECTOR OF CIVIL DEFENSE

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

RECEIVED JUN 12 1997 MANAGEMENT DIVISION PUBLIC WORKS

PHONE (808) 733-4300
FAX (808) 733-4287

June 9, 1997

TO: Ms. Gina Ichiyama
Department of Accounting and General Services

FROM: Roy C. Price, Sr.
Vice Director of Civil Defense

SUBJECT: Draft Environmental Impact Statement-University of Hawaii at Hilo

Thank you for the opportunity to comment on the draft environmental impact statement concerning the University of Hawaii at Hilo, University Park, TMK 2-4-01:7, 12, 19, 41 and 2-4-03:26.

Reference Chapter 4.7, Flood Hazard, the report expresses concern that the project site may be affected by flooding of the Waiakea Stream and local drainage canal which borders the site even though the development is not in a floodplain area. If this is a strong concern, suggest that a 500-year flood profile be conducted to insure that valuable buildings, equipment and lives are protected and to obtain a better understanding of the impact of floods exceeding the 100-year profile.

Reference Chapter 9.3, Civil Defense Emergency Shelter, it is very likely that several of the buildings of this development could be used for emergency shelters if adequately protected. Therefore, it is important that State Civil Defense be contacted as early as possible to initiate discussions on shelter protection. Also, the County of Hawaii Civil Defense Agency must be contacted because that organization possesses the responsibility of designating buildings as shelters on the island.

If you have any questions, please contact Larry Kanda, State Hazard Mitigation Officer, at 733-4300.

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1166.7

JUL 22 1997

RECEIVED
JUL 23 1997
ENGINEERING CONCEPTS

Mr. Roy C. Price, Sr.
Vice-Director of Civil Defense
Department of Defense
3949 Diamond Head Road
Honolulu, Hawaii 96816

Dear Mr. Price:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of June 9, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and offer the following response to your comments:

1. A Flood Study and Conditional Letter of Map Revision (CLOMA) has been submitted to the Federal Emergency Management Agency (FEMA) due to proposed construction improvements within Waiakea Stream. The submittal included both the 100-year and 500-year flood profiles and limits.

2. The Final EIS will state that State Civil Defense will be contacted to initiate discussions on the potential for use of proposed buildings as emergency shelters, and the County of Hawaii Civil Defense Agency will be notified due to their role in designating buildings as shelters.

Mr. Roy C. Price, Sr.
Letter No. PM-1166.7
Page 2

A copy of your comment letter and this response will be included in the Final EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/sl
c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

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

RECEIVED
JUN 18 1997
ENGINEERING CONCEPTS

LAWRENCE MIIKE
DIRECTOR OF HEALTH

In reply, please refer to:

June 12, 1997 97-008A/epo

To: The Honorable Benjamin Cayetano
Governor, State of Hawaii
c/o Director, Office of Environmental Quality Control
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

From: Lawrence Miike
Director of Health

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo
UNIVERSITY PARK
Hilo, Hawaii
TMK: 2-4-01: 7 & 41

Thank you for allowing us to review and comment on the subject project. At this time, we do not have any comments to offer.

c: DAGS
Engineering Concepts, Inc.✓
UHH

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1154.7

JUL 18 1997

TO: The Honorable Lawrence Miike, Director
Department of Health

SUBJECT: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of June 12, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and acknowledge that you have no comments to offer at this time.

Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

SAM CALLEJO
State Comptroller

c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

JUN 7 1997
ENGINEERING CONCEPTS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
DEPUTIES
Gilbert Coloma-Agaran

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

June 3, 1997

Benjamin J. Cayetano, Governor, State of Hawaii
c/o Office of Environmental Quality Control
235 South Beretania Street
State Office Tower, Suite 702
Honolulu, Hawaii 96813

LOG NO: 19558
DOC NO: 9706PM02

Dear Governor Cayetano:

SUBJECT: Draft Environmental Impact Statement for University of Hawaii at Hilo University Park
Hilo, South Hilo, Hawaii Island
TMK: 2-4-01:7, 12, 19, 41 and 2-4-03:26

We have nothing new to add to our review letters of October 28, 1994 and February 13, 1997 that are included in Appendix D where we indicate that the proposed development will have "no effect" on significant historic sites.

Sincerely,

DON HIBBARD, Administrator
State Historic Preservation Division

PM:els

c Ms. Gina Ichiyama, DAGS
✓ Mr. Kenneth Ishizaki, Engineering Concepts
Mr. Lo-Li Chih, University of Hawaii at Hilo

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1159.7

JUL 18 1997

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

Dear Mr. Hibbard:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of June 3, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and acknowledge your comment that the proposed development will have "no effect" on significant historic sites.

A copy of your comment letter and this response will be included in the Final EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
ENGINEERING BRANCH
P O BOX 373
HONOLULU, HAWAII 96809

RECEIVED
MAY . . 1997
ENGINEERING CONCEPTS

MAY 29 1997

Ms. Gina Ichiyama,
Department of Accounting and General Services
1151 Punchbowl Street, Room 427
Honolulu, Hawaii 96813

Dear Ms. Ichiyama:

Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo University Park
Hilo, Island of Hawaii

Thank you for allowing us to review and comment on the subject document.

We have previously reviewed the Environmental Impact Statement Preparation Notice for the subject project, and have no additional comments.

Should you have any questions, please contact Mr. Dennis Imada of the Project Planning Section at 587-0257.

Sincerely,

Andrew M. Monden
ANDREW M. MONDEN
Chief Engineer

DI:ck

c: Ken Ishizaki, Engineering Concepts
OEQC
Lo-Li Chih, UH at Hilo

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1158.7

JUL 18 1997

Mr. Andrew M. Monden
Chief Engineer
Engineering Branch
Land Division
Department of Land and Natural Resources
P. O. Box 373
Honolulu, Hawaii 96809

Dear Mr. Monden:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of May 29, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and acknowledge that you have no additional comments.

Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

Gordon Matsuoka
GORDON MATSUOKA
State Public Works Engineer

GI/sl

c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

BENJAMIN J. CAYETANO
GOVERNOR

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

RECEIVED
JUN 7 1997
ENGINEERING CONCEPTS

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
JERRY M. MATSUDA
GLENN M. OKIMOTO

IN REPLY REFER TO:
STP 8.7982

June 4, 1997

TO: THE HONORABLE BENJAMIN J. CAYETANO, GOVERNOR
STATE OF HAWAII
C/O OFFICE OF ENVIRONMENTAL QUALITY CONTROL

FROM: KAZU HAYASHIDA
DIRECTOR OF TRANSPORTATION

SUBJECT: UNIVERSITY OF HAWAII AT HILO, UNIVERSITY PARK
DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
TMK: 2-4-01: 7 & 41

Thank you for your transmittal of May 23, 1997, requesting our comments on the subject DEIS.

Plans for any construction work within the State highway right-of-way must be submitted for our review and approval.

c: Engineering Concepts, Inc.
University of Hawaii at Hilo
Department of Accounting and General Services

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1155.7

JUL 18 1997

RECEIVED
JUL 19 1997
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TO: The Honorable Kazu Hayashida, Director
Department of Transportation

SUBJECT: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601
(Reference: STP 8.7982)

Thank you for your letter of June 4, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and acknowledge your comment that plans for any construction work within the State highway right-of-way must be submitted for your review and approval.

A copy of your comment letter and this response will be included in the Final EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

SAM CALLEJO
State Comptroller

c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
HOUSING FINANCE AND DEVELOPMENT CORPORATION
677 QUEEN STREET, SUITE 300
HONOLULU, HAWAII 96813
FAX (808) 587-0600

ROY S. OSHIRO
EXECUTIVE DIRECTOR

RECEIVED
JUN 17 1997
ENGINEERING CONCEPTS

IN REPLY REFER TO
97:PPE/2165

June 10, 1997

TO: Governor, State of Hawaii
c/o Office of Environmental Quality Control

FROM: Roy S. Oshiro
Executive Director

SUBJECT: Draft Environmental Impact Study for the University of Hawaii at Hilo, University Park

We have reviewed the subject report and have no housing-related comments to offer at this time.

Thank you for the opportunity to comment.

c: Gina Ichiyama, DAGS
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, U.H. Hilo

HFDC

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1156.7

... 13 ...

Mr. Roy S. Oshiro
Executive Director
Housing Finance and Development Corporation
Department of Budget and Finance
677 Queen Street, Suite 300
Honolulu, Hawaii 96813

Dear Mr. Oshiro:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of June 10, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and acknowledge that you have no housing-related comments to offer at this time.

Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

BENJAMIN J. CAYETANO
GOVERNOR

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

GARY GILL
DIRECTOR

RECEIVED

ENGINEERING CONCEPTS

June 3, 1997

Sam Callejo
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaii 96810

Attention: Gina Ichiyama

Dear Mr. Callejo:

Subject: Draft Environmental Impact Statement (EIS) for University Park, University of Hawaii at Hilo

Please include the following in the final EIS:

1. An *historical perspective* of this project; include a section on project history that describes past feasibility and planning studies related to this project and how it evolved to its present form.

2. A *description of the environment of the area* from both a local and regional perspective; in particular describe environmental resources that are unique or rare to the Hilo area.

3. A full analysis of the *cumulative impacts* of this and other geographically-related projects; cumulative impacts are those that result from this project in addition to past, present and reasonably foreseeable future actions. One example would be cumulative traffic impacts of the university expansion in addition to other area projects.

4. In addition to the list of required *permits* (Section 1.13), please indicate their status.

5. In Appendix A, Comment Letters and Responses, include a copy of the letter dated February 12th, 1997, from the Deparment of Education (DOE). In Section 10.2.2, Consulted State Agencies, amend the list to indicate that DOE responded with no comments.

If you have any questions please call Nancy Heinrich at 586-4185.

Sincerely,

~~GARY GILL~~
Director

c: Ken Ishizaki, Engineering Concepts

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1190.7

AUG 26 1997

Mr. Gary Gill
Director
Office of Environmental Quality Control
Leiopapa A Kamehameha, Suite 702
235 South Beretania Street
Honolulu, Hawaii 96813

Dear Mr. Gill:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of June 3, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and offer the following response to your comments:

1. The Final EIS will include a historical perspective of the project, including a description of past feasibility and planning studies related to this project and its evolution to its present form.

2. The Final EIS will include a description of the environment of the area from both a local and a regional perspective. Environmental resources that are unique or rare to the Hilo area will be described.

3. With regard to cumulative impacts of this and other geographically related projects, the Final EIS will identify the proposed construction of offsite student housing as a foreseeable future action. The need for offsite housing would be directly related to development of the University Park. The cumulative impact of both projects results from increased population (i.e., traffic, public facilities and community services) which have been identified in the Draft EIS.

4. The status of required permits will be indicated in the Final EIS.

5. The Final EIS will be amended to include the Department of Education's (DOE) comment letter dated February 12, 1997, and the appropriate section of the text will be revised to indicate that the DOE responded with no comments.

A copy of your comment letter and this response will be included in the Final EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/sl
c: Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

University of Hawai'i at Mānoa

Environmental Center
A Unit of Water Resources Research Center
Crawford 317 • 2550 Campus Road • Honolulu, Hawai'i 96822
Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

RECEIVED
AUG 2 1 1997
ENGINEERING CONCEPTS

July 7, 1997

RE: 0682

Ms. Gina Ichiyama
Department of Accounting and General Services
1151 Punchbowl Street, Room 427
Honolulu, Hawaii 96813

Dear Ms. Ichiyama:

Draft Environmental Impact Statement
University of Hawaii at Hilo
University Park
Hilo, Hawaii

Introduction

The proposed campus expansion plan to which this Draft Environmental Impact Statement (DEIS) relates calls for a 116-acre expansion of the existing University of Hawaii at Hilo (UH Hilo) campus. The project will include academic facilities, recreational facilities and student housing, as well as infrastructural changes such as road widening, extension of a water main and construction of a bridge across Waiakea Stream. This construction will meet the growing campus demands into the next century. The Department of Accounting and General Services (DAGS) functions as the agent for development of this project. The requirement that the DEIS be prepared has been based primarily on the project's potential short-term impact on the physical environment and long-term impact on the surrounding community.

We have been assisted in this review by Dr. Paul Ekern, UH Department of Agronomy and Soil Science (retired); and Noel Ludwig, Environmental Center.

In general, this DEIS appears to be well-prepared and comprehensive. However, we suggest that certain areas need additional attention. Although the proposed construction—as well as the long-term impacts of the project—may not have direct influence on these elements, several potential hazards and their potential impact on the project have not been addressed in sufficient detail. In particular, the impacts of acid precipitation, wet climate, and hazards pertaining to earthquakes, lava flows and thixotropic soils need additional consideration. These and other topics will be discussed in greater detail below.

Ground Stability, Natural Hazards

The proposed project site (indeed, the entire island of Hawai'i) has been labeled Seismic Probability Zone 4, susceptible to major earthquake damage and requiring strict building codes. The International Conference of Building Officials determined at their annual meeting in August, 1996 that "a range of effective peak ground acceleration between 0.3 g to 0.7 g is expected with a 10% probability of exceedance over a 50-year interval." This should be mentioned in the DEIS, and it should be made explicit that the proposed construction will follow the necessary codes.

The Panaewa soil group (p. 4-3) includes soils known to be thixotropic (McCall, 1975, p. 25), which are sufficiently unstable that it may even be necessary to remove them from the construction sites altogether. This concern should be addressed for both onsite and offsite construction.

The 1881 lava flow is shown to have made a near approach to the proposed expansion site (Appendix B, p. 4), and the 1984 flow from Mauna Loa also entered the general vicinity (Lockwood et al., 1985). Accordingly, the potential for lava flow damage should be assessed in the DEIS, especially regarding the northern portion of the expansion area.

All three of these topics should be considered both during the construction phase and for the completed project. The DEIS should also present remedial measures to these hazards onsite once construction is complete.

Climate

Due to the persistent high humidity and rainfall in the area, the DEIS should include such measures as covered walkways, air conditioning for mold and allergy prevention.

Wind and rainfall patterns in the area are complex (Schroeder et al., 1977; Carson and Brown, 1976), and it is known that the diurnal variation in these patterns can wash entrained pollutants back and forth across the Hilo area (Nickerson and Dias, 1981; Mendonca, 1969; Mendonca and Iwaoka, 1969) In particular, such impurities as salt from sea spray and sulfur dioxide from Kilauea Volcano can cause significant corrosion damage during periods when these pollutants are maintained at high levels in the area (Miller, 1980; Seto et al., 1969). Although the possible deleterious impacts of vog are mentioned in Appendix G (page 2), more discussion should be devoted to these long-term impacts. Salt spray would be particularly corrosive in the makai section of the proposed extension. Measures to mitigate all of these impacts should be incorporated into building designs.

Finally, some mention should be made of the potential damage resulting from increased hurricane and drought (and associated fire) vulnerability connected to El Nino events (Chu, 1989; Philander, 1992).

Dry Wells

Section 4.5 (page 4-3) mentions that dry wells will be excavated out of pahoehoe lava flows. The DEIS should expand more on the potential of such dry wells to accommodate storm runoff and similar water volumes when floored in pahoehoe lava. In certain areas, this lava may have insufficient permeability to adequately absorb the inflowing runoff.

Typographical Errors

Page 4-7, last sentence of first paragraph of Section 4.8.2: form small clumps.

Page 8-4, first complete sentence: from tsunami.

We appreciate the opportunity to review this Draft EIS, and we look forward to verifying the inclusion of our suggestions in the Final document.

Sincerely,

John T. Harrison
Environmental Coordinator

cc: Gary Gill, Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Roger Fujioka, Water Resources Research Center, University of Hawaii
Paul Ekern
Noel Ludwig

References

Carson, J.L. and R.M. Brown, Jr., 1976. The correlation of soil algae, airborne algae, and fern spores with meteorological conditions on the Island of Hawaii. *Pacific Science* 30(2), pp. 197-205.

Chu, P.S. Hawaiian drought and the Southern Oscillation. *International Journal of Climatology* 9, pp. 619-631.

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McCall, W.W., 1975. *Soil Classification in Hawaii*. Circular 476, Cooperative Extension Service, University of Hawaii, Honolulu.

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Nickerson, E.C. and M.A. Dias, 1981. On the existence of atmospheric vortices downwind of Hawaii during the HAMEC project. *Journal of Applied Meteorology* 20, pp. 868-873.

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Schroeder, T.A., B.J. Kilonsky and B.N. Meisner, 1977. *Diurnal Variation in Rainfall and Cloudiness*. Water Resources Research Center Technical Report No. 112, University of Hawaii, Honolulu.

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BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1191.7

AUG 26 1997

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

Dear Mr. Harrison:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of July 7, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and offer the following response to your comments:

Ground Stability, Natural Hazards

1. According to the Uniform Building Code, 1994, the island of Hawaii is in Seismic Probability Zone 3. Discussions have been held on raising the seismic zone to 4, but no decision has yet been made. The Final EIS will include a statement on the location of the project site within Seismic Probability Zone 3 and that proposed construction will follow the necessary codes to mitigate potential impacts.

2. The Final EIS will include a statement on the Panaewa soil group. Soils investigations will be conducted prior to each phase of construction to evaluate the specific soil conditions at the site. Recommendations for removal of unsuitable material will be made at that time, which will mitigate potential impacts.

3. The Final EIS will include a statement on the vicinity of the proposed project to past lava flows.

Climate

1. Incorporation of covered walkways and air conditioning will be considered during the design phase.

2. The Final EIS will include a statement on the potential impact of vog. Since 1983, when the current phase of volcanic activity commenced, the most active vents have been Pu'u O'o and Kapaianaha, both of which are almost directly south of Hilo. As noted in the Air Quality Impact Report (Appendix G of the DEIS), air quality in the Hilo area is periodically degraded by vog under southerly, "kona" wind conditions. These winds occur approximately 7 percent of the time; thus discussion of "long-term" impacts must be prefaced by the caveat that such impacts are based on intermittent, not continuous exposures. For there to be significant impact, not only must the winds be southerly, but the vents must be active, and this is not always the case. During two 12-month periods of monitoring in Hilo (J. W. Morrow, et al.), sulfate concentrations, which are the best indicator of the presence of vog, averaged 1 to 2 micrograms per cubic meter ($\mu g/m^3$), but showed occasional peak values as high as 15 $\mu g/m^3$. During the sampling years, there were 4 to 5 sampling days in which 24-hour concentrations were greater than or equal to 5 $\mu g/m^3$. Since the sampling schedule was once every three days, this would suggest that total "high" days might have reached 12 to 15 days per year had monitoring occurred every day. This equates to 3 to 4 percent of the time, somewhat less than the 7 percent of time associated with wind direction alone.

Acidic sulfate aerosols such as vog may exacerbate the condition of persons with pre-existing pulmonary diseases such as asthma, bronchitis and emphysema. Anecdotal data in Hawaii suggest that this is the case during vog episodes in areas that are not routinely exposed to vog (e.g.

Hilo, where air quality is normally quite pristine, but degrades visibly when the winds turn "kona" and the volcano is active). As noted above, these are not chronic exposures, but rather acute exacerbations from which the patients recover when the winds and air quality return to normal.

3. The Final EIS will include a statement that the corrosive nature of the climate will be a consideration in design of buildings and facilities.

4. We recognize that there may be an increased potential for damage due to hurricane, drought and associated fire vulnerability connected to El Nino events. However, these potential impacts apply worldwide, and are not specific to this project or location.

<u>Dry Wells</u>

The proposed storm drain system will discharge to existing storm drains or Waiakea Stream. The purpose of incorporating dry wells within the proposed storm drain system is to prevent an increase in runoff to offsite areas after development. It is not the intent of the dry wells to contain all runoff from the proposed development. The Draft EIS identified soils within the project site as pahoehoe lava or underlain by pahoehoe lava bedrock based on the USGS *Soil Survey*. Planning, design and construction of dry wells will be performed in accordance with the Department of Health Underground Injection Control (UIC) regulations which require evaluation by a geologist. Dry well capacity will be evaluated during this process. In the event of inadequate capacity, the dry well may be deepened or a new location may be selected.

<u>Typographical Errors</u>

The two errors noted will be corrected in the Final EIS.

A copy of your comment letter and this response will be included in the Final EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/sl
c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

Stephen K. Yamashiro
Mayor

RECEIVED
JUN 4 1997

Nelson M. Tsuji
Fire Chief

Edward Bumatay
Deputy Fire Chief

County of Hawaii

FIRE DEPARTMENT

777 Kilauea Avenue • Mall Lane, Room 6 • Hilo, Hawaii 96720-4239
(808) 961-8297 • Fax (808) 961-8296

June 2, 1997

Honorable Benjamin J. Cayetano
Governor, State of Hawaii
c/o Office of Environmental Quality Control
State Office Tower, Suite 702
235 South Beretania Street
Honolulu, HI 96813

Dear Governor Cayetano:

Subject: Draft Environmental Impact Statement
University of Hawaii at Hilo, University Park
South Hilo, Island of Hawaii
TMK: 2-4-01:7, 12, 19, 41 and 2-4-03:26

We have no comments on the above-referenced draft environmental impact statement.

Sincerely,

NELSON M. TSUJI
Fire Chief

NMT/mo

cc: Gina Ichiyama, DAGS
✓Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

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

LETTER NO. PM-1160.7

JUL 13 97

Mr. Nelson M. Tsuji
Fire Chief
Fire Department
County of Hawaii
Mall Lane, Room 6
777 Kilauea Avenue
Hilo, Hawaii 96720-8296

Dear Chief Tsuji:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of June 2, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and acknowledge that you have no comments.

Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/sl
c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

Stephen K. Yamashiro
Mayor

County of Hawaii
PLANNING DEPARTMENT
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720-4252
(808) 961-8288 • Fax (808) 961-9615

Virginia Goldstein
Director
Russell Kokubun
Deputy Director

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ENGINEERING CONCEPTS

July 7, 1997

Honorable Benjamin J. Cayetano
Governor
c/o Office of Environmental Quality Control
235 South Beretania Street
State Office Tower, Suite 702
Honolulu, HI 96813

Dear Governor Cayetano:

Draft Environmental Impact Statement (DEIS) for the Proposed University of Hawaii At Hilo - University Park
TMK: 2-4-01: 7, 12, 19 & 41 and 2-4-03: 26; Waiakea, South Hilo, Hawaii

Thank you for providing our office with the opportunity to offer comments regarding the draft environmental impact statement for the proposed development of the 116-acre University Park as an expansion of the University of Hawaii at Hilo complex. We have completed our review and have the following comments to offer:

1. Page I-2, under State Land Use - should clarify that University Park project site is situated within the Urban district while the water reservoir site, TMK: 2-4-01:12, is situated within the Agricultural district.

2. Page I-2, under County Zoning - The proposed University Park project site is situated within an area zoned Agricultural-1 acre (A-1a) and Single Family Residential (RS-10) by the County. The DEIS includes a typographical error for the A-1a zoned district. Should also state that the water reservoir site is designated A-1a.

3. The establishment of the proposed University Park to accommodate research, technology, and academic pursuits as well as to provide for recreational and student housing facilities is a permitted use within the A-1a and RS-10 zoned district pursuant to Section 25-4-11(c) of the Hawaii County (Zoning) Code which states that

"Public uses, structures and buildings and community buildings are permitted uses in any district, provided that the [Planning] director has issued plan approval for such use."

4. The construction of the water reservoir on a portion of TMK: 2-4-01: 12 is considered a permitted use by the Zoning Code [§25-4-11(a) & (b)] which specifies, respectively, that *"Communication, transmission, and power lines of public and private utilities and governmental agencies are permitted uses within any district."* and that *"Any substation used by a public utility for the purpose of furnishing . . . . water . . . . shall be a permitted use in any district provided that the use is not hazardous or dangerous to the surrounding area and the director has issued plan approval for such use."*

5. Please confirm all affected parcels. We are not sure of the relationship between the proposed project and TMK: 2-4-03: 26.

Once again, thank you for allowing our office the opportunity to comment. Should you have any questions, please feel free to contact us.

Sincerely,

Russell Kok

for VIRGINIA GOLDSTEIN
Planning Director

DSA:pak
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xc: Ms. Gina Ichiyama, DAGS-HNL
Mr. Gary Gill, OEQC
Mr. Ken Ishizaki, Engineering Concepts, Inc.
Mr. Lo-Li Chih, University of Hawaii at Hilo
County Department of Public Works-Engineering
County Department of Water Supply
Land Use Controls Division

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1192.7

AUG 26 1997

Ms. Virginia Goldstein
Director
Planning Department
County of Hawaii
25 Aupuni Street, Room 109
Hilo, Hawaii 96720-4252

Dear Ms. Goldstein:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of July 7, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and offer the following response to your comments:

1. Section 1.2 (State Land Use) of the Final EIS will be clarified to state that the University Park project site is situated within the Urban district and the water reservoir site is situated within the Agricultural district.

2. Section 1.2 (County Zoning) of the Final EIS will be corrected to state that the University Park project site is situated within an area zoned Agricultural-1 acre (A-1a) and Single Family Residential (RS-10), and the water reservoir site is designated A-1a.

3. We acknowledge your comment that construction of the proposed University Park is a permitted use within the A-1a and RS-10 zoned districts pursuant to Section 25-4-11(c) of the Hawaii County (Zoning) Code.

4. We acknowledge your comment that construction of the proposed water reservoir is a permitted use by the Zoning Code §25-4-11(a) & (b).

5. The proposed water reservoir site is located within both TMK: 2-4-01:12 and 2-4-03:26.

A copy of your comment letter and this response will be included in the Final EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

Stephen K. Yamashiro
Mayor

RECEIVED
JUN 3 1997
ENGINEERING CONCEPTS

Wayne G. Carvalho
Police Chief

James S. Correa
Deputy Police Chief

County of Hawaii
POLICE DEPARTMENT
349 Kapiolani Street • Hilo, Hawaii 96720-3998
(808) 935-3311 • Fax (808) 961-2702

May 30, 1997

The Honorable Benjamin J. Cayetano
Governor, State of Hawaii
c/o Office of Environmental Quality Control
235 South Beretania Street
State Office Tower, Suite 702
Honolulu, Hawaii 96813

Dear Governor Cayetano:

SUBJECT: UNIVERSITY OF HAWAII AT HILO, UNIVERSITY PARK
SOUTH HILO, ISLAND OF HAWAII
TAX MAP KEY: 2-4-01:7, 12, 19, 41 AND 2-4-03:26

We have reviewed the Draft Environmental Impact Statement (DEIS) on the referenced project and offer the following concerns:

According to the DEIS, the University expansion will raise the population to approximately 3,625 (3,067 students and 558 faculty/staff), and consequently, increase housing, traffic, and activity in the area.

In response to the potential impact on police protection, we ask that the proposing agency assist the Hawaii Police Department at the appropriate time in lobbying the Hawaii County Council to accordingly increase the police resources in South Hilo.

Thank you for the opportunity to comment.

Sincerely,

Wayne G. Carvalho
WAYNE G. CARVALHO
POLICE CHIEF

CMC:lk

cc: Ms. Gina Ichiyama, Dept. of Accounting & General Services
Mr. Kenneth Ishizaki, Engineering Concepts, Inc.
Mr. Lo-Li Chih, University of Hawaii at Hilo

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1167.7

JUL 2 2 1997

RECEIVED
JUL 2 3 1997
ENGINEERING CONCEPTS

Mr. Wayne G. Carvalho
Police Chief
Police Department
County of Hawaii
349 Kapiolani Street
Hilo, Hawaii 96720-3998

Dear Chief Carvalho:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of May 30, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document. We acknowledge your request for assistance from DAGS (the proposing agency) in lobbying for additional police resources. However, it may be more appropriate for the University of Hawaii at Hilo (the user agency) to assist in any lobbying effort before the Hawaii County Council. We suggest you contact the University of Hawaii at Hilo University Relations Director, Gerald DeMello, at 974-7567 to coordinate your lobbying efforts.

A copy of your comment letter and this response will be included in the Final EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

Gordon Matsuoka
GORDON MATSUOKA
State Public Works Engineer

GI/sl
c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

Stephen K. Yamashiro
Mayor

County of Hawaii
DEPARTMENT OF PUBLIC WORKS
25 Aupuni Street, Room 202 • Hilo, Hawaii 96720-4252
(808) 961-8321 • Fax (808) 961-8630

Donna Fay K. Kiyosaki
Chief Engineer

Jiro A. Sumada
Deputy Chief Engineer

RECEIVED
JUN 5 1997
ENGINEERING CONCEPTS

June 3, 1997

BENJAMIN J CAYETANO GOVERNOR STATE OF HAWAII
c/o OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
STATE OFFICE TOWER SUITE 702
HONOLULU HAWAII 96813

SUBJECT : DRAFT ENVIRONMENTAL IMPACT STATEMENT
The University of Hawaii at Hilo, University Park
Waiakea, South Hilo, Hawaii
TMK: 3 / 2-4-01: 07, 12, 19, 41 and 2-4-03: 26

We acknowledge receipt of your submittal concerning the subject matter, and provide you with our comments as follows:

1. Section 1.13, Necessary Permits and Approvals; include the Permit to Work Within the County Right-of-Way, and a Letter of Map Revision through the Federal Emergency Management Agency (FEMA), if necessary.

2. Should specify that Waiakea Stream, which runs through the subject parcels, is under the jurisdiction of the County of Hawaii. The County has an operation and maintenance agreement with the Corps of Engineers, for this tributary.

3. The Traffic Impact Assessment should include the geometric, lane widths, and A.M. & P.M. traffic counts, for the Kinoole Street/Lanikaula Street intersection. Please submit this data to the Department of Public Works for further analysis.

4. Is the University constructing the recommended left-turn storage lane on Lanikaula Street at the intersection with Access 6? Will the University be contributing to mitigate all other traffic problems from this development?

Should there be any questions concerning this matter, please feel free to contact Mr. Casey Yanagihara in our Engineering Division at (808)961-8327.

Galen M. Kuba, Division Chief
Engineering Division

CKY

copy: Planning Department
DAGS (Gina Ichiyama)
Engineering Concepts, Inc. (Ken Ishizaki)
UH Hilo (Lo-Li Chih)

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1168.7

JUL 2 2 1997

RECEIVED
JUL 2 3 1997
ENGINEERING CONCEPTS

Mr. Galen M. Kuba
Division Chief
Engineering Division
Department of Public Works
County of Hawaii
25 Aupuni Street, Room 202
Hilo, Hawaii 96720-4252

Dear Mr. Kuba:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of June 3, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and offer the following response to your comments:

1. A Permit to Work within the County Right-of-Way and a FEMA Letter of Map Revision will be listed under the section on "Necessary Permits and Approvals" in the Final EIS.

2. The Final EIS will state that Walakea Stream is under the jurisdiction of the County of Hawaii, and that the County has an operation and maintenance agreement with the Corps of Engineers for the tributary.

3. Inclusion of geometrics and lane widths is beyond the scope of the Traffic Impact Assessment and may be more appropriately discussed during design of roadway improvements. Morning and afternoon traffic counts for the Kinoole Street/Lanikaula Street intersection were included in Appendix A of the Traffic Impact Assessment.

4. As stated in the DEIS, the recommended left-turn storage lane on Lanikaula Street at the intersection with Access 6 will be constructed when its need is warranted due to growth of the university.

   Although there are no plans to construct the improvements in the initial development phase, the university is committed to mitigating the traffic problems which may result from the proposed project.

A copy of your comment letter and this response will be included in the Final EIS. Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

07/18/97 17:06 005

Stephen K. Yamashiro
Mayor

Diane S. Quitiquit
Director

RECEIVED - DAGS
DIV. OF PUBLIC WORKS
'97 JUL 18 A 10:53

County of Hawaii

DEPARTMENT OF RESEARCH AND DEVELOPMENT
25 Aupuni Street, Room 219 • Hilo, Hawaii 96720-4252

June 18, 1997

Ms. Gina Ichiyama
Dept. of Accounting and General Services
State of Hawaii
1151 Punchbowl Street, Room 427
Honolulu, Hawaii 96813

Dear Ms. Ichiyama:

Re: Draft Environmental Impact Statement (DEIS) for University of Hawaii at Hilo, University Park

Thank you for the opportunity to review and comment on the referenced DEIS. Our comments at this time concern the impact of energy use at the University Park.

We note the constructive approach being taken in regard to the handling of solid waste generated at the University Park and recommend that appropriate mitigation measures also be adopted in the project design phase to minimize energy impacts. The project will be subject to the provisions of the energy section of the Hawaii County Building Code. However, appreciably more can be achieved to reduce facility energy consumption over and above code requirements. These include the installation of energy related equipment and systems with high enough efficiency levels to qualify for utility rebates for new commercial construction, including utility customized incentive programs. Also, the application of life cycle costing criteria to the selection of energy related systems would be an ideal method to ensure that energy demands are economically minimized.

Such approaches will ensure that the project design conforms with state objectives for achieving high energy efficiency levels in a cost effective manner.

Yours truly,

Raymond Carr
Economic Development Specialist

xc: Diane Quitiquit, Director

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

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

LETTER NO. PM-1161.7

JUL 18 1997

Mr. Raymond Carr
Department of Research and Development
County of Hawaii
25 Aupuni Street, Room 219
Hilo, Hawaii 96720-4252

Dear Mr. Carr:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of June 18, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document. In response to your comment concerning the impact of energy use at the University Park, the Final EIS will include the following statements:

1. The project will be subject to the provisions of the energy section of the Hawaii County Building Code.

2. During the design phase, appropriate mitigation measures will be considered to reduce energy consumption over and above code requirements. These measures may include installation of energy-related equipment and systems with high efficiency levels that qualify for utility rebates for new commercial construction, including utility customized incentive programs. In addition, application of life cycle cost criteria in selection of energy-related systems will be considered.

Oct 02 97 08:42a OEQC, State of Hawaii (808) 586-4186 p.1

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

OFFICE OF PLANNING

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

BENJAMIN J. CAYETANO, Governor
SEIJI F. NAYA, Director
BRADLEY J. MOSSMAN, Deputy Director
RICK EGGED, Director Office of Planning

Tel.: (808) 587-2846
Fax: (808) 587-2824

RECEIVED

'97 JUL -1 P4:03

OFC. OF ENVIRONMENTAL QUALITY CONTROL

Ref. No. P-6755

June 20, 1997

MEMORANDUM

TO: Gary Gill, Director
Office of Environmental Quality Control

FROM: Rick Egged
Director, Office of Planning

SUBJECT: Draft Environmental Impact Statement (EIS) for the University of Hawaii at Hilo, University Park

We do not have any comments to offer on the draft environmental impact statement for the proposed project.

If there are any questions, please contact Christina Meller of our CZM Program at 587-2845.

BENJAMIN J. CAYETANO
GOVERNOR

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

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. PM-1207.7

OCT 6 1997

RECEIVED

OCT 7 1997

Mr. Rick Egged, Director
Office of Planning
Department of Business, Economic
Development and Tourism
235 South Beretania Street, 6th Floor
Honolulu, Hawaii 96813

Dear Mr. Egged:

Subject: Draft Environmental Impact Statement (DEIS)
University of Hawaii at Hilo, University Park
D.A.G.S. Job No. 11-31-7601

Thank you for your letter of June 20, 1997, regarding the DEIS for the University Park project. We appreciate your efforts in reviewing the document and acknowledge that you have no comments to offer at this time.

Should you have any questions, please contact Ms. Gina Ichiyama at 586-0474.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

GI/si
c: Office of Environmental Quality Control
Kenneth Ishizaki, Engineering Concepts, Inc.
Lo-Li Chih, University of Hawaii at Hilo

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APPENDIX *C*

ASSESSMENT OF STREAM IMPACTS
(by AECOS, Inc.)

AECOS No. 765C

An Assessment of Stream Impacts for a Bridge Crossing of Waiakea Stream at University of Hawaii, Hilo, Hawai'i

Prepared For:

Engineering Concepts, Inc.
250 Ward Avenue, Suite 206
Honolulu, Hawaii 96814

Prepared By:

AECOS, Inc.
970 N. Kalaheo Ave., Suite C311
Kailua, Hawaii 96734

March 1997

WAIAKEA STREAM

Introduction

This report details surveys conducted along Waiakea Stream in the South Hilo District of the Island of Hawai`i for the development of "University Park", a 116-acre expansion of the University of Hawaii Hilo Campus (Engineering Concepts, 1997). Specifically, the surveys were concerned with Waiakea Stream which divides the proposed development from the existing campus, and the requirements for infrastructure crossings of the stream. An assessment of impacts for a sewerage crossing was the subject of an earlier report (*AECOS*, 1994).

The primary structural features of the development addressed herein are 1) a pedestrian/vehicle bridge and 2) channel widening and bank stabilization in the vicinity of the proposed bridge. The bridge will be a 90-ft long, single-span crossing on prestressed concrete girders. The bridge is located on a broad bend in the stream, and the stream channel will be widened in this area by cutting back approximately 10 feet on the west (left) bank. Grouted rip-rap slope paving is proposed to stabilize the left bank for distances of 80 ft upstream and 180 ft downstream of the bridge. A CRM wall is proposed for the east (right) bank of the stream, from 35 ft upstream to 150 downstream from the bridge; grouted rip-rap slope paving would extend about 130 ft upstream and 70 ft downstream of the CRM section.

Waiakea Stream is one of several streams which feed into Waiakea Pond and the Wailoa River, opening into the southern part of Hilo Bay. This system is one of the few stream systems draining the Mauna Loa (south) side of the boundary between the great volcanoes, Mauna Kea and Mauna Loa (Figure 1), despite a high annual rainfall averaging over 100 inches in the Hilo area and nearly 200 inches at Mountainview (Teliaferro, 1959). However, an absence of perennial streams is characteristic of volcanic high islands were the surface material is composed of geologically recent lava flows. In contrast, the older Mauna Kea slopes northwest of Hilo are deeply dissected. The Hamakua Coast which extends north along the north flank of Mauna Kea supports many streams, including the extensive Wailuku River system located on the cleft between Mauna Kea and Mauna Loa and discharging into the southwest corner of Hilo Bay.

From above the University of Hawaii at Hilo campus to Waiakea Pond, Waiakea Stream is essentially a drainage channel, modified to move freshet flows quickly through Hilo to Waiakea Pond on the lowlands at Wailoa River State Park and into Hilo Harbor. Along most of this stream course, portions of the channel have been modified with levees and revetments (reinforced channel margin), but the stream bed remains in a more or less natural state, or at least comprised of a natural, bedrock material. A few sections of concrete-lined channel are associated with roadway crossings.

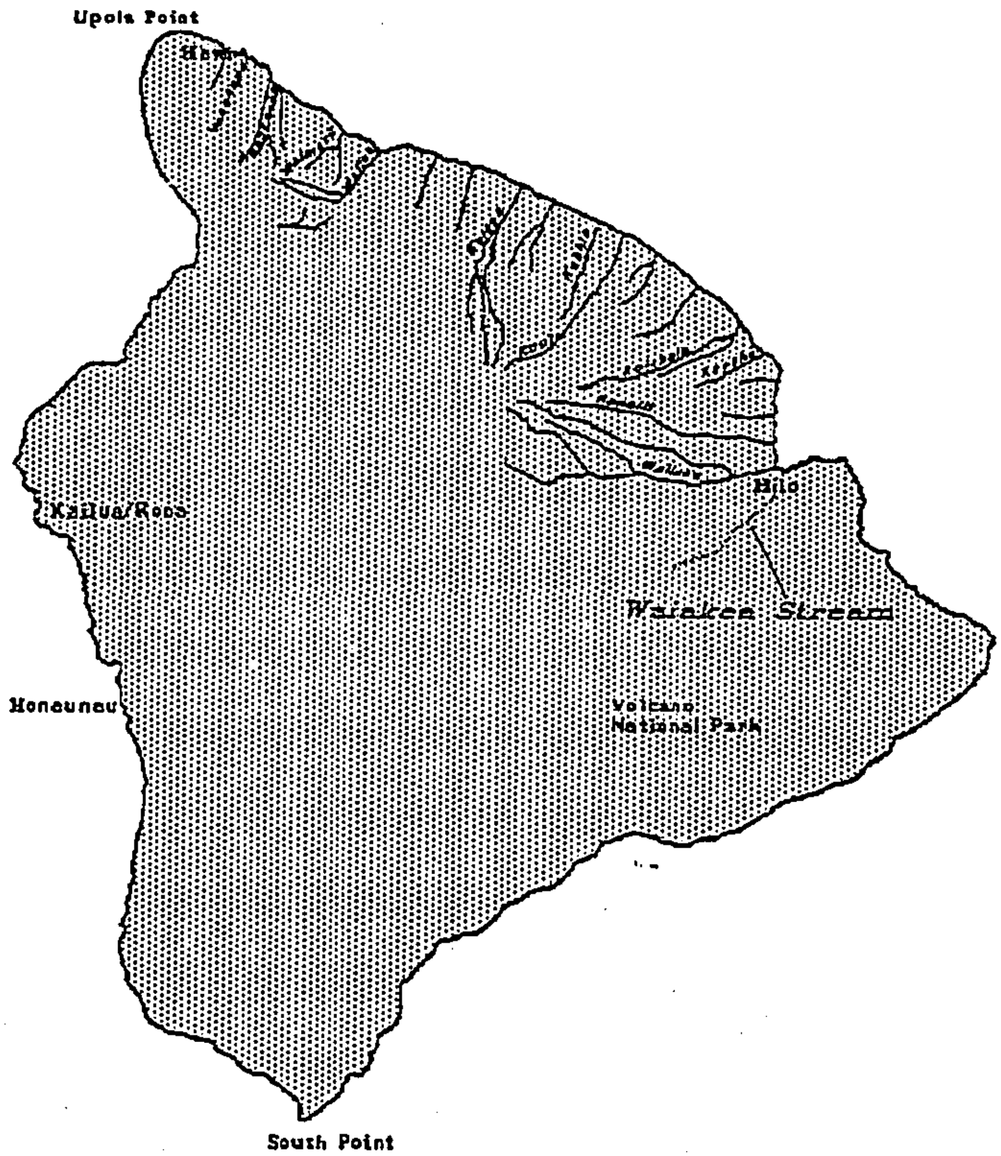

Figure 1. Island of Hawaii showing distribution of perennial streams and the location of Waiakea Stream.

Waiakea Stream has several branches (Figure 2), some fed by springs at higher elevations above Hilo and thus seems to be perennial over short segments. Certainly between about the 1000-foot elevation and the campus at around 100 feet above sea level, Waiakea Stream is intermittent. The topographic map (USGS, 7.5-minute series, Hilo Quadrangle) shows a perennial stream channel (solid blue line) arising from the

1881 lava flow at about the 300 ft. elevation, joining Waiakea Stream just above West Lanikula Street, and continuing downslope into Waiakea Pond. This confluent branch appears to exist only as a dry, overgrown ditch, dubiously classified as a "stream" and certainly not perennial. No substantial part of Waiakea Stream in the vicinity of the U.H. Hilo campus is perennial, although Waiakea Pond backs up into the channel under Kilauea Avenue. The substratum of the stream bed varies considerably from dense basalt outcrops, to loose cinder-like material, to deposited sediment. Where the bed is dense basalt, pools of water are retained, and these pools are fed by both the considerable rainfall received in the Hilo area and, in some cases, influent flows producing short segments of interconnected pools, which may approach permanency.

Review of Previous Waiakea Area Stream Surveys

Waiakea Stream is listed as a branch of the Wailoa River along with Alenaio Stream, and Timbol and Maciolek (1978) represented the stream system as perennial down to about the 1300 ft. elevation. These authors estimated that 12% of the stream channel was altered by culverts and/or reveted banks in the late 1970s. This percentage has probably increased because the stream skirts and traverses a number of recent housing developments in Waiakea Homesteads. The Wailoa River was further classified as interrupted, of low to moderate value (exploitive consumptive), with two upstream diversions, and crossed 22 times by roadways. Five segments or branches are listed: Alenaio, Kaluiiki, Waiakea, Wailoa River, and Waipahoehoe. However, all but Waiakea Stream are intermittent branches of Alenaio Stream. The Alenaio system drains the area around the Saddle Road and is separated from the Waiakea system by the lava flow of 1881 which nearly reached Hilo town (Figure 2). On the U. S. Geological Service, 7.5-minute series, topographic map (Hilo Quadrangle), Waipahoehoe Stream is shown disappearing into the 1881 flow at the 500-foot elevation.

A survey of stream macrofauna by Timbol and Maciolek (1978) on Alenaio Stream within Hilo yielded only introduced guppy (*Poecilia reticulata*) as abundant and 'o'opu naniha (*Awaous genivittatus*), 'o'opu okuhe (*Eleotris sandwicensis*), aholehole (*Kuhlia sandvicensis*), mosquitofish (*Gambusia affinis*), and southern platyfish (*Xiphophorus maculatus*) as common. The 'opae oeha'a (*Macrobrachium grandimanus*), a native crustacean, was listed as abundant.

The Wailoa River in Hilo is coded No. 8-2-61 by the Hawaii Stream Assessment (Hawaii Cooperative Park Service Unit, 1990). This stream is stated to be perennial with some tributaries separately listed in the stream data base (i.e., Alenaio as 8-2-61.01.1, Kaluiiki, Waiakea, and Waipahoehoe as 8-2-61.01). The stream is listed under "special areas" as including a natural area reserve or sanctuary, special marine or estuarine reach, and waterfall. The latter probably is Naalapa Falls. The "special" estuary may refer to the Wailoa River at the head of Hilo Harbor, which includes the Waiakea Public Fishing Area

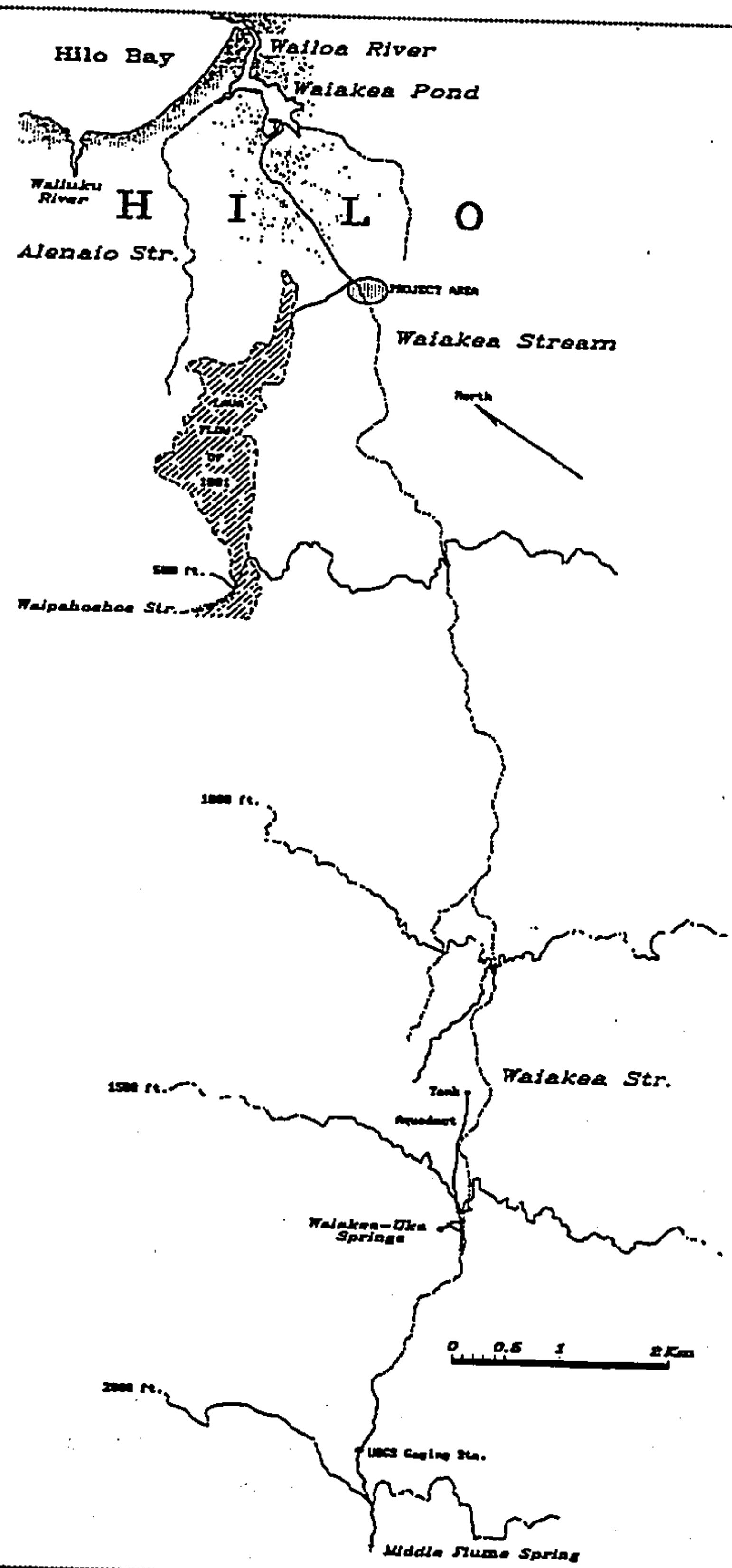

Figure 2. Map of Waiakea Stream from headwater at 2100 ft. elevation to Hilo Bay.

on the western border of Wailoa River State Park. The "aquatic resources" rank is "substantial", listing o'opu nakea (*Awaous stamineus*) present.

Field Surveys

As a part of the field work conducted for this report, *AECOS* biologists undertook a field reconnaissance of lower Waiakea Stream on October 30, 1993. This survey was for the purpose of assessing the impacts of a proposed sewerage pipe crossing (*AECOS*, 1994) at the UH Hilo campus. This survey began at around 0900 hrs in the stream bed just above the West Lanikaula Street bridge (Figure 3) at the U.H. Hilo campus and extended upstream to the area beside the campus baseball field (upper part of campus). Portions of the descriptions of the stream in the following section are based on observations made during this earlier survey. Aquatic species observed at that time are also included in the discussion below.

A second reconnaissance survey of Waiakea Stream was conducted on August 7, 1996 with emphasis on the area around the proposed bridge crossing for the University Park across the stream from the existing campus. Several upstream and downstream segments of the stream were visited to complete the description of the middle reach of this stream. Weather conditions on August 7 included high cloud cover with light but scattered rains becoming more frequent in the afternoon. During the detailed survey of pools in the vicinity of the bridge conducted at mid-morning, conditions were generally good, with no rainfall (although wet surfaces indicated an earlier rain).

Near the proposed bridge site (project area), the stream bed is solid basalt rock with many scattered pools in depressions in the rock (Figure 3). Many of the pools are isolated and would seem to be ephemeral. However, in some areas, a small volume of water was flowing between pools, apparently arising as influent from the stream margins as flow diminished to nothing further upstream on the basalt formation. Trees, mostly gunpowder tree (*Trema orientalis*) with some guava (*Psidium guajava*), shade parts of the stream, particularly just below the bridge crossing point and further upstream near the campus ball field. In the area of most numerous pools immediately upstream from the crossing point, the stream bed is wide and the pools, exposed to the sun, support a dense growth of blue-green algae (*Oscillatoria* sp.) coating the bottoms.

Although the right bank is revetted in places (a sloped, grouted rip-rap) to protect campus structures from erosion, this is not presently the case in the immediate area proposed for the bridge. A section of the right bank beside the baseball field (upstream) is revetted to protect against erosion. The stream bed narrows in this area, and the stream has cut a several meters deep channel through a layer of relatively loose material (an old a'a flow?). No traces of surface water were present here, or further upstream to and beyond the Komohana Street crossing of Waiakea Stream.

Figure 3. Pools in the basalt stream bed of Waiakea Stream looking downstream at the proposed bridge crossing site (mostly dry area in the background) taken on Jan. 6, 1994.

A list of aquatic species for Waiakea Stream is presented in Table 3. Within the segment of the stream around the project area, just upstream of a broad bend in the stream, a low escarpment occurs near the centerline of the proposed bridge structure. Above the escarpment, pools of water support a freshwater fauna. Predominant at the time of the survey was the introduced (non-native) guppy (*Poecilia reticulata*). The next most abundant fish observed was the introduced swordtail (*Xiphophorus helleri*). When this area was surveyed in October 1993, the indigenous 'o'opu nakea (*Awaous guamensis*) was found to be abundant. This was not the case in August 1996, when 'o'opu could not be found at all, despite a concerted effort to locate native fauna. The 'o'opu nakea observed in October 1993 were mostly between 4 and 6 cm in length: juveniles probably attempting to migrate upstream.

Also observed in these pools in August 1996, were crayfish (*Procambarus clarki*), tadpoles (*Bufo marinus* and *Rana catesbeiana*), and dragonfly naiads (*Pantala flavescens*). Adult dragonflies (*Pantala flavescens* and *Anax junius*) were abundant flying back and forth along the stream in this area. A snail (listed as a sinistral Lymnaidae) was seen in 1993, but could not be found in 1996.

TABLE 3. Checklist of aquatic biota observed or reported from Waiakea Stream.

Species	Common name	Status	ID QA	Abundance
ALGAE				
MYXOPHYCEAE (CYANOPHYCEAE)				
?*Oscillatoria* sp.	algal turf		20	Abundant
CHLOROPHYCEAE				
Spirogyra sp.	green filamentous alga		20	Occasional
INVERTEBRATES				
ARTHROPODA, INSECTA				
ODONATA - LIBELLULIDAE				
Anax junius (Drury)	green darner (adult)	Ind.	10	Common
ODONATA - LIBELLULIDAE				
Pantala flavescens (Fabricius)	globe skimmer (adult)	Nat.	10	Abundant
Pantala flavescens (Fabricius)	globe skimmer, (naiad)	Nat.	10	Common
ODONATA - COENAGRIIDAE				
Ischnura ramburii (Selys-Longchamps)	(adult)	Nat.	10	Uncommon
ARTHROPODA, CRUSTACEA				
DECAPODA - PALAEMONIDAE				
Macrobrachium grandimanus	*'opae o'eha'a*	End.	10	1)
DECAPODA - CAMBARIDAE				
Procambarus clarki (Girard)	Amer. swamp crayfish	Nat.	10	Occasional
MOLLUSCA				
PULMONATA - LYMNAEIDAE				
uniden., sinistral	pond snail		10	†
VERTEBRATES				
FISHES - ELEOTRIDAE				
Eleotris sandwicensis (Vaillant & Savage)	*'o'opu 'akupa*	End.	01	1)
FISHES - GOBIIDAE				
Awaous stamineus (Eydoux & Souleyet)	*'o'opu nakea*	End.	10	†, 2)
Stenogobius genivittatus (Cuvier & Valenciennes)	*'o'opu naniha*	Ind.	01	1)
FISHES - KUHLIIDAE				
Kuhlia sandvicensis (Steindachner)	*aholehole*	End.	01	1)
FISHES - POECILIIDAE				
Gambusia affinis (Baird & Girard)	mosquitofish	Nat.	01	1)
Poecilia reticulata (Peters)	guppy	Nat.	10	Abundant
Xiphophorus helleri Heckel	green swordtail	Nat.	10	Abundant
Xiphophorus maculatus (Günther)	moonfish	Nat.	01	1)

Table 3. Species Checklist (Continued).

Species	Common name	Status	ID QA	Abundance
AMPHIBIANS - BUFONIDAE				
Bufo marinus L. (tadpoles)	giant neotropical toad	Nat.	10	Abundant
AMPHIBIANS - RANIDAE				
Rana catesbeiana Shaw (tadpoles)	American bullfrog	Nat.	10	Common

ID QA (species identification source and quality assessment) Codes: 01 - reported in unpublished literature; 10 - observed/identified in field; 20 - collected; identified from keys.
1) - Reported in Timbol and Maciolek (1978) from Alenaio Stream.
2) - Reported in Hawaii Cooperative Park Service Unit (1990).
† - Species seen in October 1993 (*AECOS*, 1994), but not in January 1996.

A reconnaissance of selected segments of Waiakea Stream above the U. H. campus was undertaken on August 7, 1996 to provide a general description of the upstream aquatic environments. Observations were limited to accessible areas from roadways. Minor stream flow was observed off Hoaka Road within Waiakea Homesteads. At the end of Hoaka Road, where private property (posted) begins, the stream was overgrown with grasses and flow could not be assessed. Waiakea Stream above and under a bridge on Hoaka Road at the 870 ft (265 m) elevation is confined within a concrete-lined channel of relatively recent construction. Immediately downstream from the bridge, a large, shallow pool of standing water was observed. This pool had a mixed rock and silt bottom, and was inhabited by guppy (*P. reticulata*), swordtail (*X. helleri*), amphibian tadpoles (*Bufo* and *Rana*), crayfish (*P. clarki*), and naiads of a dragonfly (*Pantala flavescens*). A single damselfly (*Ischnura ramburii*) was observed in this area.

The stream was explored along a short reach at the 750 ft (230 m) elevation, where a concrete-lined channel and culvert cross under a side road off Hoaka Road. Here, as in the project area, small pools were present on dense basalt, fed from seepage along the banks. These pools were found to be inhabited by swordtail (*Xiphophorus helleri*), guppy (*Poecilia reticulata*), crayfish (*Procambarus clarki*), and dragonfly naiad (*Pantala flavescens*). A growth of the bright-green stringy alga, *Spirogyra* sp. was found in one of the pools. Water quality Station 1 was located a short distance upstream from the culvert where several pools were connected by a small volume of flowing water.

Waiakea Stream at the 1930 ft. (590 m) elevation was visited on October 30, 1993 along Olaa Flume Road off Stainback Highway. Flow in the vicinity of the USGS gage was considerable. Only *Anax* naiads and tadpoles of *Rana catesbeiana* were observed in the water, although little time was spent in the area which was not reached until very late in the day. The stream gage operated by USGS (No. 16700000) on Waiakea Stream off Olaa Flume Road is above all diversions. Average flow based upon the most recent available records is 11.7 cfs (USGS, 1990). None of the aquatic species observed during the reconnaissance surveys are listed as threatened or endangered (USFWS, 1996).

Water quality Station 1 was located off Hoaka Road (see above) and Station 2 was located in a pool in the immediate vicinity of the proposed stream crossing at U. H. Hilo (see Figure 2). In both cases, pools were selected which showed that a flow of water was taking place, although this flow was only on the order of 1 liter per minute. Results of water quality measurements are given in Table 4. Note the relatively high temperatures and dissolved oxygen values, indicating somewhat isolated bodies of water with considerable algal productivity. Both samples were relatively clear (low turbidity and low TSS) reflecting the still water, lack of runoff inputs, and suggesting biological primary productivity was dominated by benthic algae (larger ponds or lakes might have substantial phytoplankton causing high turbidity).

Table 4. Water quality characteristics of Waiakea Stream (August 1996).

STATION	Temp. (C)	DO (mg/l)	Cond. (umhos/cm)	pH (pH units)	Turbidity (ntu)	TSS (mg/l)
Sta. 1	23.6	9.30	14.6	--	1.06	1.4
Sta. 2	27.7	8.95	26.9	--	1.22	2.0
	Nitrate + nitrite (µg N/l)	Ammonia (µg N/l)	Total N (µg N/l)	Total P (µg P/l)		
Sta. 1	26	28	321	16		
Sta. 2	1	5	292	18		

The inorganic nutrient results were interesting because of the contrast. Despite indications from the DO results, the low nitrate + nitrite and ammonia levels at Station 2 suggest the abundant benthic algae in these unshaded pools are utilizing available dissolved nutrients to support growth. Conditions at Station 2 included shade and less evident benthic algal growth. Inorganic nutrients here were not being utilized as efficiently in this area. Total N and total P values are fairly typical for Hawaiian streams in rural or undeveloped watersheds.

University Park Project Assessment

The middle reach of Waiakea Stream is clearly intermittent flowing, yet isolated pools and systems of pools support a moderately diverse fauna and flora. The reason may be that, unlike intermittent streams in drier coastal areas, the wetter windward Big Island environment confers a longevity on these pools that allows the inhabitants to survive all but the most prolonged drought periods. The biota is dispersed up and down stream during relatively frequent freshets associated with local or mauka rain events.

The stream alteration proposed relates to establishing a roadway between the U. H. Hilo campus and the U. H. Technology Park currently accessed off Komohana Road. Waiakea Stream separates the campus from the University Park parcel. A sewerage line crossing, located about 440 ft (130 m) upstream of the West Lanikaula Street bridge, has since been completed. The sewage line crossing entailed trenching through the basalt of the stream bed, laying the pipe, then encasing the pipe within concrete. The resulting structure, a narrow concrete pad, was set more or less flush with the stream bed, and has no impact on stream flow, or aquatic habitat.

The site of the proposed bridge is at the lower end of an extensive group of fresh water pools distributed along the basalt stream bed (Figure 3). These pools could represent the best "permanent" aquatic habitat in Waiakea Stream between Kupulau Road (Waiakea Homesteads) and Waiakea Pond (downtown Hilo). Another grouping of pools occurs some 50 ft (15 m) downstream of the bridge crossing in a somewhat different geological setting. The construction of the bridge will have direct impact on only a few of the pools in the upper group which extends for perhaps 200 to 300 ft (60 to 90 m) upstream from the proposed crossing point. Because these pools are distributed mostly upstream from the proposed bridge, long-term impacts resulting from runoff with street pollutants also will not be important.

Minimal impacts would occur for a bridge constructed as a span supported on endwall supports at (or outside of) the ordinary high water mark for the stream in this location. Addition of a center support would not substantially increase the impacts given the nature of the stream bed in this area, although the present bridge design does not include such a support. The proposed channel alterations, that retain the existing bedrock basalt stream bed, significantly reduce potential adverse impacts of the project on aquatic environments.

This project also entails alterations to the stream banks above and below the proposed bridge. These structural changes represent mostly extensions of existing revetted slopes, particularly on the right bank (Figure 4). Some widening of the stream bed is also planned. Waiakea stream in this area is confined to a channel with steep banks. The stream gradient is moderately steep. Thus, the proposed bridge and bank modifications do not represent potentially adverse changes in hydrology. In this area, freshets fill the existing channel and do not spread beyond the banks as a matter of course. In part, this is due to historical alterations of the stream (including a levee on the campus side) and downstream where the stream passes through residential developments. However, all of the segment within UH Hilo property is characterized by a channel with banks that are nearly vertical or steep-sloped, providing minimal opportunity for high flows to spread out. Thus, the ecological impact on the aquatic environment of the proposed bank stabilization structures would be minimal.

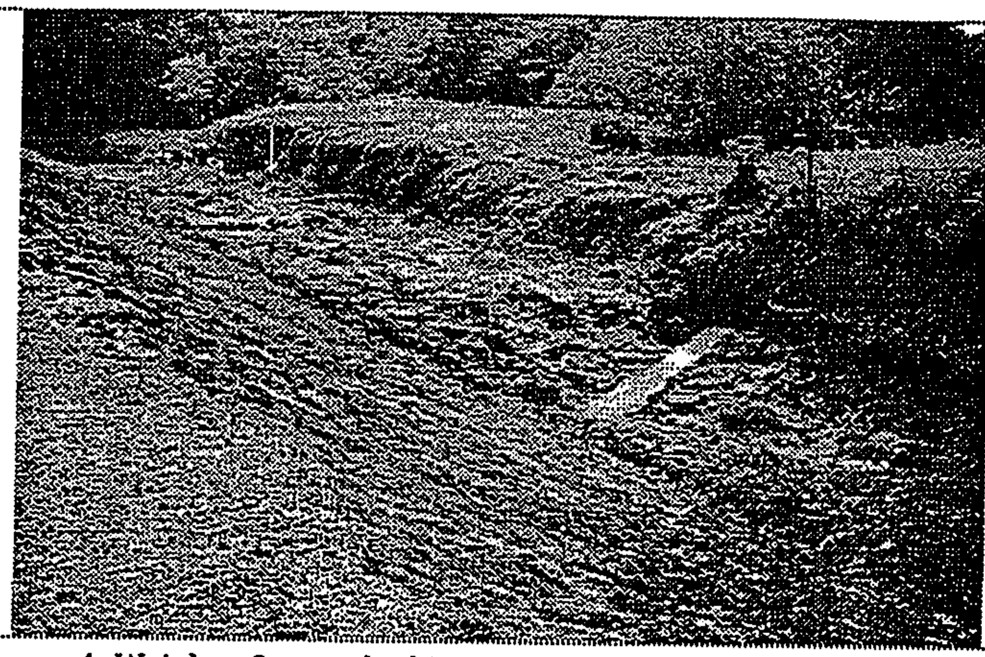

Figure 4. Waiakea Stream looking upstream from the right bank levee showing an existing utility line crossing, location of the new sewerage crossing, (indicated by vertical arrow), sloped grouted rip-rap bank (foreground), and "natural" near-vertical bank (opposite side).

Some reduction of shading will result from the loss of trees presently growing above the bank. On the other hand, the bridge will shade at least some of the pools shown in Figure 3 during a part of each day. Neither of these changes is considered significant.

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APPENDIX *D*

BOTANICAL RESOURCES ASSESSMENT STUDIES
(by Char & Associates)

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May 1996

BOTANICAL RESOURCES ASSESSMENT STUDY
STREAM CHANNEL AREA
UNIVERSITY OF HAWAI'I - HILO
HILO, ISLAND OF HAWAI'I

INTRODUCTION

The proposed project along Waiakea Stream is for improvements to the stream channel and construction of a bridge to connect University Park to the main UH Hilo campus. The study area is located mauka (west of) the student dorms and the College of Agriculture facilities.

Field studies to assess the botanical resources found on the project site were conducted on 16 April 1996 by a team of two botanists. The primary objectives of the walk-through field survey were to describe the vegetation, search for threatened and endangered species, and identify areas of potential environmental problems or concerns, particularly the presence of wetlands, and propose appropriate mitigation measures.

A discussion of the vegetation found on the project site follows. The plant names used are in accordance with Wagner et al. (1990) for the flowering plants and Lamoureux (1988) for the ferns.

DESCRIPTION OF THE VEGETATION

The vegetation on the University Park parcel was surveyed by Char in November 1992 for the proposed infrastructure for the research and technology lots. Introduced mixed forest composed primarily of large gunpowder (*Trema orientalis*) and melochia (*Melochia umbellata*) trees as well as several other tree species in smaller numbers occurs on the University Park land adjacent to the stream channel study area. Locally abundant near the study area is a grove of Alexandra or king palm (*Archontophoenix alexandrae*). On the UH Hilo campus side, the vegetation consists of mats of California grass (*Brachiaria mutica*) with sourbush or pluchea (*Pluchea symphytifolia*) shrubs and small stands of gunpowder and melochia trees. This area appears to be infrequently maintained.

Wedelia (*Wedelia trilobata*), a commonly used ground cover species, is abundant along both banks of the stream. California grass occurs as small scattered patches. Other species occasionally encountered here include small clumps of palmgrass (*Setaria palmifolia*), downy woodfern (*Christella parasitica*), and yellow ginger (*Hedychium flavescens*); a few small guava shrubs (*Psidium guajava*); and smaller herbaceous species such as oriental hawksbeard (*Youngia japonica*), bubble-gum plant (*Polygala paniculata*), and maile hohono (*Ageratum houstonianum*).

The stream has been eroded down to the bedrock of solid, dense pahoehoe lava. Scattered here and there in depressions are a few shallow pools of water. Some of the herbaceous plants and seedlings of the woody components mentioned previously occur in the stream bed where there are small pockets of soil and gravel. Much of the stream bank is also solid bedrock.

No wetlands occur within the project site. All three criteria for determining wetlands must be present; these are the presence of hydric soils, wetland indicator species (hydric vegetation), and hydrology (Environmental Laboratory 1987). On the project site, there are no areas with hydric soils as the stream bed and most of the stream bank is solid bedrock. Wetland indicator species (Reed 1988) do not cover 50% or more of the site and the vegetation is composed largely of upland species.

DISCUSSION AND RECOMMENDATIONS

The vegetation on the site proposed for the stream channel improvements and the bridge are dominated by alien or introduced plant species; these are all those plants which were brought to the Hawaiian Islands by humans after Western contact, that is, Cook's discovery of the islands in 1778. None of the plants encountered during the survey is a threatened and endangered species (U.S. Fish and Wildife Service 1994a, 1994b); nor is any plant considered rare or vulnerable (Wagner et al. 1990). No wetlands occur within the project site. Similar findings were recorded for the adjacent University Park parcel (Char 1992).

Given the findings above and the limited nature of the project, no significant negative impacts to the botanical resources are expected. No recommendations are proposed at this time.

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May 1996

BOTANICAL RESOURCES ASSESSMENT STUDY
UH HILO UNIVERSITY PARK
INFRASTRUCTURE IMPROVEMENTS, PHASE IIA
RESERVOIR AND WATER LINE ALIGNMENT
HILO, ISLAND OF HAWAI'I

INTRODUCTION

The proposed offsite water improvements will consist of a 0.5 MG reservoir and an influent line which will connect to an existing water line. The project site is located immediately east (makai) of the Sunrise Estates Subdivision. The proposed 200 ft. long by 200 ft. wide reservoir site is located within a much larger parcel which is 500 ft. long by 300 ft. wide. The proposed connecting water line alignment or corridor is 40 ft. wide by roughly 1,200 ft. long.

Field studies to assess the botanical resources found on the larger reservoir parcel and the water line corridor were made on 16 April 1996 by a team of two botanists. The primary objectives of the field survey were to describe the vegetation on the project site, search for threatened and endangered species as well as rare and vulnerable plants, and identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

A walk-through survey method was used. Notes were made on plant associations and distribution, substrate types, topography, exposure, drainage, etc. The project site was accessed from the makai end of Puloku Street. The water line corridor follows along an old grub line now overgrown by various grasses and weedy herbs and shrubs. Portions of the reservoir parcel were staked and flagged prior to our field studies. The parcel is covered by dense vegetation consisting of an 'ohi'a/uluhe community with scattered patches of strawberry guava and melastoma shrubs.

DESCRIPTION OF THE VEGETATION

A description of the vegetation found on the reservoir parcel and the water line corridor is presented below. The plant names used in the discussion follow Wagner et al. (1990) for the flowering plants and Lamoureux (1988) for the ferns.

Reservoir Parcel: A portion of the vegetation on the parcel was surveyed by Gerrish (1992) for the future Puainako Street Extension project. Gerrish noted that the vegetation along this portion of the roadway corridor consisted of an 'ohi'a (*Metrosideros polymorpha*)/uluhe fern (*Dicranopteris linearis*) forest, but with many areas dominated by strawberry guava or waiawi (*Psidium cattleianum*) and other alien or introduced species.

On Hawai'i island, the 'ohi'a/uluhe forest is associated with young lava flows and shallow soils on the lower, windward slopes of the Puna and Hilo Districts (Cuddihy and Stone 1990). Typically, it is composed of dense, almost impenetrable, mats of uluhe fern with scattered, widely spaced 'ohi'a or 'ohi'a lehua trees up to 40 ft. tall. Because of the thick cover of uluhe fern, there are only a few other species associated with this vegetation type. On the reservoir site, the other native species which occur infrequently are 'ahaniu (*Machaerina mariscoides*), hapu'u (*Cibotium glaucum*), *Scleria testacea*, huehue (*Cocculus trilobus*), neneleau

(<u>Rhus</u> <u>sandwicensis</u>), and 'ama'u (<u>Sadleria</u> <u>cyatheoides</u>).

Strawberry guava and melastoma (<u>Melastoma</u> <u>candidum</u>) shrubs form 6 to 12 ft. tall thickets throughout the 'ohi'a/uluhe forest on the project site. Melastoma cover is denser along the lower half of the reservoir parcel. Both strawberry guava and melastoma are alien or introduced plants; these are plants which were brought to the islands by humans after Western contact, that is, Cook's discovery of the Hawaiian Islands in 1778. Since their introduction, both species have spread rapidly and invaded lowland mesic to wet habitats (Cuddihy and Stone 1990).

Ground cover under the melastoma and strawberry guava thickets is sparse, with much leaf litter and barren lava. A few blechnum fern plants (<u>Blechnum</u> <u>occidentale</u>) form small clumps here and there along with seedlings of the two alien shrub species. Under the dense mats of uluhe, ground cover is almost always absent; leaf and stem litter and barren lava predominate.

<u>Water Line Corridor</u>: The water line corridor follows along an old grub line for the most part. The vegetation on this disturbed area consists of a varied assemblage of mostly weedy, alien grasses, herbs, and shrubs. Broomsedge grass (<u>Andropogon</u> <u>virginicus</u>), and owi (<u>Stachytarpheta</u> <u>dichotoma</u>) are the most abundant components of the weedy vegetation in most places. Other species occasionally encountered include Glenwood grass (<u>Sacciolepis</u> <u>indica</u>), bamboo orchid (<u>Arundina</u> <u>graminifolia</u>), Spanish clover (<u>Desmodium</u> <u>incanum</u>), Hilo grass (<u>Paspalum</u> <u>conjugatum</u>), sleeping grass or puahilahila (<u>Mimosa</u> <u>pudica</u>), yellow foxtail (<u>Setaria</u> <u>gracilis</u>), hairy sword-fern or 'okupukupu (<u>Nephrolepis</u> <u>multiflora</u>), <u>Spermacoce</u> <u>mauritiana</u>, etc. Hairy swordfern is locally abundant where the corridor approaches the end of Puloku Street. Along the northern half of the corridor, sourbush (<u>Pluchea</u> <u>symphytifolia</u>) and young, 4 to 6 ft. tall melastoma and strawberry guava shrubs cover roughly 50%

of the corridor.

Along the corridor's edge, the 'ohi'a/uluhe forest is more disturbed and open. It supports patches of broomsedge and hairy swordfern as well as a number of alien plants which include melochia (Melochia umbellata), guava (Psidium guajava), and gunpowder tree (Trema orientalis). The uluhe fern cover is patchy with large thickets of strawberry guava and melastoma in between. Some native plants such as Scleria, pala'a fern (Sphenomeris chinensis), and neneleau prefer these more open, sunny areas.

A list of all the native species observed on the reservoir parcel and the water line corridor during the field studies is presented in Table 1.

DISCUSSION AND RECOMMENDATIONS

The native-dominated 'ohi'a/uluhe forest occurs on the reservoir parcel and along the edges of the water line corridor as well as the adjacent undeveloped lands. In places, the forest supports dense thickets of strawberry guava and melastoma. The 'ohi'a/uluhe forest represents a fairly early stage in plant succession on wet lava flows and does not support a rich diversity of native plant species. This vegetation type or plant community is fairly common on the relatively young lava flows in the Hilo and Puna Districts.

A large number of weedy species as well as a few native plants are found on the water line corridor. The corridor follows along an old grub line just makai of the subdivision.

No listed, proposed, or candidate threatened and endangered plant species (U.S. Fish and Wildlife Service 1994a, 1994b) were found during the survey. Nor did we find any plants considered rare or vulnerable (Wagner et al. 1990).

Given the findings above and the limited nature of the project, the proposed project is not expected to have a significant negative impact on the botanical resources. There are no botanical reasons to impose any restrictions, inmpediments, or conditions to the proposed project.

TABLE 1. List of native plants found on the reservoir parcel and water line alignment, Hilo, Hawai'i.

Scientific name	Common name	*Status
FERNS		
BLECHNACEAE (Blechnum Fern Family)		
Sadleria cyatheoides Kaulf.	'ama'u, 'ama'uma'u	E
DICKSONIACEAE (Tree Fern Family)		
Cibotium glaucum (J. Sm.) Hook. & Arnott	hapu'u, hapu'u pulu	E
GLEICHENIACEAE (Vine Fern Family)		
Dicranopteris linearis (Burm.) Underw.	uluhe, unuhe	I
LINDSAEACEAE (Lace Fern Family)		
Sphenomeris chinensis (L.) Maxon	pala'a, pala pala'a	I
FLOWERING PLANTS		
ANACARDIACEAE (Mango Family)		
Rhus sandwicensis A. Gray	neneleau	E
CONVOLVULACEAE (Morning-glory Family)		
Ipomoea indica (J. Burm.) Merr.	koali 'awa	I
CYPERACEAE (Sedge Family)		
Machaerina mariscoides ssp. meyenii (Kunth.) T. Koyama	'ahaniu, 'uki	E
Scleria testacea Nees		I
MENISPERMACEAE (Moonseed Family)		
Cocculus trilobus (Thunb.) DC	huehue	I
MYRTACEAE (Myrtle Family)		
Metrosideros polymorpha Gaud.	'ohi'a lehua, 'ohi'a	E

TABLE 1. List of native plants. (Continued)

Scientific name	Common name	*Status
POACEAE (Grass Family)		
Paspalum scrobiculatum L.	ricegrass, mau'u laiki	I?
STERCULIACEAE (Cacao Family)		
Waltheria indica L.	'uhaloa, hi'aloa, kanakaloa	I?

*Status
- E = endemic = native only to the Hawaiian Islands.
- I = indigenous = native to the Hawaiian Islands <u>and</u> also elsewhere throughout the Pacific and/or tropics.
- I? = questionably indigenous = data not clear if dispersal by natural or human-related mechanisms, but weight of evidence suggests probably indigenous.

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BOTANICAL SURVEY
UNIVERSITY OF HAWAI'I - HILO
PROPOSED INFRASTRUCTURE FOR RESEARCH AND TECHNOLOGY LOTS
SOUTH HILO DISTRICT, ISLAND OF HAWAI'I

by

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Prepared for: ENGINEERING CONCEPTS, INC.

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BOTANICAL SURVEY
UNIVERSITY OF HAWAI'I - HILO
PROPOSED INFRASTRUCTURE FOR RESEARCH AND TECHNOLOGY LOTS
SOUTH HILO DISTRICT, ISLAND OF HAWAI'I

INTRODUCTION

The proposed infrastructure for research and technology lots is located within a 116 acre State-owned parcel. The parcel is bounded by Komohana Road to the west, the Wailoa River and the existing University of Hawai'i Hilo (UHH) campus to the east and south, and a small, unnamed stream to the north. An existing 50-foot wide electrical easement runs through the property, roughly in a mauka-makai direction. Portions of the property are currently in use by the UH Agriculture Center (8.0 acres) and by the Joint Astronomy Center (JAC) Facility (4.4 acres). In addition, parts of the main access road (Road "A") and the road below the JAC facility (Road "B") have already been constructed.

Field studies to assess the botanical resources found on the project site were conducted on 06-07 November 1992; a total of three botanists were used for the field studies. The primary objectives of the survey were to: 1) provide a description of the general vegetation types; 2) compile an inventory of the flora; and 3) search for threatened and endangered plant species protected by Federal and State laws.

SURVEY METHODS

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. Topographic maps, the preliminary lot layout map, and soil maps (overlay of soil types on a photobase) were examined to determine acess, boundaries, reference points, terrain characteristics, and vegetation cover patterns.

The less disturbed areas, which are more likely to harbor native plant communities, and, perhaps, rare plants were more intensively surveyed. The electrical easement served as the primary access; from the easement a number of surveyor's transects and long overgrown trails can be found.

A walk-through (pedestrian) survey method was used. Notes were made on plant associations and distribution, substrate types, topography, exposure, drainage, etc. Plant identifications were made in the field; plants which could not be positively identified were collected for later determination in the herbarium (UH, Manoa - HAW) and for comparison with the most recent taxonomic treatment of the flora.

The species recorded are indicative of the season ("rainy" vs. "dry") and the environmental conditions at the time of the survey. A survey taken at a different time and under varying environmental conditions would no doubt yield slight variations in the species list, especially of the weedy, annual plants.

DESCRIPTION OF THE VEGETATION

To our knowledge, there have been no detailed botanical reports dealing specifically with the project site. A short, but incomplete list of the "predominant flora" was compiled for the University of Hawaii Hilo Long Range Development Plan (State of Hawai'i 1977).

The mauka (west) half of the project site, along Komohana Road, is mapped as "rLW", pahoehoe lava flow (Sato _et al_. 1973), although, in places, there are jumbled heaps of 'a'a lava out-croppings. This flow is part of the 1881 Mauna Loa flow (Macdonald and Abbott 1970). Along the northern and central portion of the site, the substrate is mapped as "rKFD", Keaukaha extremely rocky muck, 6 to 20% slopes (Sato _et al_. 1973). This consists of well-drained, thin organic soils overlying pahoehoe lava bedrock. Both the 1881 flow and the Keaukaha soil series support a native-dominated forest of 'ohi'a trees and dense, matted uluhe ferns. Along the south and eastern portion of the site, the substrate is mapped as "PeC", Panaewa very rocky silty clay loam, 0 to 10% slope (Sato _et al_. 1973). This is a moderately well-drained, dark brown silty clay loam over pahoehoe bedrock; the depth to pahoe-hoe bedrock ranges from 15 to 20 inches. The vegetation on this soil series is composed largely of introduced species, mostly secondary forest trees, and the area appears to have been cultivated. There are a number of rock terraces and other features on this part of the site.

More detailed descriptions of the 'ohi'a-uluhe forest and the introduced mixed forest are presented below. All the plants inventoried during the field studies are presented in the check-list at the end of this report.

'Ohi'a-Uluhe Forest

The 'ohi'a-uluhe forest occurs on wetter areas of the island, on both 'a'a and pahoehoe substrates. Its general physiognomy is of widely spaced 'ohi'a trees (_Metrosideros polymorpha_) within an almost continuous mat of uluhe fern (_Dicranopteris linearis_).

There are three variants of this vegetation type on the project site. On the relatively younger 1881 Lava Flow, around the JAC facility and the Agriculture Center, the forest is typical of the earlier stages of succession. The majority of the 'ohi'a trees are of about even age and size, ranging from 15 to 25 ft. tall. The uluhe fern is very dense and forms an almost impenetrable mat between the trees, varying in height from 6 to 9 ft.; in places where the fern has climbed onto the trees, the tangled mats can be 12 ft. high. Because the uluhe cover is so dense, there are few other smaller species. Occasionally, a few plants of melastoma (Melastoma candidum), bamboo orchid (Arundina graminifolia), and strawberry guava (Psidium cattleianum) may be observed.

Where the forest occurs on the somewhat geologically older flow which has been mapped as "rKFD", Keaukaha rocky muck, the uluhe mat becomes patchy. Hala or pandanus (Pandanus tectorius) is frequently observed; if left undisturbed, the next step in natural succession would probably be to an 'ohi'a-hala dominated forest. However, the forest in this area supports a number of introduced species. Some fairly large-sized thickets of strawberry guava and melastoma shrubs, 12 to 15 ft. tall, are found here. Emerging above the 25 to 40 ft. tall 'ohi'a are scattered plants of gunpowder tree (Trema orientalis) and melochia (Melochia umbellata). The ground cover consists largely of strawberry guava and melastoma seedlings along with patches of hairy sword fern (Nephrolepis multiflora). Blechnum fern (Blechnum occidentale) and shampoo ginger (Zingiber zerumbet) may be locally common. Moss-covered rocks are also frequent. Lygodium japonicum, a lacy, slender, climbing fern, is locally abundant along the edges of this forest and along the trails cut through the forest, especially along the powerline easement. Lygodium has escaped from gardens around Hilo town and has established itself in surrounding woods and gulches (Char 1992).

The third and minor variant of this vegetation type includes the plants found in the disturbed areas within the 'ohi'a-uluhe forest. The plants in these areas consist of an assortment of largely introduced grasses, herbs, shrubs, and saplings. These include torpedo grass (Panicum repens), molasses grass (Melinis minutiflora), broomsedge (Andrpogon virginicus), partridge pea (Chamaecrista nictitans), sensitive plant or puahilahila (Mimosa pudica), pluchea (Pluchea symphytifolia), melastoma, a number of Desmodium and Crotalaria species, and saplings of melochia and gunpowder tree. Two native species occur in fairly large numbers in these more open, sunny areas. Neneleau (Rhus sandwicensis), a small tree, 6 to 24 ft. tall, belonging to the mango family, is common along the powerline easement. Scleria testacea, a sedge with sharp-edged leaf margins, is locally abundant along "Road B", near the JAC facility. Also found in this area are a few plants of 'akiohala (Hibiscus furcellatus), a native, pink-flowered hibiscus.

Introduced Mixed Forest

This vegetation type occurs on the portion of the property with Panaewa soil ("PeC"), a relatively deep, dark brown silty clay loam. The forest consists primarily of large gunpowder and melochia trees, 30 to 50 ft. tall. Other tree species found in this forest type include Chinese banyan (Ficus microcarpa), guarumo (Cecropia obtusifolia), bingabing (Macaranga mappa), African tulip (Spathodea campanulata), satin leaf (Chrysophyllum oliviforme), and avocado (Persea americana). Large groves of Alexandra or king palm (Archontophoenix alexandrae) are common along the western portion of this forest, near the Waiola River and across from the University of Hawai'i Hilo campus. A stand of very old mango trees (Mangifera indica) is also found in this forest type.

The common yellow guava (Psidium guajava) forms somewhat dense shrub layers in some places of the forest. Seabean (Dioclea wilsonii), a large woody liana which produces clusters of dark purple flowers, is occasionally observed climbing over the trees and shrubs.

Ground cover is variable. Where the tree canopy cover is dense, only the more shade-tolerant plants such as wood fern (Christella parasitica) and Oplismenus compositus can be found, however, much of the ground is barren, wet soil. Where the trees thin out and there is more light available, clumps of palmgrass (Setaria palmifolia), up to 3 ft. tall, and low, rambling prickly shrubs of thimbleberry (Rubus rosifolius) are abundant.

Along the eastern edge of the forest where it abuts the Waiola River, it is open and the ground is covered by a thick blanket of California grass (Brachiaria mutica) and wedelia (Wedelia trilobata). Scattered through the California grass and wedelia are plants of honohono (Commelina diffusa), primrose willow (Ludwigia octovalvis), and a few guava shrubs. Also found along or near the river are clumps of banana (Musa X paradisiaca), ti (Cordyline fruticosa), elephant grass (Pennisetum purpureum), and yellow ginger (Hedychium flavescens).

DISCUSSION AND RECOMMENDATIONS

In summary, the native-dominated 'ohi'a-uluhe forest occurs on the younger substrates -- the 1881 Lava Flow and Keaukaha extremely rocky muck. The geologically older Panaewa soil type supports a forest composed primarily of introduced species. The 'ohi'a-uluhe forest represents a fairly early stage in plant succession on wet lava flows, and, although, both of these native species make up the bulk of the vegetation, this type of forest does not have a rich array of other native species.

Of a total of 122 species inventoried on the site, 100 (82%) are introduced or alien species, 6 (5%) are originally of Polynesian introduction, and 16 (13%) are native. Of the natives, 12 are indigenous, that is, they are native to the Hawaiian Islands and also elsewhere, and 4 are endemic, that is, they are native only to the islands. The majority of the introduced species are weedy plants which prefer open, disturbed sites. The native species can be found in similar environmental habitats throughout the islands. None of the plants inventoried on the State-owned parcel are officially listed threatened and endangered species; nor are any proposed or candidate for such status (U.S. Fish and Wildlife Service 1989, 1990).

Given the findings above, the proposed project is not expected to have a significant negative impact on the botanical resources. Whenever possible native plants should be used for landscaping. The following recommendations are offered. On portions of the property covered by the 'ohi'a-uluhe forest, there are some areas with slopes greater than 10% and it would be difficult to build on these areas without substantial grading. It is suggested that these areas be left intact, and incorporated into the landscape design wherever feasible. These strips of 'ohi'a-uluhe forest would provide a buffer between the different facilities planned for the site; they would function as a noise screen and also protect the visual quality of the site. Costs for grading and then revegetating these areas could be eliminated.

As for landscaping material, it is recommended that some of the more easily cultivated native species found in the general region (Hamakua-Hilo-Puna) be used. These include 'ohi'a, tree ferns (Cibotium), 'ahanui (Machaerina), 'ohe (Tetraplasandra), loulu palm (Pritchardia), etc. Botanists and horticulturists on the UH Hilo and Hilo Community College facility, who are more familiar with the local flora, can also be approached to provide a list of native species suitable for landscaping the project site.

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PLANT SPECIES LIST -- Proposed Infrastructure for Research and Technology Lots at UH - Hilo

A checklist of all those terrestrial, vascular plant species inventoried on the project site during the field studies is presented below. The species are arranged alphabetically within each of three groups: Ferns, Monocots, and Dicots. The taxonomy and nomenclature of the Ferns follow Lamoureux (1984); the flowering plants, Monocots and Dicots, are in accordance with Wagner et al. (1990), for the most part.

For each species, the following information is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name, when known.
3. Biogeographic status. The following symbols are used:
   - E = endemic = native only to the Hawaiian Islands
   - I = indigenous = native to the Hawaiian Islands and also elsewhere throughout the Pacific
   - P = Polynesian = plants originally of Polynesian introduction prior to Western contact (Cook's discovery of the islands in 1778); not native
   - X = introduced or alien = all those plants brought to the islands by humans, intentionally or accidentally, after Western contact; not native.
4. Presence (+) or absence (-) of a particular species within each of two vegetation types recognized on the project site (see text for discussion):
   - o = 'Ohi'a-Uluhe Forest
   - i = Introduced Mixed Forest

Scientific name	Common name	Status	Vegetation type o	Vegetation type i
FERNS				
BLECHNACEAE (Blechnum Family)				
Blechnum occidentale L.	blechnum fern	X	+	+
DICKSONIACEAE (Tree Fern Family)				
Cibotium glaucum (J. Sm.) Hook. & Arnott	hapu'u	E	+	–
GLEICHENIACEAE (Vine Fern Family)				
Dicranopteris linearis (Burm.) Underw.	uluhe	I	+	+
HEMIONITIDACEAE (Gold Fern Family)				
Pityrogramma calomelanos (L.) Link	silver fern	X	–	+
LINDSAEACEAE (Lace Fern Family)				
Sphenomeris chinensis (L.) Maxon	pala'a	I	+	–
LYGODIACEAE (Climbing Fern Family)				
Lygodium japonicum (Thunb.) Sw.	lygodium	X	+	+
NEPHROLEPIDACEAE (Sword Fern Family)				
Nephrolepis multiflora (Roxb.) Jarrett ex Morton	hairy sword fern	X	+	+
POLYPODIACEAE (Common Fern Family)				
Phlebodium aureum (L.) J. Sm.	laua'e-haole	X	–	+
Phymatosorus scolopendria (Burm.) Pic.-Ser.	laua'e, lauwa'e	X	–	+
Pleopeltis thunbergiana Kaulf.	pakahakaha, 'ekaha-'akolea	I	–	+
THELYPTERIDACEAE (Woodfern Family)				
Christella parasitica (L.) Levl.	woodfern, oakfern	X	+	+

Scientific name	Common name	Status	Vegetation type o	Vegetation type i
FLOWERING PLANTS				
MONOCOTS				
AGAVACEAE (Sisal Family)				
Cordyline fruticosa (L.) A. Chev.	ti, ki	P	+	+
ARACEAE (Aroid Family)				
Dieffenbachia picta Schott	dieffenbachia	X	+	–
ARECACEAE (Palm Family)				
Archontophoenix alexandrae (F. v. Muell.) H.A. Wendl. & Drude	king palm, Alexandra palm	X	+	+
COMMELINACEAE (Dayflower Family)				
Commelina diffusa N.L. Burm.	honohono	X	–	+
CYPERACEAE (Sedge Family)				
Cyperus halpan L.		X	+	–
Fimbristylis dichotoma (L.) Vahl.		I	+	–
Kyllinga brevifolia Rottb.	green kyllinga, kili'o'opu	X	+	–
Machaerina mariscoides ssp. meyenii (Kunth) T. Koyama	'ahaniu, 'uki	E	+	–
Pycreus polystachyos (Rottb.) P. Beauv.		I	+	–
Scleria testacea Nees		I	+	–
DIOSCOREACEAE (Yam Family)				
Dioscorea bulbifera L.	bitteryam, pi'oi	P	+	–
Dioscorea pentaphylla L.	pi'ia	P	+	–
MUSACEAE (Banana Family)				
Musa X paradisiaca L.	banana, maia	P	–	+

Scientific name	Common name	Status	Vegetation type o	Vegetation type i
ORCHIDACEAE (Orchid Family)				
Arundina graminifolia (D. Don) Hochr.	bamboo orchid	X	+	–
Spathoglottis plicata Blume	Philippine ground orchid	X	+	+
PANDANACEAE (Hala Family)				
Pandanus tectorius S. Parkinson ex Z.	pandanus, hala	I?	+	–
POACEAE (Grass Family)				
Andropogon virginicus L.	broomsedge	X	+	–
Brachiaria mutica (Forsk.) Stapf	California grass	X	+	+
Coix lachryma-jobi L.	Job's tears	X	+	+
Digitaria sp.	crabgrass	X	+	–
Eragrostis sp.	Hamakua eragrostis	X	+	–
Melinis minutiflora P. Beauv.	molasses grass	X	+	–
Oplismenus compositus (L.) P. Beauv.		X	–	+
Panicum maximum Jacq.	Guinea grass	X	+	–
Panicum repens L.	torpedo grass, Wainaku grass	X	+	–
Paspalum conjugatum Bergius	Hilo grass, mau'u Hilo	X	–	+
Paspalum scrobiculatum L.	ricegrass, mau'u laiki	I?	+	–
Pennisetum purpureum Schumach.	napier grass, elephant grass	X	–	+
Rhynchelytrum repens (Willd.) Hubb.	Natal redtop	X	+	–
Sacciolepis indica (L.) Chase	Glenwood grass	X	+	–
Setaria gracilis Kunth	yellow foxtail	X	+	–
Setaria palmifolia (J. König) Stapf	palmgrass	X	+	+
ZINGIBERACEAE (Ginger Family)				
Hedychium flavescens N. Carey ex Roscoe	yellow ginger	X	–	+
Zingiber zerumbet (L.) Sm.	shampoo ginger, 'awapuhi kuahiwi	P	+	–
DICOTS				
ACANTHACEAE (Acanthus Family)				
Justicia betonica L.	white shrimp plant	X	+	–

Scientific name	Common name	Status	Vegetation type o	Vegetation type i
ANACARDIACEAE (Mango Family)				
Mangifera indica L.	mango, manako	X	+	+
Rhus sandwicensis A. Gray	neneleau	E	+	–
Schinus terebinthifolius Raddi	Christmas berry	X	–	+
APIACEAE (Parsley Family)				
Centella asiatica (L.) Urb.	Asiatic pennywort, pohe kula	X	+	–
ARALIACEAE (Ginseng Family)				
Schefflera actinophylla (Endl.) Harms	octopus tree, umbrella tree	X	+	+
ASTERACEAE (Sunflower Family)				
Ageratina riparia (Regel) R. King & H. Robinson	pamakani	X	–	+
Ageratum houstonianum Mill.	maile hohono	X	+	–
Bidens alba var. radiata (Schultz-Bip.) Ballard ex Melchert	white-flowered bidens	X	–	+
Crassocephalum crepidioides (Benth.) S. Moore	crassocephalum	X	+	–
Eclipta alba (L.) Hassk.	false daisy	X	+	–
Emilia fosbergii Nicolson	pua lele	X	+	–
Erechtites valerianifolia (Wolf) DC.	fireweed	X	+	–
Pluchea symphytifolia (Mill.) Gillis	pluchea, sourbush	X	+	–
Sonchus oleraceus L.	sow thistle, pua-lele	X	+	–
Wedelia trilobata (L.) Hitchc.	wedelia	X	+	+
BALSAMINACEAE (Touch-me-not Family)				
Impatiens wallerana J.D. Hook.	impatiens	X	–	+
BEGONIACEAE (Begonia Family)				
Begonia foliosa var. miniata (Planch.) L.B. Sm. & B.G. Schubert	fuschia begonia	X	–	+
Begonia hirtella Link	white-flowered begonia	X	+	–
BIGNONIACEAE (Bignonia Family)				
Spathodea campanulata P. Beauv.	African tulip	X	–	+

Scientific name	Common name	Status	Vegetation type o	Vegetation type i
BOMBACACEAE (Bombax Family)				
Indet. sp.		X	–	+
BUDDLEIACEAE (Butterfly Bush Family)				
Buddleia asiatica Lour.	Asiatic butterfly bush, huelo-'ilio	X	+	–
CAMPANULACEAE (Bellflower Family)				
Hippobroma longiflora (L.) G. Don	star-of-Bethlehem	X	+	–
CARYOPHYLLACEAE (Pink Family)				
Drymaria cordata (L.) Willd. ex Roem.	pipili	X	–	+
CECROPIACEAE (Cecropia Family)				
Cecropia obtusifolia Bertol.	guarumo	X	–	+
CLUSIACEAE (Mangosteen Family)				
Clusia rosea Jacq.	autograph tree, copey	X	+	+
CONVOLVULACEAE (Morning-glory Family)				
Ipomoea alba L.	moonflower, koali pehui	X	+	–
Ipomoea indica (J. Burm.) Merr.	koali 'awahia	I	+	–
Ipomoea triloba L.	little bell, pink bindweed	X	+	–
EUPHORBIACEAE (Spurge Family)				
Macaranga mappa (L.) Mull. Arg.	bingabing	X	–	+
Phyllanthus debilis Klein ex Willd.	niruri	X	+	–
Ricinus communis L.	castor bean, koli, pa'aila	X	+	–
FABACEAE (Bean Family)				
Caesalpinia major (Medik.) Dandy & Exell	kakalaioa, hihikolo	X?	+	–
Chamaecrista nictitans (L.) Moench	partridge pea, lauki	X	+	–
Crotalaria cf. lanceolata E. Mey.		X	+	–
Crotalaria pallida Aiton	smooth rattlepod, pikakani	X	+	–
Crotalaria retusa L.		X	+	–

Scientific name	Common name	Status	Vegetation type o	Vegetation type i
Desmodium cajanifolium (Kunth) DC.	tick clover	X	+	-
Desmodium incanum DC.	Spanish clover, ka'imi	X	+	-
Desmodium intortum (Mill.) Urb.		X	-	+
Desmodium tortuosum (Sw.) DC.	Florida beggarweed	X	+	-
Desmodium sp. 1		X	+	-
Desmodium sp. 2		X	+	-
Dioclea wilsonii Standl.	sea bean, maunaloa	X?	-	+
Mimosa pudica var. unijuga (Duchass. & Walp.) Griseb.	sensitive plant, sleeping grass, pua hilahila	X	+	-
LAMIACEAE (Mint Family)				
Hyptis pectinata (L.) Poit.	comb hyptis	X	+	-
LAURACEAE (Laurel Family)				
Persea americana Mill.	avocado, alligator pear	X	-	+
LYTHRACEAE (Loosestrife Family)				
Cuphea carthagenensis (Jacq.) Macbr.	tarweed, Colombian cuphea	X	+	-
MALVACEAE (Mallow Family)				
Hibiscus furcellatus Desr.	'akiohala, 'akiahala, hau hele	I	+	-
Sida rhombifolia L.	Cuba jute	X	+	-
MELASTOMATACEAE (Melastoma Family)				
Dissotis rotundifolia (Sm.) Triana	dissotis	X	+	-
Melastoma candidum D. Don	melastoma	X	+	+
MORACEAE (Mulberry Family)				
Ficus microcarpa L. f.	Chinese banyan	X	-	+
MYRTACEAE (Myrtle Family)				
Metrosideros polymorpha Gaud.	'ohi'a, 'ohi'a lehua	E	+	-
Psidium cattleianum Sabine	strawberry guava	X	+	+
Psidium guajava L.	guava, kuawa	X	+	+

Scientific name	Common name	Status	Vegetation type o	Vegetation type i
ONAGRACEAE (Evening Primrose Family)				
Ludwigia octovalvis (Jacq.) Raven	primrose willow, kamole	P?	–	+
OXALIDACEAE (Wood Sorrel Family)				
Oxalis corymbosa DC.	pink wood sorrel, ihi pehu	X	–	+
PASSIFLORACEAE (Passionflower Family)				
Passiflora edulis Sims	passionfruit, liliko'i	X	–	+
Passiflora foetida L.	scarlet-fruited passionflower, pohapoha	X	+	–
PIPERACEAE (Pepper Family)				
Peperomia leptostachya Hook. & Arnott	'ala 'ala wai nui	I	–	+
POLYGALACEAE (Milkwort Family)				
Polygala paniculata L.	bubble-gum plant	X	+	–
POLYGONACEAE (Buckwheat Family)				
Polygonum sp.		X	–	+
ROSACEAE (Rose Family)				
Rubus rosifolius Sm.	thimbleberry	X	+	+
RUBIACEAE (Coffee Family)				
Hedyotis corymbosa (L.) Lam.		X	+	–
Paederia scandens (Lour.) Merr.	maile-pilau	X	+	+
Spermacoce assurgens Ruiz & Pav.	buttonweed	X	+	–
Spermacoce mauritiana Gideon		X	+	–
SAPINDACEAE (Soapberry Family)				
Filicium decipiens (Wight & Arnott) Thwaites ex J.D. Hook.	fern tree	X	–	+
SAPOTACEAE (Sapodilla Family)				
Chrysophyllum oliviforme L.	satin leaf	X	–	+

Scientific name	Common name	Status	Vegetation type o	Vegetation type i
SCROPHULARIACEAE (Figwort Family)				
Castilleja arvensis Cham. & Schlechtend.	Indian paintbrush	X	+	–
STERCULIACEAE (Cacao Family)				
Melochia umbellata (Houtt.) Stapf	melochia	X	+	+
Waltheria indica L.	'uhaloa, hi'aloa, kanakaloa	I?	+	–
ULMACEAE (Elm Family)				
Trema orientalis (L.) Blume	gunpowder tree, charcoal tree	X	+	+
URTICACEAE (Nettle Family)				
Pilea microphylla (L.) Liemb.	artillary plant, rockweed	X	–	+
VERBENACEAE (Verbena Family)				
Lantana camara L.	lantana, lakana	X	+	–
Stachytarpheta dichotoma (Ruiz & Pav.) Vahl	owi, oi	X	+	–

APPENDIX *E*

ARCHAEOLOGICAL INVENTORY SURVEYS
(by Cultural Surveys Hawaii)

BENJAMIN J. CAYETANO
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STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

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

February 13, 1997

Dr. Hallett Hammatt
Cultural Surveys of Hawaii
733 North Kalaheo Avenue
Kailua, Hawaii 96734

LOG NO: 18942 ✓
DOC NO: 9702PM09

RECEIVED
FEB 19 1997
ENGINEERING CONCEPTS

Dear Dr. Hammatt:

SUBJECT: "Archaeological Survey of a Proposed Reservoir and Waterline Easement for the University of Hawaii at Hilo, Infrastructure Improvements Phase IIA" (Winieski, Borthwick and Hammatt 1996) Waiakea, South Hilo, Hawaii Island TMK: 2-4-03: 26 and 2-4-01: 12

Thank you for your transmittal sheet dated November 19, 1996 and our apologies for the delay in reviewing the subject report.

The report meets with our approval. We believe that the survey of the 5.23 acre parcel was adequate. Few, if any, historic sites were anticipated in the subject area and, indeed, none were found.

Since no historic sites were found during this survey, use of this parcel will have "no effect" on significant historic sites.

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

PM:amk

JOHN WAIHEE
GOVERNOR OF HAWAII

KEITH AHUE, CHAIRPERSON
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STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

October 28, 1994

RECEIVED
NOV 2 1994
ENGINEERING CONCEPTS

LOG NO: 13055
DOC NO: 9410PM23

Dr. Hallett Hammatt
Cultural Surveys of Hawaii
733 North Kalaheo Avenue
Kailua, Hawaii 96734

Dear Dr. Hammatt:

SUBJECT: Replacement Pages for Final Report: "Archaeological Survey and Testing of Lands Proposed for Research and Technology Lots at the University of Hawaii at Hilo" (Borthwick, Collins, Folk and Hammatt 1993)
***Waiakea*, South Hilo, Island of Hawaii**
TMK: 2-4-01: 7, 41

Thank you for sending us the two replacement pages for the subject report that we had requested in our review letter of August 9, 1994. Now that we have these pages we can officially accept the report. This concludes the historic preservation review process for this project.

Sincerely,

DON HIBBARD, Administrator
State Historic Preservation Division

PM:jk

c. Mr. Ken Ishizaki, Engineering Concepts

Archaeological Survey of a Proposed Reservoir and Waterline Easement for the University of Hawaii at Hilo, Infrastructure Improvements Phase IIA (TMK 2-4-03:26 and 2-4-01:12)

by

John Winieski, M.A.
Douglas Borthwick, B.A
and
Hallett H. Hammatt, Ph.D.

for

Engineering Concepts, Inc.

by

Cultural Surveys Hawaii
November 1996

ABSTRACT

An archaeological inventory survey was conducted in Hilo, Hawai'i at the 5.23 acre site of a proposed reservoir and waterline easement adjacent to Sunrise Estates subdivision for the University of Hawai'i at Hilo, University Park Infrastructure Improvements Phase IIA (TMK 2-4-03:26 and 2-4-01:12). Since no archaeological sites or cultural resources were discovered, no impact to historic sites of any kind are anticipated.

ACKNOWLEDGEMENTS

We would like to thank Dana Yamamoto of Engineering Concepts, Inc. for coordinating the project, and providing maps and helpful information.

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

On October 17, 1993 Cultural Surveys Hawaii conducted an archaeological inventory survey of forested land in Waiākea *ahupua'a*, South Hilo district on the island of Hawai'i (Figure 1-3). The parcel under study, located at the end of Puloku Street in the new Sunrise Estates sub-division, is the site of a proposed UH Hilo University Park reservoir and waterline easement (Figure 4).

Scope of Work

At the request of Engineering Concepts, Inc., Cultural Surveys agreed to perform a full archaeological inventory survey of the UH Hilo University Park reservoir and waterline easement. This survey would satisfy state and county requirements. Results of the survey would be provided in a report, which would also include any necessary background information.

Study Area Description

The study area comprises approximately 5.23 acres in the *ahupua'a* of Waiākea, in South Hilo, on the windward coast of Hawai'i Island (TMK 2-4-03:26 and 2-4-01:12). It is presently accessible from the eastern end of Puloku Street, which intersects a previously bulldozed grub line which runs roughly north-east/south-west. The grub line, approximately 20-40 feet wide, is proposed as the waterline easement which will run from the proposed reservoir site to an existing waterline. The reservoir site will be located on a lot directly makai of the grub line at its south-west end. The reservoir parcel is bounded on the north side by existing channelized drainage, and on all other sides by undeveloped forested land.

Elevations within the study area range from roughly 450 ft. a.m.s.l. to 500 ft.

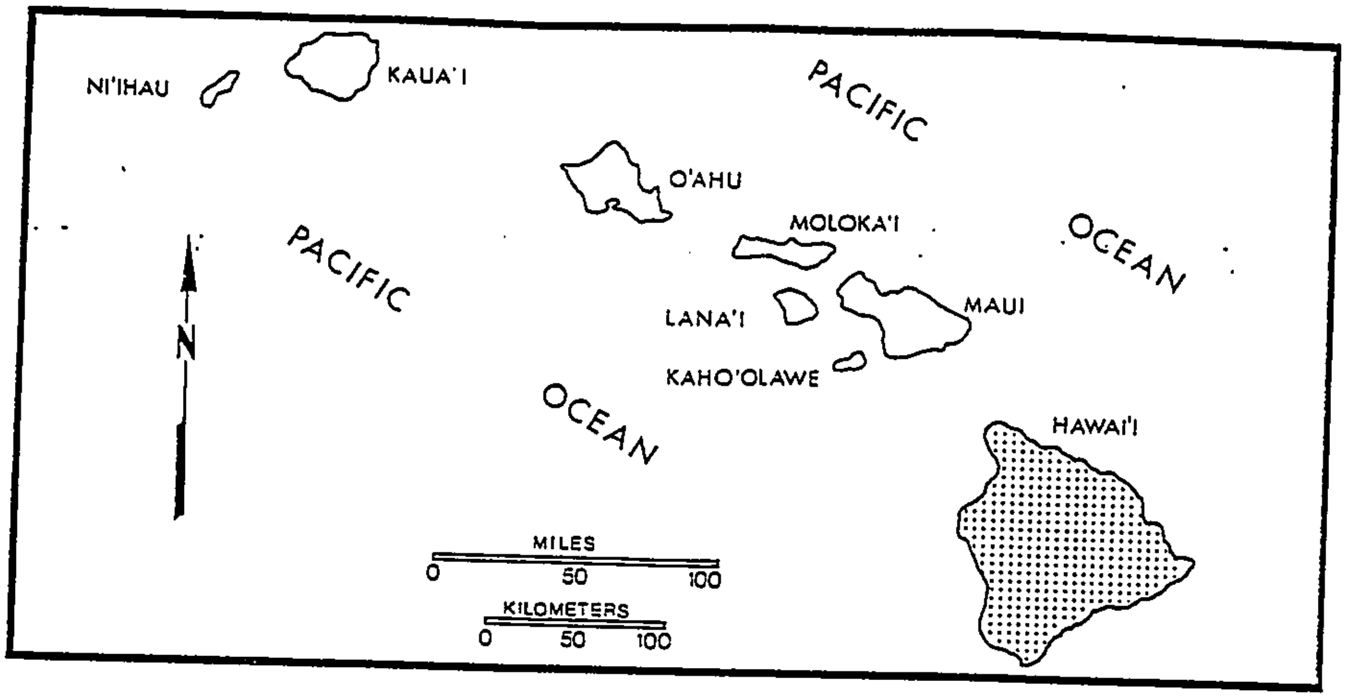

Figure 1 State of Hawai'i

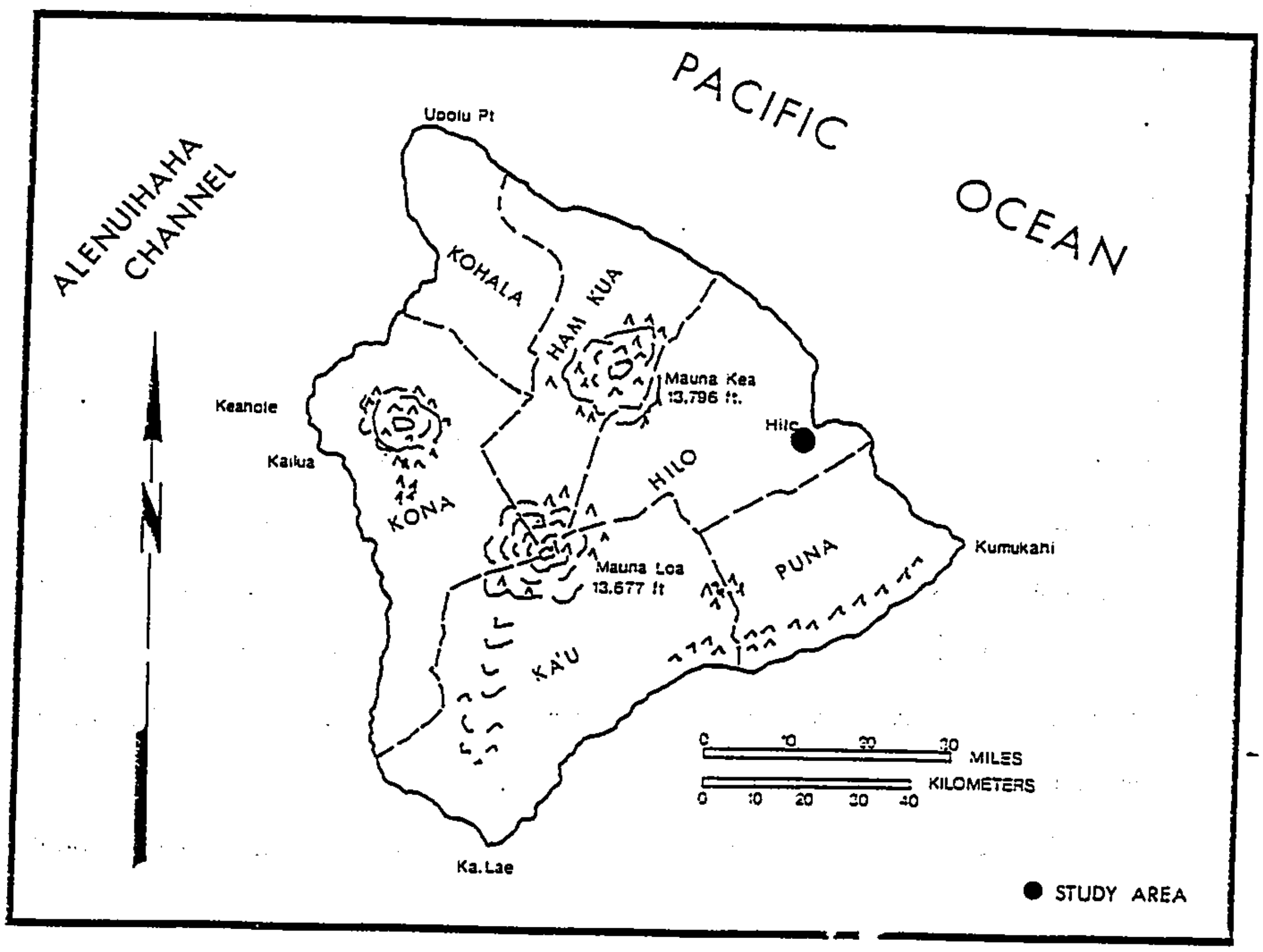

Figure 2 General Location Map, Hawai'i Island

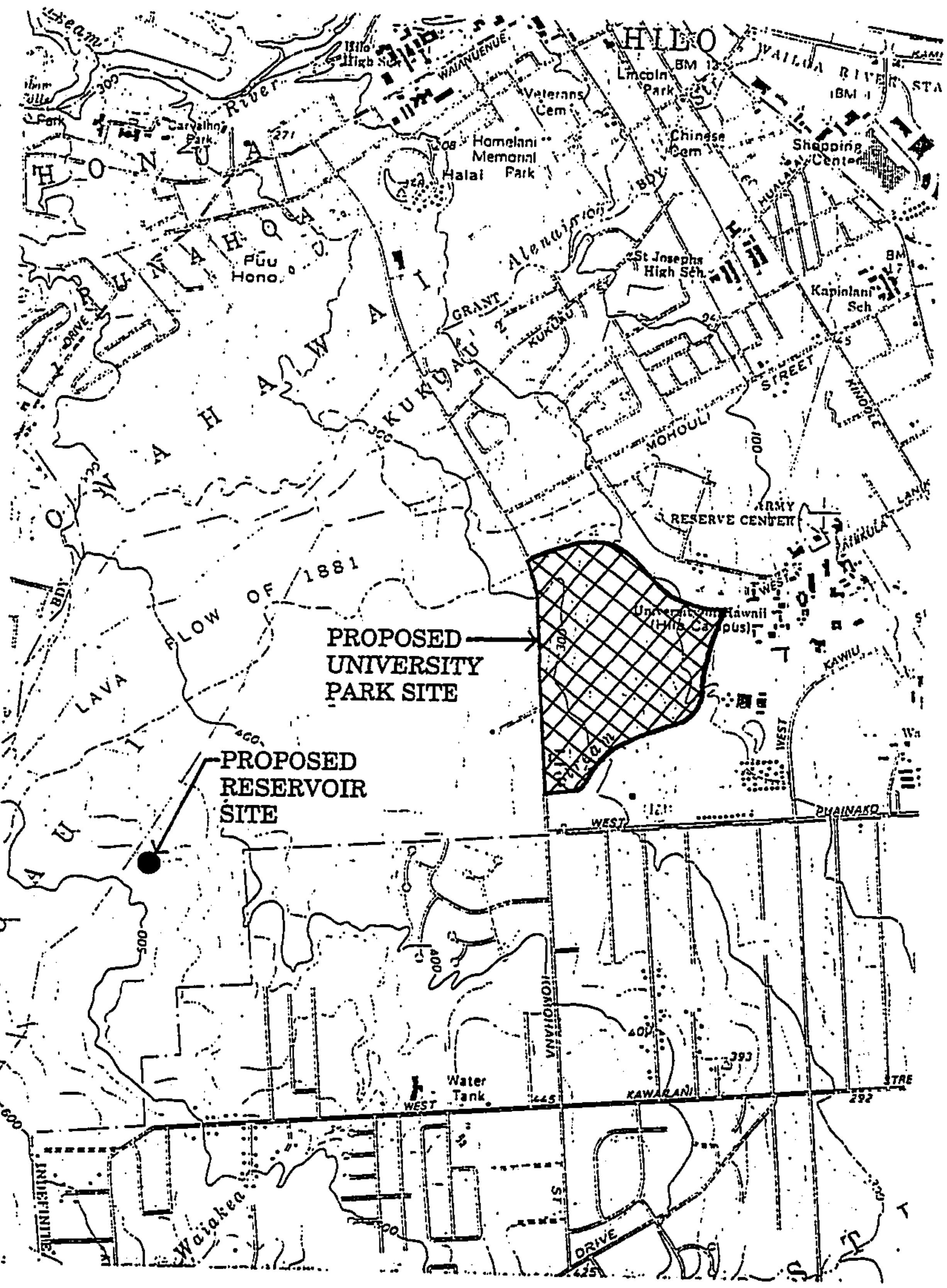

Figure 3 Portion of USGS Topographical Map, 7.5 Minute Series, Hilo Quadrangle, Showing Approximate Location of Study Area

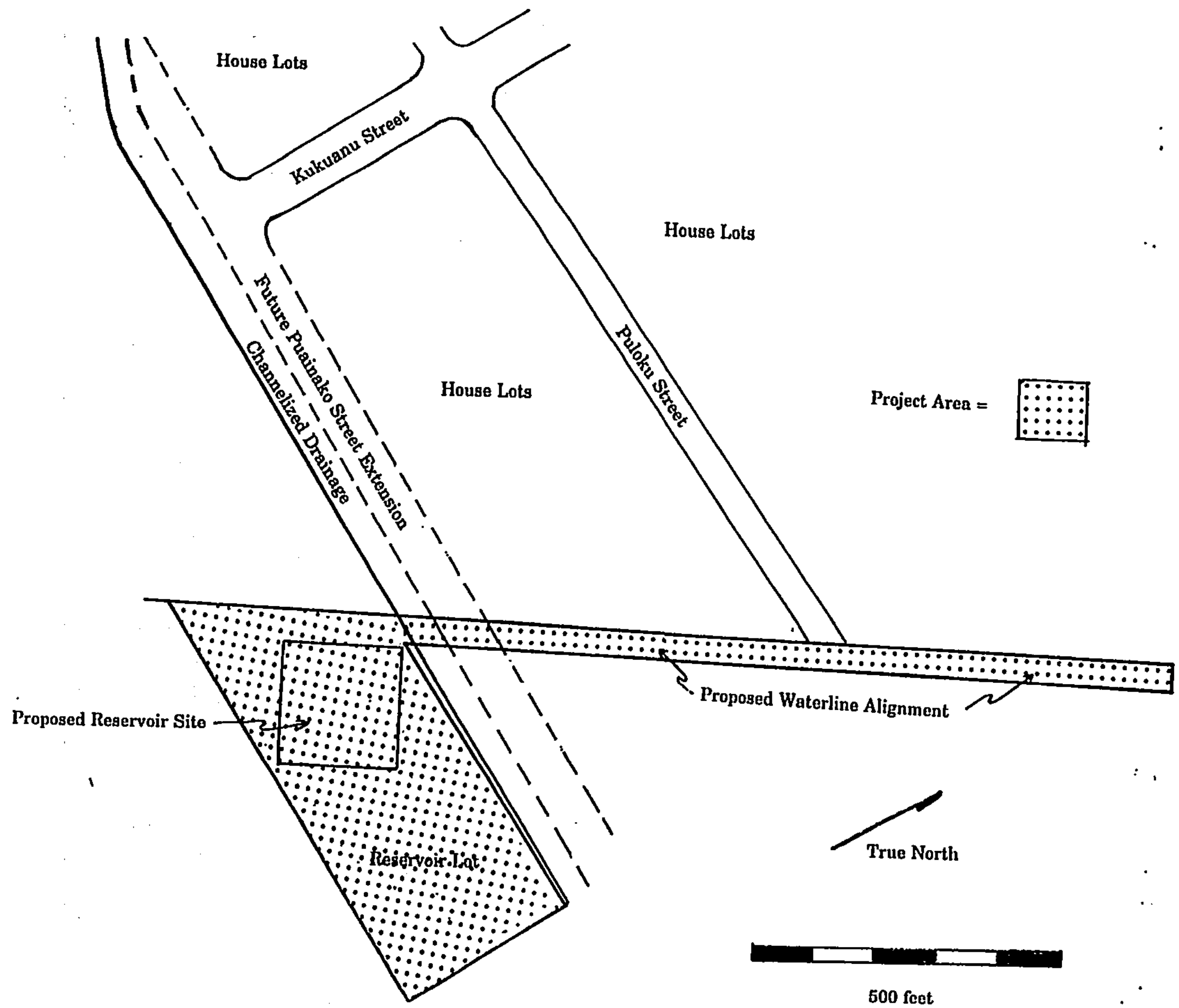

Figure 4 Project Area Map

a.m.s.l. on the lower east slope of Mauna Loa Volcano.

Several historic flows from Mauna Loa Volcano have affected the terrain along its eastern slope. An 1881 flow affected much of the Waiākea *Ahupua'a*, flowing to within a mile of Hilo Bay. A part of the east end of this 1881 flow is present just to the north of the study area. However, the 1881 flow did not impact the study area which is located on an older pahoehoe lava flow which pre-dates it.

Although virtually unweathered pahoehoe lava dominates the study area, vegetation is dense due to the vast amounts of rain on the windward side of Hawaii Island. The vegetation in this area is characterized by *uluhe* fern (*Diacranopteris linearis*), except for stands of strawberry guava trees (*Psidium cattleianum*) with little or no understory.

CULTURAL HISTORY

The *ahupua'a* of Waiākea, South Hilo, is large, encompassing some 95,000 acres. It extends from the coast to approximately the 6,000 feet elevation on the windward slope of Mauna Loa. In 1979 Holly McEldowney prepared an "Archaeological and Historical Literature Search and Research Design," as part of a "Lava Flow Control Study" (McEldowney 1979). In her report McEldowney describes five zones of land use and associated resources. The five zones, which are applicable to Waiākea, include: I. Coastal settlement; II. Upland Agricultural; III. Lower Forest; IV. Rain forest; and V. Sub-Alpine or Montaine (*Ibid.*). The zones are described below from *mauka* (Zone V) to *makai* (Zone I) or in order of ascending importance in terms of settlement patterns.

Zone V (Sub-alpine), which is defined as being above the 5,500 ft. elevation, was probably of only marginal importance in terms of land utilization during prehistoric (pre-A.D. 1776) times. As McEldowney indicates "Use of major trails, although important to settlement and land use in all zones, probably dominated the utilization of this zone" (*Op.*

cit:30). Resources probably procured from this zone include birds like *nene* (geese) and *'ua'u* (petrel) for food, timber products, and possibly lithic materials.. Though Waiākea extends into this sub-alpine zone it is not one of the major *ahupua'a* associated with this zone or the saddle region like Humu'ula which "cuts off" Waiākea at roughly the 6,000 foot elevation.

Zone IV (Rain Forest) is defined as ranging from 2,500 to 5,500 feet in elevation. Resources of bird feathers, medicinal plants, and possibly some timber products would have been procured from this zone with bird feathers probably of greatest importance. Habitation within this zone was probably exclusively temporary though possibly lava tubes or other site areas were utilized recurrently. In general, as McEldowney states because of "the less diversified use of this zone, and the implications of overnight visits rather than extended stays, make the overall potential for sites in this zone even lower" (i.e., compared to Zone III) (*Ibid.*).

Zone III (Lower Forest) is defined as ranging from 1,500 to 2,500 feet in elevation. McEldowney suggests that it is within this zone that the upper limits of the pre-historic farming took place. However, the main usage was probably still resource procurement of naturally occurring forest products. The farming or "supplemental food sources" would have included, "banana, wet and dry-land taro, ti, and yams (*Dioscorea* sp.) which were planted along streams and trails and in small patches of cleared forest" (*Op. cit.*:26). The forest products would have included a variety of timber, including Koa for canoes, bird feathers, dye and medicinal plants, mamaki which was used for a variety of bark cloth or kapa, *'ie'ie* for basketry, *olonā* for cordage and a source of famine type foods, such as *hapu'u*. Habitation was still dominantly temporary though recurrent use is indicated by forest cultivation and the probably tending of specific forest products such as *olonā* (*Ibid.*).

Zone II (Upland Agricultural) is defined as ranging from 50 to 1,500 feet in elevation. The zone was described by "early visitors to Hilo Bay" as "an open park land gently sloping to the base of the woods." ... "an expanse broken by widely spaced cottages" or huts, neatly tended gardens, and small clusters of trees" (*Op. cit.*: 19).

The present study area is situated within this upland agricultural zone. Though described as a vast "expanse" it would appear that only the more agriculturally productive areas were intensively farmed. In the 1820s it was "estimated that 1/20 of the expanse (i.e., zone of cultivation) in N. and S. Hilo was planted in crops" (Goodrich 1826:4 in McEldowney 1979:21). The reasons for what appeared to the early visitors as a "lack of more extensive planting " (*Ibid.*) include, the need for fallow periods especially in soils where nutrients are rapidly leached out, but more important to intensive agricultural use in the Hilo area is soil type or lack there of. Intensive agricultural in Zone II was focused on area with a soil mantle leaving younger exposed lava areas for plants not needing continuous care (e.g., grasses, ferns).

Habitation within the upland agricultural zone (i.e., Zone II) apparently including some permanent occupation sites but was still dominantly temporary. The description of habitations refer to "scattered huts" with adjacent "garden plots" or "cottages" with "neatly tended gardens " (*Op. cit.*: 18-19) but no descriptions of village complexes like those along the coast.

Zone 1 (Coastal Settlement) is defined as " from sea level to roughly 20 to 50 ft. elevation or 1/2 mile inland" (*Op. cit.*: 15). This zone contained the majority of the population in village settings. The Hilo Bay area, of which Waiākea ahupua'a encompasses the southern half, was described "as a nearly continuous complex of native huts and garden plots interspersed with shady groves of trees, predominately breadfruit (*Artocarpus altilis*) and coconut (*Cocos nucifera*)." (*Op cit.:16*). Additional sites mentioned included, "canoe sheds, several heiau, and large complexes catering to chiefs and their retainers" (*Ibid.*). Thus the coastal zone included virtually all of the permanent habitation sites and was the focal point of resource utilization procured elsewhere within the ahupua'a.

Based on the above zonal characterization of Waiākea the tradition or pre-contact (i.e., pre-A.D. 1776) settlement pattern included, a heavily populated coastal zone, an upland agricultural zone with forest zones beyond. The coastal zone included the village clusterings of the permanent habitations with direct access to rich and varied marine resources including fishponds, and probably the majority of agricultural production as well.

The upland agricultural zone was probably expanded into as the prime lands within the coastal zone were intensively utilized. Over time the upland agricultural zone was converted from forest to an "open park land" where plantings occurred on soil mantled lava flows. Habitation for most part was probably temporary with a few scattered permanent occupation complexes.

Beyond the upland agricultural zone was the forest which ranged from rain forest to sub-alpine forest. In Waiākea these forest zones were quite large which allowed for extensive gathering of forest products. The products in part included, timber, especially Koa for canoes, birds, for consumption (nene, 'ua'u) and feathers, medicinal and dye plants, and famine type foods.

Late Prehistoric Early Historic ca. 1790-1840

The rich and varied resources that Waiākea offered made it one of the most important locales on Hawaii Island. Traditional accounts concerning Waiākea include references to it being the seat of chiefly residences as early as ca. A.D. 1550 (Kelly, Nakamura, Barrère 1981). Chiefly associations with Waiākea continued through traditional times and into the historic era. Kamehameha retained Waiākea after he had conquered all of the islands (ca. 1800), and upon " his death his personally held Hilo lands, including Pi'i-honua, Punahoa, and Waiākea, descended to Liholiho, his son and heir to the kingdom,"..additionally " Kamehameha had given the ili kupono of Pi'opi'o to his favorite wife Ka'ahumanu" (*Op. cit.*: 11). The 'ili of Pi'opi'o is in Waiākea and is situated between Hilo Bay and Wailoa River and its associated fishponds.

Land use during the early historic period was still essentially subsistence based though aspects of major changes were occurring. The sandalwood trade, establishment of the American Board of Commissioners for Foreign Missions (ABCFM) station in Hilo, and the arrival of whalers began the shift away from subsistence to a market based economy. Settlement was still focussed on the coastal zone as was most of the agricultural production of both indigenous food crops and newly introduced plants.

During this early historic period the Forest and Sub-Alpine Zones land use was changing also. Besides the more traditional procurement of timber products and even bird feathers for taxes (McEldowney 1979:35). Cattle, goats, and sheep were being hunted in the upper zones. These animals were introduced in the 1790s and after an imposed 10 year prohibition on their killing had spread over large portions of the interior of Hawaii Island, especially the Waimea area. However, "by the 1830s substantial amounts of hides, jerked meat, and tallow were exported from Hilo" (*Op. cit.*:36).

Mid 1800s

Traditional land tenure changed during this time span to the privatization of land ownership. Generally referred to as the "Great Mahele" privatization actually included a number of government acts from the late 1840s to the mid 1850s. The Kamehameha dynasty's control over the valuable Waiākea *ahupua'a* was evidenced in that virtually the entire *ahupua'a* became Crown Lands with the *'ili* of Pi'opi'o awarded to Victoria Kamamalu (LCA 7713:16), a granddaughter of Kamehameha I and heir to Ka'ahumanu as well.

Twenty-six (26) Land Commission Awards (LCAs) were granted within Waiākea. None of these LCAs are within the present study area. The LCAs were all within the coastal zone, except for two (2663 and 2402) which were in the lower portion (i.e., ca. 100 ft. a.m.s.l.) of the upland agricultural zone. The LCAs or *kuleana*(s) were for the most part focused around the edges of the large fishponds of Waiākea. Land use information of the *kuleana* generally refer to cultivated fields with house lots indicating habitation and agricultural production within the same zone, unlike leeward Hawaii Island where in many cases *kuleana* included coastal house lots with the need of corresponding upland agricultural lots, because of elevation dependent rainfall.

Interior land use during this period was progressing toward more organized ranching, especially cattle ranching. Timber for firewood and housing was also still being exploited, as Hilo was being transformed into an entirely wooden-framed "New Bedford type Whaling Town" (*Op. cit.*:37).

Though the coastal zone still contained the vast majority of the population houses and stores were concentrated in the northern half of the bay, away from Waiākea, because the main pier for Hilo was at the mouth of Wailuku River. This indicates a substantial change from the traditional settlement pattern of a "nearly continuous complex of native huts" along the bay's shoreline.

Late 1800s

During this period commercial sugar cane became the economic mainstay of the Hilo area with Waiākea Mill Company becoming one of the largest. Plantation operations generally developed ca. 1860s and for Waiākea this was on leased Crown lands. Waiākea Mill Company was in operation by the late 1870s and through its agents, Theo H. Davies and Alexander Young, had procured the lease of all of Waiākea by 1888 (Kelly, Nakamura, Barrère 1981:89). The mill was located at the head (*mauka* end) of Waiākea Fishpond and sugar was transported by barge through the pond and down Wailoa River to Hilo Bay.

Immigrant labor (Chinese, Japanese, Portuguese) were living in "camps" set up by the plantation for its workers. Waiākea Mill Co. would eventually have some 10 camps situated along major rail lines of the plantation.

Land use was dominated by commercial cane activities within Zones I to III (Coast to Lower Rain Forest). Ranching became formalized though not specific to Waiākea. "Other examples of business, not directly related to sugar cultivation, were the continued use of the Waiākea fishponds, an active Chinese fish market, small pastures above Hilo supporting dairy cattle, and scattered vegetable gardens" (McEldowney 1979:39).

Early 1900s

Sugar and its associated industries continued to expand during this period. The Hawaii Consolidated Railway was built eventually extending "from Waiākea Mill and wharf through Puna, most of Ōla'a and along the N and S Hilo coast" (*Op. cit.*:41). Many of the immigrant laborers from the late 1800s moved off the plantation, being replaced by new Filipino laborers. Hilo continued to grow and become the second largest urban center in the new Territory of Hawaii.

Ranching in the Hilo areas, but not specifically in Waiākea, came under the control of two large enterprises; the Parker and Shipman Ranches. In Waiākea a large portion of Zone II (Upland Agricultural Zone) too rocky for sugar cane cultivation became available for lease as Waiākea pasture lands. The present study area is mostly former Waiākea pasture land. The specific use of the pasture land is not known but McEldowney indicates that "A substantial amount of grazing land adjacent to Hilo or to sugarcane fields supported dairy cows for Hilo's several dairies" (*Ibid.*).

In 1918 the 30-year lease of the Waiākea Mill Co. expired and because Hawaii had become a Territory the "land fell under homesteading laws that required the government to put some of it up for lease to homesteaders who would be willing to grow sugar cane on it. Waiākea Mill was to grind the crop for them. A total of about 700 acres of land was divided into cane lots (between 10 and 76 acres each) and house lots ranging from 1 to 3 acres..." (Kelly, Nakamura, Barrère 1981:121). The homestead and cane lots eventually reverted to the overall mechanized cultivation of the mill company as the homestead and cane lots "experiment was declared a failure" (*Op. cit.*:121).

By the 1920s the Waiākea Mill Co. had some 7,000 acres in cane production. Also, in the 1920s large tracts of remaining forest in Waiākea were "designated as forest reserve" (McEldowney 1979:42). The main reason appears to have been for maintaining the "forest as a 'watershed' to capture, retain, and support the continuous flow of water necessary to the sugar industry" (*Ibid.*). Clearly, sugar was the dominate economic factor during this period including the formation of settlements (i.e. camps).

Mid 1900s till present

Plantation life dominated the early portion of this time span but in 1948 Waiākea Mill Co. was liquidated (Condé and Best 1973:119). However, a major industry associated with cane by-products, canec, was begun in 1928. The canec plant was located adjacent to Waiākea Mill with bagasse, the cane by-product utilized, pumped through pipes from the mill to the plant. The canec plant shut down operations in 1966.

During this period major construction jobs started in the 1920s were completed. These major construction jobs, in part, included Hilo Bay, wharfs and breakwater and bridges. Some of these projects were actually major reconstruction work from damage during the winter of 1923, which included storm surf in January and a tidal wave in February (Kelly, Nakamura and Barrère 1981:171). During the World War II period in

Hilo, expansion and designation of Hilo airport as General Lyman Field and the construction of the Saddle Road were major projects undertaken as part of the military presence on the island, which was very substantial.

Prior to the closing of the Waiākea Mill Co. there were at least 10 "camps" or plantation villages. Only Camp 1 was within the coastal zone with Camps 2 to 10 within the upland agricultural zone with Camp 10 the highest at ca. 1300 ft. a.m.s.l. The present study area included active mechanized cane cultivation probably right up until closing (1948), and leased pasture lands. The lease of the Waiākea pasture lands during this period was to a Mr. Kazuo Miyasaki (G.L. #2751 exp. 6/17/60). Specific use of the pasture is not known, but as mentioned previously, dairy cattle pasturage is a distinct possibility.

After statehood (1959) and with the closing of the mill and canec plant, tourism was looked at as the next economic mainstay. In Waiākea, C. Brewer & Co. built a hotel complex at the site of the old canec plant. Other hotels were built along the Hilo Bay frontage of Waiākea near Coconut Island or Mokuola. Large tracts of former Waiākea Homestead and Cane lots were converted to housing or sub-division tracts adjacent to the study area. U.H. Hilo campus was expanded as it continues to do presently. The study area itself ceased to be utilized for pasturage (ca 1960s?) and other buildings recently constructed there are: the School of Agriculture building, the Joint Astronomy building, CalTech Building; Subaru Building.

Summary

In summary, the traditional settlement pattern included, almost exclusively, permanent coastal habitation with associated intensive agriculture. Immediately up slope of the coastal zone was an area cleared for extensions of agricultural production though not as intensively utilized as in the coastal zone. Beyond or *mauka* of the cleared upland agricultural zone was forest which ranged from dense rain forest to sub-alpine forest at the upper limit of Waiākea (ca. 6,000 feet). Habitation for the zones beyond the coastal zone was essentially temporary in nature, associated with exploitation of forest products. This pattern changed over time as the historically introduced religion(s), economy, and socio-political system replaced the traditional Hawaiian system. The major impetus for change was the development of commercial sugar cane within Waiākea. Settlement patterns during the period from the mid 1800s to the mid 1900s were almost exclusively set by the Waiākea Mill Co. Camps for immigrant laborers were constructed at specific locations based on the plantation organization. Most of these permanent housing locations were in areas previously associated with sparsely scattered temporary habitations in the upland agricultural zone of Waiākea. Because most of the study area was too rocky (i.e. exposed pahoehoe) for commercial cane, associated camps were not present. It appears that historically, most of the area within which the project area lies was utilized as pasture land.

Hilo eventually became the second largest urban center in the State of Hawaii. Permanent housing is no longer dependent on a specific set of environmental conditions as it was during traditional Hawaiian times. The large acreage involved in subsistence agriculture and utilization of resources specific to certain elevations is no longer a necessity because of the market-based economy of today.

PREVIOUS ARCHAEOLOGICAL RESEARCH

There have been a number of archaeological and historic studies that are pertinent to the *ahupua'a* of Waiākea within which the study area lies. Notable among these somewhat regional studies are, Alfred E. Hudson's 1930s East Hawaii Site Survey, Holly

McEldowney's "Archaeological and Historical Literature Search and Research Design, Lava Flow Control History," and "Hilo Bay: A Chronological History" (Marion Kelly, Barry Nakamura and Dorothy B. Barrère 1981). Review of these documents, and others, indicate that no previously documented sites with state site numbers were located within the present study area. These regionally oriented studies, however, were the basis for describing the settlement pattern specific to Waiākea *ahupua'a*. The discussion of settlement patterns is contained within Cultural History section of this report.

Additionally, a "Summary of Prior Archaeological Work" compiled by Ms. Jadelyn J. Moniz (1992) for Waiākea list ten studies ranging from field inspections to inventory surveys. The studies include research from 1979 to 1992. The description of each of the ten previous studies includes a basic review of findings and relating "adequacy" for the individual reports in terms of inventory level survey," based on Title 13, Subtitle 6, Chapter 147: Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports" (Moniz 1992).

There have been no previous inventory-level archaeological surveys specific to the current study area. However, an archaeological inventory survey and testing for proposed western expansion of the UH Hilo campus (Borthwick *et al.*, 1993), and an inventory survey for a proposed Pu'ainako Street extension project (Hunt and McDermott, 1993) indicate the presence of archaeological sites within approximately one mile *makai* of the present study area.

Hunt and McDermott (1993) identified 11 sites, comprising 88 individual features, within or adjacent to alternative alignments for the proposed Pu'ainako Street extension. The Pu'ainako Street extension survey included areas immediately on the northern side of the channelized drainage with the project area on the southern side. Thus, the survey covered lands some 50-100 feet away, as well as bisecting the proposed waterline easement. Hunt and McDermott located no sites in the vicinity, or on the type of terrain of the present project area. All the sites they located lacked construction stability (a characteristic of prehistoric Hawaiian sites), and test excavations yielded numerous historic period artifacts. This field evidence, along with historic research, indicated the historic origin of the sites consistent with late nineteenth and early twentieth century commercial sugar cane cultivation in the area.

Borthwick *et al.* (1993) surveyed and tested the land area mauka of the UH Hilo campus, and located definitive evidence of sugar cane cultivation as recently as the 1940s. The south end of the study area contained a field bounded by a continuous rock wall within which was tillable land with furrows still visible. Rock mounds within the field system were tested by excavation, and contained no prehistoric cultural material. The mounds were built upon field sediments or upon shallow bedrock up-croppings, indicating that they were contemporaneous with sugar cane cultivation in the area, and probably were field clearing mounds. Two additional small sites located on the northern fringe of the tilled land were found to contain no stratified deposits or prehistoric cultural materials. Mid-twentieth century bottles were located on the surface within the sites, and the sites were interpreted as lunch stations - temporary or single use sites - of field workers. Portions of the study area which were comprised of pahoehoe lava flow, with no tillable soil, were found to contain no cultural resources related to archaeology.

ANTICIPATED FINDINGS

A low likelihood of locating cultural resources within the present study was anticipated based on previous research and archaeology in the area. The study area falls within McEldowney's (1979) Upland Agricultural range (ie. Zone II), where only soil mantled areas would have been extensively farmed and associated habitation primarily temporary in nature, leaving areas of exposed lava flow (as in the present project area) largely uncultivated and uninhabited. This is consistent with the findings of the previously cited archaeological studies *makai* of the project area (Borthwick *et al.*, 1993 and Hunt and McDermott, 1993), which, though finding evidence of historic agricultural activities within areas containing adequate soil, found no archaeologically relevant materials or sites, prehistoric or historic, on areas of exposed pahoehoe lava flow.

SURVEY RESULTS

Methodology

The study area was surveyed by two Cultural Surveys Hawaii archaeologists, Douglas Borthwick and John Winieski, who traversed the property on foot. The dense vegetation was a seriously inhibiting factor in visibility within the reservoir lot, horizontally as well as of the actual ground surface. The most difficult vegetation to survey through was *uluhe* or false staghorn fern which dominates the reservoir lot. Range of the *uluhe* conforms closely with the pahoehoe lava. Visibility was somewhat improved within the scattered and dense stands of strawberry guava (*Psidium cattleianum*) which cover portions of the lot. The trees grow on the average less than 12 inches apart making passage extremely difficult, but are only one to 4 or 5 centimeters thick and visibility is surprisingly good. One can see a minimum of 20 to 30 feet horizontally and the ground underfoot is clear except for leaf litter and sphagnum moss on the unweathered pahoehoe lava of low undulating topography. Visibility was somewhat improved on the previously bulldozed grub line, which though overgrown with various tall grasses, was largely absent of *uluhe* fern.

Traverses throughout the study area were done by two individuals who first went north-east from the south end of Puloku Street along the proposed 40' wide waterline alignment down to the existing waterline which is located beneath existing powerline poles. They then walked back up the grub line (south-west), along the proposed waterline alignment, to the proposed reservoir lot. Using the drainage channel which runs the length of the northern border of the reservoir lot as access, incursions were made into the thick and sometimes impenetrable vegetation wherever possible. Access was adequate in several spots so that full penetration into the lot was possible. The result was that several traverses, both east-west and north-south, were accomplished, covering the full extent of the lot, and including the survey staked reservoir site itself. The individuals, upon exiting on the western border of the lot, were able to additionally survey the entire extent of the existing grub line which borders this western side.

Results

The archaeological survey located no archeological sites or cultural materials, in the study area. Evidence of recent grubbing of the waterline easement portion of the project area was provided by numerous bulldozer pushed piles of pahoehoe boulders located on the edge of the entire length of the easement. Additional piles of boulders within the reservoir lot indicated that some bulldozing may have occurred there as well. The whole project area was, as expected, found to be on undulating pahoehoe lava flow, with little soil, and with vegetation (predominantly *uluhe*) consistent with this type of terrain.

SUMMARY AND SIGNIFICANCE

An archaeological inventory survey of forested land in Waiākea *ahupua'a*, in Hilo Town, on the island of Hawai'i, was conducted by Cultural Surveys Hawaii. The project area is located at the end of Puloku Street adjacent to the new Sunrise Estates sub-division. It is the proposed site of a UH Hilo University Park reservoir and waterline easement.

The site is located on undulating pahoehoe lava flow terrain, and falls within a settlement zone characterized by McEldowney (1979) as the Upland Agricultural (ie. Zone

II). The prevalence of pahoehoe lava in the study area, and the results of two archaeological surveys in similar terrain (one of which (Hunt and McDermott, 1993) surveyed lands adjacent to the north of the reservoir site, and bisected the proposed waterline easement), led to the expectation that few, if any, archaeological sites would be present in the project area.

In the survey of the project area, which involved complete coverage of the proposed waterline easement, and transverses of the proposed reservoir lot, no archaeological sites were discovered. Bulldozed piles of pahoehoe boulders evidenced previous grubbing along the waterline easement, as well a some bulldozing within the reservoir lot.

The absence of any archaeological sites thus allows for placement of the proposed reservoir anywhere within the reservoir parcel, without archaeological impact. However, *if in the unlikely* event that archaeological features are encountered during reservoir construction, the appropriate state and county agencies should be notified in order to determine an appropriate course of action for mitigation.

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PHOTO APPENDIX

Figure 5 Photograph Showing East View of Access to Project Area from Puloku Street

Figure 6 Photograph Showing South-West View of Bulldozed Grubline Proposed for Waterline Easement

Figure 7 Photograph Showing Existing Waterline at North-East End of Bulldozed Grubline

Figure 8 Photograph Showing South View of Typical Vegetation within Reservoir Parcel

Archaeological Survey and Testing of Lands Proposed for Research and Technology Lots at the University of Hawaii at Hilo (TMK 2-4-01:7 and 41)

by

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for

Engineering Concepts

by

Cultural Surveys Hawaii
April 1993
Revised November 1993

ABSTRACT

During the weeks beginning December 14, 1992 and January 5, 1993 Cultural Surveys Hawaii conducted an archaeological inventory survey of approximately 163 acres of forested land in Waiākea *ahupua'a*, South Hilo district on the island of Hawai'i. The parcel under study is owned by the University of Hawaii at Hilo. Portions of this parcel are slated for the development of three research and technology lots. Construction of water, sewer, drainage, and electrical systems to service the three lots are proposed. The purpose of the study was to locate, and describe any and all archaeological resources within the survey area.

Two recent structures - the School of Agriculture Building at the southwest corner of the study area, and the Joint Astronomy Building in the central, *mauka* portion - are extant within the study area as well as portions of the access road system. Large swaths have also been bulldozed across the study area in a northwest-southeast orientation for an old water main, and in a generally east-west direction for an electric power line.

Archeological sites were located in the southern portion of the study area. Four sites were described and mapped to scale. Two of the sites - 18668, and 18669 - and a mound-feature within a third site - 18667 - were tested by hand excavations to document stratigraphy in the sites and to search for cultural remains to help in dating the sites.

The larger of the sites are two (2) expansive historic, agricultural fields (sites -18667 and -18670). Field-rock clearing mounds are dispersed throughout both fields. The two other sites identified - 18668 and 18669 - were tested by excavation and were found to have no subsurface cultural deposits.

Based on the type and age of the sites found, and the data collected and analyzed, no further archaeological research specific to the sites within the study area is recommended.

Supplemental Inventory Survey

Cultural Surveys Hawaii was requested to conduct an inventory level archaeological survey of an approximately 11-acre parcel adjacent to the 163-acre study area reported on in this report. The parcel is at the *makai* (east) side of the proposed U.H. Hilo Research and Technology Park and includes a section of the Waiakea Flood Control Channel. The survey was done as proposed infrastructure-related construction, associated with the development of the Research and Technology Park, is planned to traverse through this adjoining area.

During the supplemental survey, four (4) plantation-era (ca. 1870s-1940s) rock clearance features (mounds) and a wall were observed and recorded. These features were associated with commercial sugar cane cultivation within the former Waiakea Cane Lots. The four mounds and wall are included under State Historic Site # 50-10-35-18670 which was designated during the original survey.

Subsurface testing was conducted at two mounds within Site -18670 to address functional, chronological, and sampling concerns. Testing confirmed plantation-era style of construction. A supplemental report for the newly surveyed area - which details the survey and testing results is included here as an attachment.

ACKNOWLEDGEMENTS

Field work for this project was carried out by Cultural Surveys Hawaii crew members Bryce Myers, Tyler Campbell, John Winieski, Tim Barr, Paul Kim and the authors. Each of us learned something new about ourselves from the *uluhe*.

Site descriptions for the report were compiled by Tim Barr. Drafting of field maps was done by Paul Kim and Joy Collins. Dr. Vickie Creed contributed her indefatigable energies and her typing and computer skills to the production of this report.

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INTRODUCTION

For a period of seven days during the weeks beginning December 14, 1992 and January 5, 1993 Cultural Surveys Hawaii conducted an archaeological inventory survey of approximately 163 acres of forested land in Waiākea *ahupua'a*, South Hilo district on the island of Hawai'i (Figure 1-3). The parcel under study is located north of Waiākea Stream, *mauka* of the University of Hawaii at Hilo campus - a portion of which will be developed into 3 research and technology lots. The bed of Waiākea Stream has been rerouted recently, by mechanized equipment, probably under the name of flood control. The old stream bed is the actual south boundary of the study area, with the new stream bed farther south.

Two structures - the School of Agriculture building at the southwest corner of the study area, and the Joint Astronomy building in the central, *mauka* portion - are extant within the study area as well as portions of the access road system (Figure 4). Two sections of the new access road alignments are completed and in use, while other areas have been bulldozed although they are currently overgrown with vegetation. Large swaths have also been bulldozed around the Joint Astronomy building, across the study area in a northwest-southeast orientation for an old water main, and in a generally east-west direction for an electric power line.

Study Area Description

The study area comprises approximately 163 acres in the *ahupua'a* of Waiākea. The lands are located within the district of South Hilo on the windward coast of Hawai'i Island. The study area, located in Hilo Town on the campus of the University of Hawai'i at Hilo, is bound by Komohana Street to the west, Waiākea Stream flood control channel

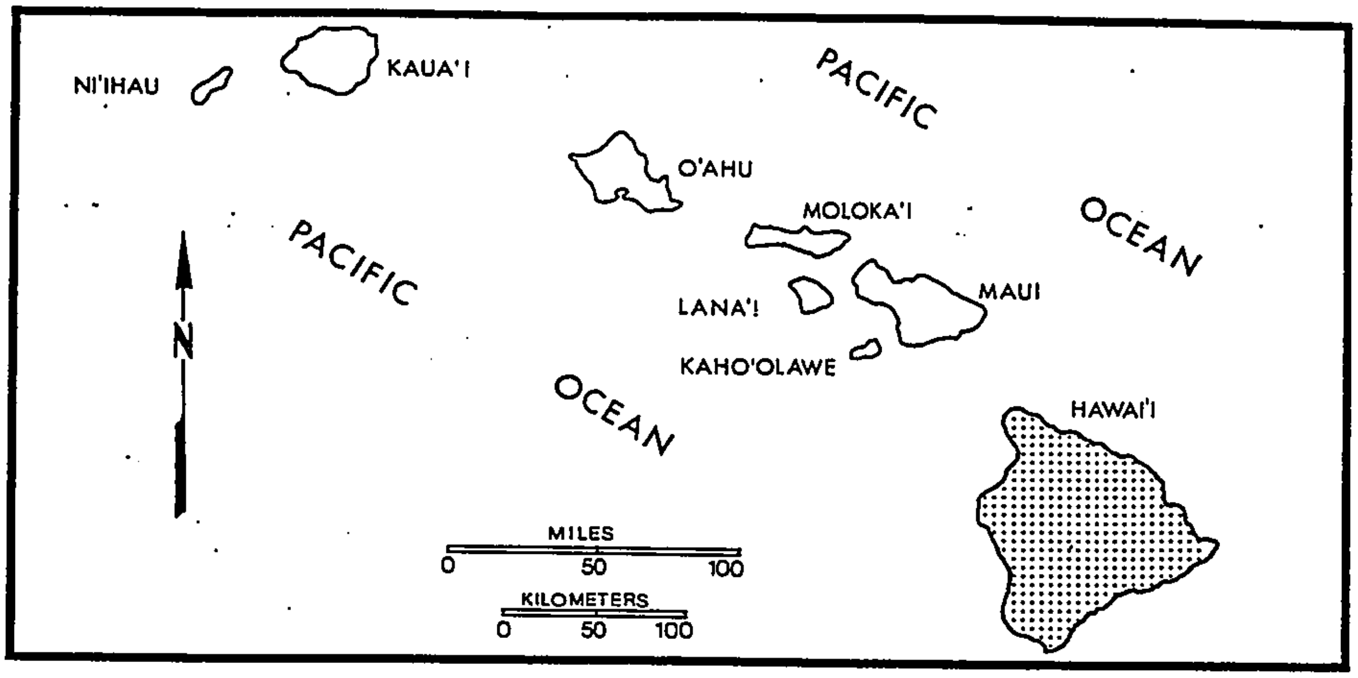


FIGURE 1
State of Hawai'i

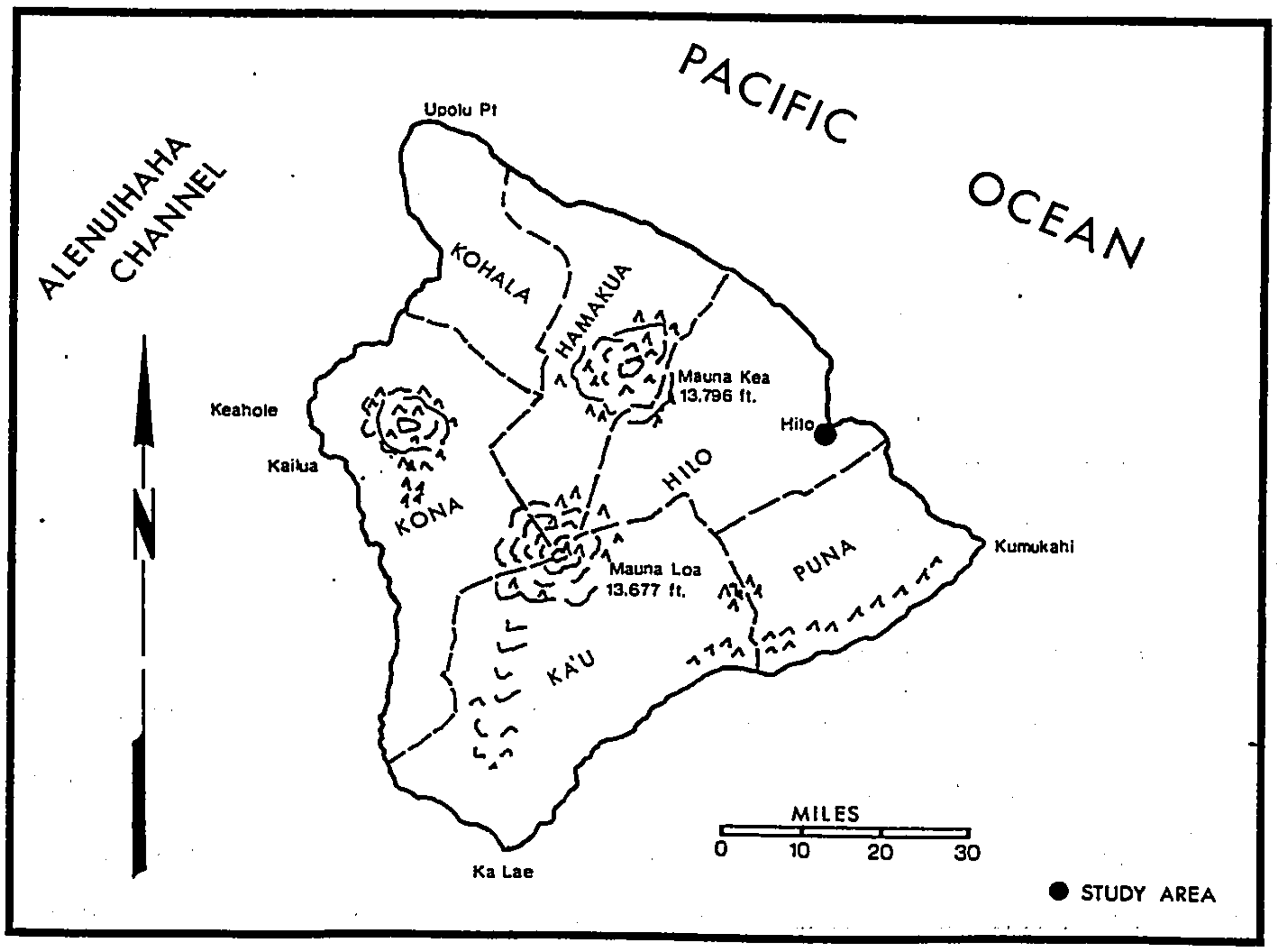


FIGURE 2
General Location Map, Hawai'i Island

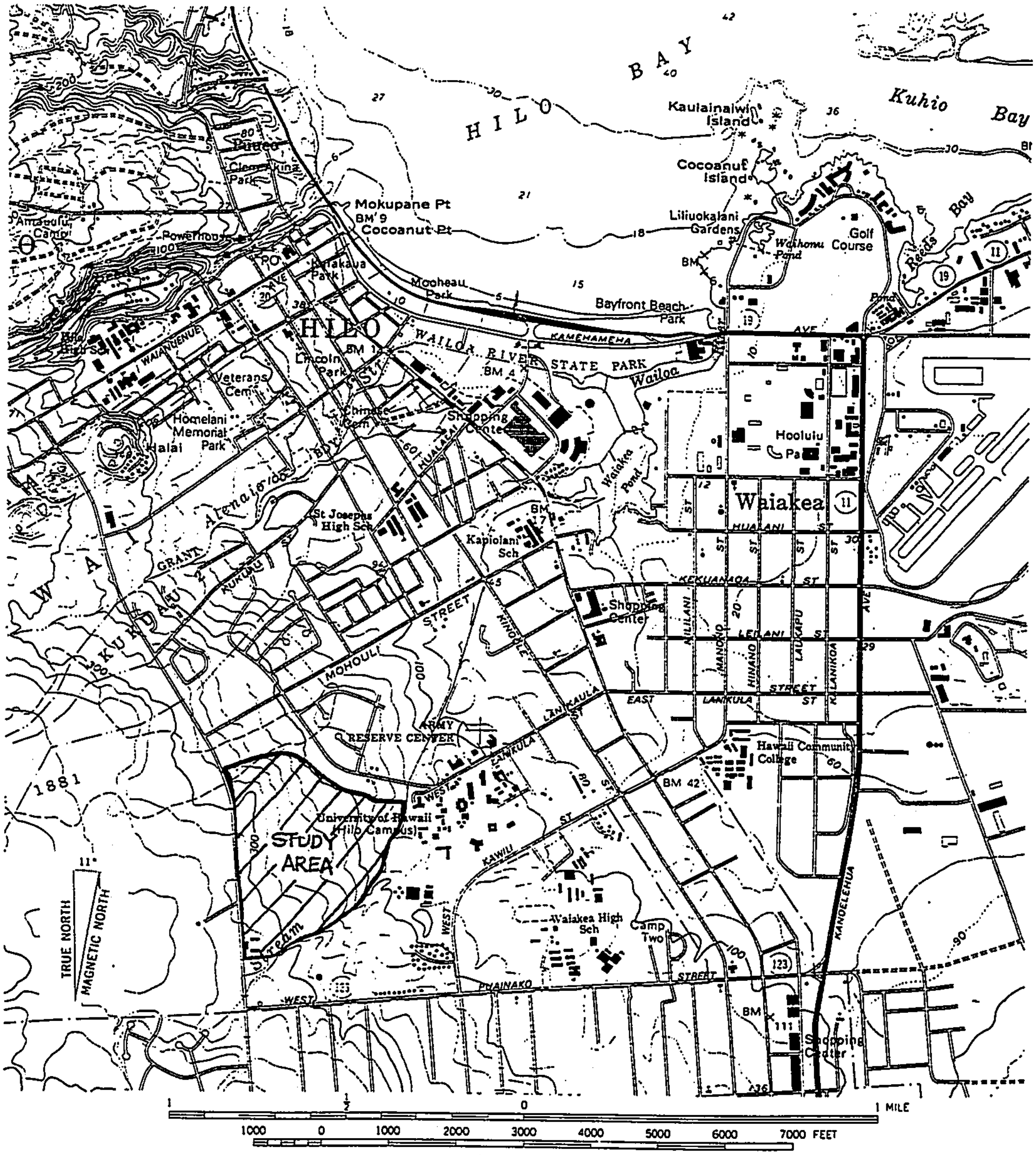


Figure 3 Portion of USGS Topographical Map, 7.5 Minute Series, Hilo Quadrangle, Showing Study Area

to the east, the old Waiākea Stream bed to the south, and a man-made drainage ditch to the north. Elevations within the study area range from roughly 140 ft. a.m.s.l. to 330 ft. a.m.s.l. on the lower east slope of Mauna Loa Volcano.

Several historic flows from Mauna Loa Volcano have affected the terrain along its eastern slope. An 1881 flow affected much of the Waiākea *Ahupua'a*, flowing into Hilo to within a mile of Hilo Bay. A part of the east end of this 1881 flow is present along the north side of the study area.

Rainfall in Waiākea *Ahupua'a* below the 5,000 ft. elevation averages 150 to 200 inches per year (Kelly et al. 1981); *makai* lands above the 5,000 ft. elevation receive an average of 30 inches of rain per year (McEldowney 1979). Waiākea Stream represents the only fresh water source within the study area.

The terrain is comprised predominately of lava flows thickly covered by vegetation. The *Soil Survey of the Island of Hawaii* (Sato *et al.*, 1973) classifies the study area lands in three basic types as follows: 1) Pana'ewa very rocky, silty clay loam, 2) Keaukaha extremely rocky muck, and 3) pahoehoe lava flow. Although lava flows predominate in the study area, vegetation is dense due to the vast amounts of rain on the windward side of Hawaii Island.

The Pana'ewa very rocky, silty clay loam occurs along the southeast side of the study area. The vegetation in this area is characterized predominately by large guava trees (*Psidium cattleianum*) with little or no understory.

The Keaukaha extremely rocky muck which covers the largest portion of the study area, occurs in the central and north sections of the study area. The vegetation is characterized by guava thicket (*Psidium cattleianum*).

The pahoehoe lava flow occurs within the western half of the study area. The vegetation is characterized by *uluhe* fern.

Development within the study area includes the aforementioned buildings; (Agriculture and Astronomy) associated parking lots, paved roads, and bulldozed swaths. In addition, a path for a water line has been cleared by bulldozing. These recent alterations to the landscape are a marked difference to the "jungle" of the rest of the study area. The speed of re-vegetation is quite evident where the bulldozed areas are in some cases barely discernible from the surrounding "jungle."

CULTURAL HISTORY

The *ahupua'a* of Waiākea, South Hilo, is large, encompassing some 95,000 acres. It extends from the coast to approximately the 6,000 feet elevation on the windward slope of Mauna Loa (Figure 4). In 1979 Holly McEldowney prepared an "Archaeological and Historical Literature Search and Research Design," as part of a "Lava Flow Control Study" (McEldowney 1979). In her report McEldowney describes five zones of land use and associated resources. The five zones, which are applicable to Waiākea, include: I. Coastal settlement; II. Upland Agricultural; III. Lower Forest; IV. Rain forest; and V. Sub-Alpine or Montaine (*Ibid.*). The zones are described below from *mauka* (Zone V) to *makai* (Zone I) or in order of ascending importance in terms of settlement patterns.

Zone V (Sub-alpine), which is defined as being above the 5,500 ft. elevation, was probably of only marginal importance in terms of land utilization during prehistoric (pre-A.D. 1776) times. As McEldowney indicates "Use of major trails, although important to settlement and land use in all zones, probably dominated the utilization of this zone" (*Op. cit*:30). Resources probably procured from this zone include birds like *nene* (geese) and *'ua'u* (petrel) for food, timber products, and possibly lithic materials. Though Waiākea extends into this sub-alpine zone it is not one of the major *ahupua'a* associated with this zone or the saddle region like Humu'ula which "cuts off" Waiākea at roughly the 6,000 foot elevation.

Zone IV (Rain Forest) is defined as ranging from 2,500 to 5,500 feet in elevation. Resources of bird feathers, medicinal plants, and possibly some timber products would have been procured from this zone with bird feathers probably of greatest importance. Habitation within this zone was probably exclusively temporary though possibly lava

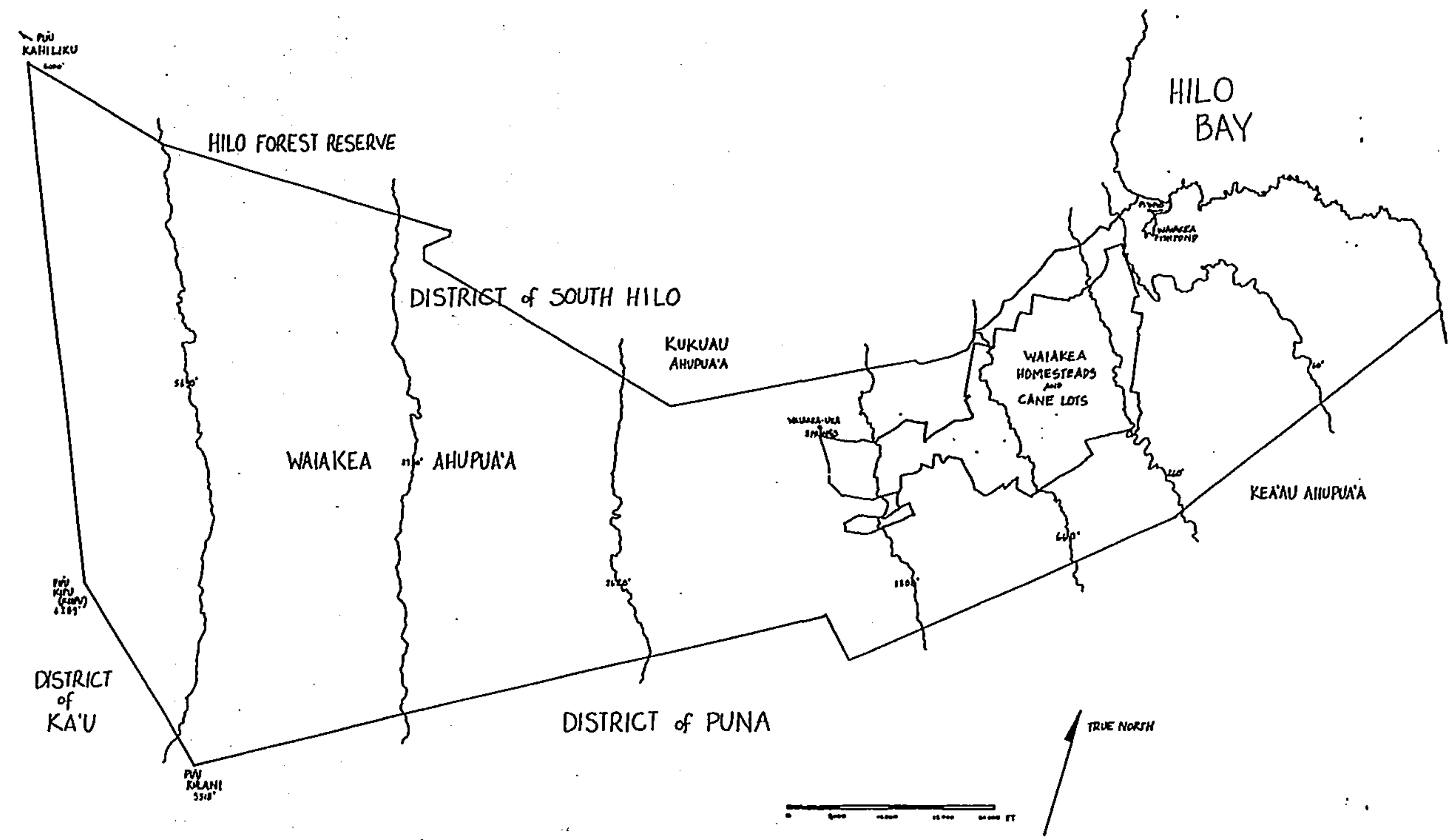


Figure 4 *Ahupua'a* of Waiakea (after USGS Topographic Map)

tubes or other site areas were utilized recurrently. In general, as McEldowney states because of "the less diversified use of this zone, and the implications of overnight visits rather than extended stays, make the overall potential for sites in this zone even lower" (i.e., compared to Zone III) (*Ibid.*).

Zone III (Lower Forest) is defined as ranging from 1,500 to 2,500 feet in elevation. McEldowney suggests that it is within this zone that the upper limits of the pre-historic farming took place. However, the main usage was probably still resource procurement of naturally occurring forest products. The farming or "supplemental food sources" would have included, "banana, wet and dry-land taro, ti, and yams (*Dioscorea* sp.) which were planted along streams and trails and in small patches of cleared forest" (*Op. cit.*:26). The forest products would have included a variety of timber, including Koa for canoes, bird feathers, dye and medicinal plants, mamaki which was used for a variety of bark cloth or kapa, *'ie'ie* for basketry, *olonā* for cordage and a source of famine type foods, such as *hapu'u*. Habitation was still dominantly temporary though recurrent use is indicated by forest cultivation and the probably tending of specific forest products such as *olonā* (*Ibid.*).

Zone II (Upland Agricultural) is defined as ranging from 50 to 1,500 feet in elevation. The zone was described by "early visitors to Hilo Bay" as "an open parkland gently sloping to the base of the woods." ... "an expanse broken by widely spaced cottages" or huts, neatly tended gardens, and small clusters of trees" (*Op. cit.:* 19).

The present study area is situated within this upland agricultural zone. Though described as a vast "expanse" it would appear that only the more agriculturally productive areas were intensively farmed. In the 1820s it was "estimated that 1/20 of the expanse (i.e., zone of cultivation) in N. and S. Hilo was planted in crops" (Goodrich 1826:4 IN McEldowney 1979:21). The reasons for what appeared to the early visitors as a "lack of more extensive planting " (*Ibid.*) include, the need for fallow periods especially in soils where nutrients are rapidly leached out, but more important to intensive agricultural use in the Hilo area is soil type or lack there of. Intensive agricultural in Zone II was focused on area with a soil mantle leaving younger exposed lava areas for plants not needing continuous care (e.g., grasses, ferns).

Habitation within the upland agricultural zone (i.e., Zone II) apparently including some permanent occupation sites but was still dominantly temporary. The description of habitations refer to "scattered huts" with adjacent "garden plots" or "cottages" with "neatly tended gardens " (*Op. cit.*: 18-19) but no descriptions of village complexes like those along the coast.

Zone 1 (Coastal Settlement) is defined as " from sea level to roughly 20 to 50 ft. elevation or 1/2 mile inland" (*Op. cit.*: 15). This zone contained the majority of the population in village settings. The Hilo Bay area, of which Waiākea ahupuaʻa encompasses the southern half, was described "as a nearly continuous complex of native huts and garden plots interspersed with shady groves of trees, predominately breadfruit (*Artocarpus altilis*) and coconut (*Cocos nucifera*)." (*Op cit.:16*). Additional sites mentioned included, "canoe sheds, several heiau, and large complexes catering to chiefs and their retainers" (*Ibid.*). Thus the coastal zone included virtually all of the permanent habitation sites and was the focal point of resource utilization procured elsewhere within the ahupuaʻa.

Based on the above zonal characterization of Waiākea the tradition or pre-contact (i.e., pre-A.D. 1776) settlement pattern included, a heavily populated coastal zone, an upland agricultural zone with forest zones beyond. The coastal zone included the village clusterings of the permanent habitations with direct access to rich and varied marine resources including fishponds, and probably the majority of agricultural production as well.

The upland agricultural zone was probably expanded into as the prime lands within the coastal zone were intensively utilized. Over time the upland agricultural zone was converted from forest to an "open parkland" where plantings occurred on soil mantled lava flows. Habitation for most part was probably temporary with a few scattered permanent occupation complexes.

Beyond the upland agricultural zone was the forest which ranged from rain forest to sub-alpine forest. In Waiākea these forest zones were quite large which allowed for extensive gathering of forest products. The products in part included, timber, especially Koa for canoes, birds, for consumption (nene, ʻuaʻu) and feathers, medicinal and dye plants, and famine type foods.

Late Prehistoric Early Historic ca. 1790-1840

The rich and varied resources that Waiākea offered made it one of the most important locales on Hawaii Island. Traditional accounts concerning Waiākea include references to it being the seat of chiefly residences as early as ca. A.D. 1550 (Kelly, Nakamura, Barrère 1981). Chiefly associations with Waiākea continued through traditional times and into the historic era. Kamehameha retained Waiākea after he had conquered all of the islands (ca. 1800), and upon " his death his personally held Hilo lands, including Piʻi-honua, Punahoa, and Waiākea, descended to Liholiho, his son and heir to the kingdom,"..additionally " Kamehameha had given the ili kupono of Piʻopiʻo to his favorite wife Kaʻahumanu" (*Op. cit.*: 11). The ʻili of Piʻopiʻo is in Waiākea and is situated between Hilo Bay and Wailoa River and its associated fishponds.

Land use during the early historic period was still essentially subsistence based though aspects of major changes were occurring. The sandalwood trade, establishment of the American Board of Commissioners for Foreign Missions (ABCFM) station in Hilo, and the arrival of whalers began the shift away from subsistence to a market based economy. Settlement was still focussed on the coastal zone as was most of the agricultural production of both indigenous food crops and newly introduced plants.

During this early historic period the Forest and Sub-Alpine Zones land use was changing also. Besides the more traditional procurement of timber products and even bird feathers for taxes (McEldowney 1979:35). Cattle, goats, and sheep were being hunted in the upper zones. These animals were introduced in the 1790s and after an imposed 10 year prohibition on their killing had spread over large portions of the interior of Hawaii Island, especially the Waimea area. However, "by the 1830s substantial amounts of hides, jerked meat, and tallow were exported from Hilo" (*Op. cit.*:36).

Mid 1800s

Traditional land tenure changed during this time span to the privatization of land ownership. Generally referred to as the "Great Mahele" privatization actually included a number of government acts from the late 1840s to the mid 1850s. The Kamehameha dynasty's control over the valuable Waiākea *ahupua'a* was evidenced in that virtually the entire *ahupua'a* became Crown Lands with the *'ili* of Pi'opi'o awarded to Victoria Kamamalu (LCA 7713:16), a granddaughter of Kamehameha I and heir to Ka'ahumanu as well.

Twenty-six (26) Land Commission Awards (LCAs) were granted within Waiākea (Figure 5). None of these LCAs are within the present study area. The LCAs were all

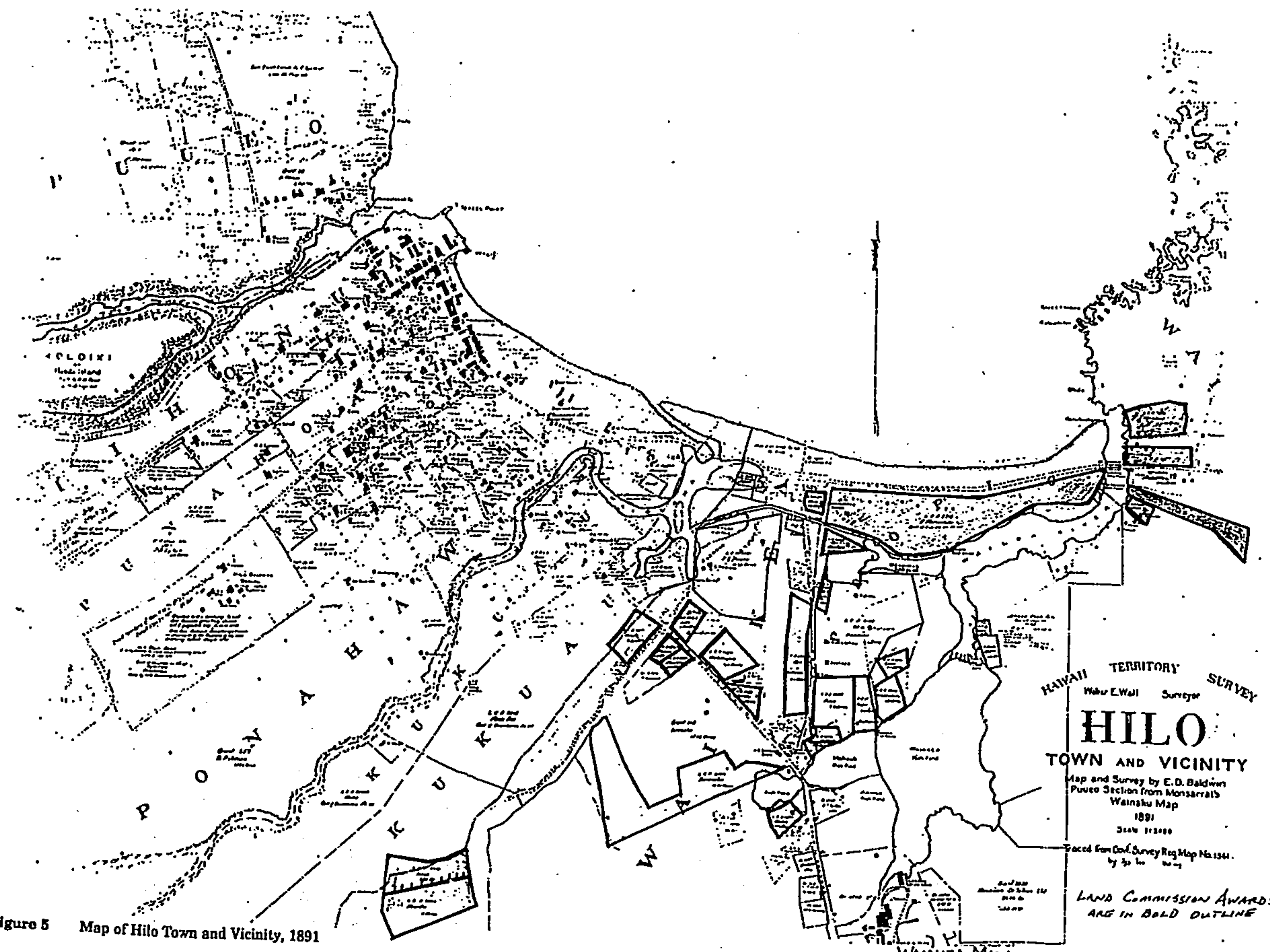


Figure 5 Map of Hilo Town and Vicinity, 1891

within the coastal zone, except for two (2663 and 2402) which were in the lower portion (i.e., ca. 100 ft. a.m.s.l.) of the upland agricultural zone. The LCAs or *kuleana*(s) were for the most part focussed around the edges of the large fishponds of Waiākea. Land use information of the *kuleana* generally refer to cultivated fields with house lots indicating habitation and agricultural production within the same zone, unlike leeward Hawaii Island where in many cases *kuleana* included coastal house lots with the need of corresponding upland agricultural lots, because of elevation dependent rainfall.

Interior land use during this period was progressing toward more organized ranching, especially cattle ranching. Timber for firewood and housing was also still being exploited, as Hilo was being transformed into an entirely wooden-framed "New Bedford type Whaling Town" (*Op. cit.*:37).

Though the coastal zone still contained the vast majority of the population houses and stores were concentrated in the northern half of the bay, away from Waiākea, because the main pier for Hilo was at the mouth of Wailuku River (See Figure 5). This indicates a substantial change from the traditional settlement pattern of a "nearly continuous complex of native huts" along the bay's shoreline.

Late 1800s

During this period commercial sugar cane became the economic mainstay of the Hilo area with Waiākea Mill Company becoming one of the largest. Plantation operations generally developed ca. 1860s and for Waiākea this was on leased Crown lands. Waiākea Mill Company was in operation by the late 1870s and through its agents, Theo H. Davies and Alexander Young, had procured the lease of all of Waiākea by 1888 (Kelly, Nakamura, Barrère 1981:89). The mill was located at the head (*mauka* end) of Waiākea

Fishpond and sugar was transported by barge through the pond and down Wailoa River to Hilo Bay.

Immigrant labor (Chinese, Japanese, Portuguese) were living in "camps" set up by the plantation for its workers. Waiākea Mill Co. would eventually have some 10 camps situated along major rail lines of the plantation (Figure 6).

Land use was dominated by commercial cane activities within Zones I to III (Coast to Lower Rain Forest). Ranching became formalized though not specific to Waiākea. "Other examples of business, not directly related to sugar cultivation, were the continued use of the Waiākea fishponds, an active Chinese fish market, small pastures above Hilo supporting dairy cattle, and scattered vegetable gardens" (McEldowney 1979:39).

Early 1900s

Sugar and its associated industries continued to expand during this period. The Hawaii Consolidated Railway was built eventually extending "from Waiākea Mill and wharf through Puna, most of Ōla'a and along the N and S Hilo coast" (*Op. cit.*:41). Many of the immigrant laborers from the late 1800s moved off the plantation, being replaced by new Filipino laborers. Hilo continued to grow and become the second largest urban center in the new Territory of Hawaii.

Ranching in the Hilo areas, but not specifically in Waiākea, came under the control of two large enterprises; the Parker and Shipman Ranches. In Waiākea a large portion of Zone II (Upland Agricultural Zone) too rocky for sugar cane cultivation became available for lease as Waiākea pasture lands. The present study area is mostly former Waiākea pasture land. The specific use of the pasture land is snot known but McEldowney indicates that "A substantial amount of grazing land adjacent to Hilo or to sugarcane

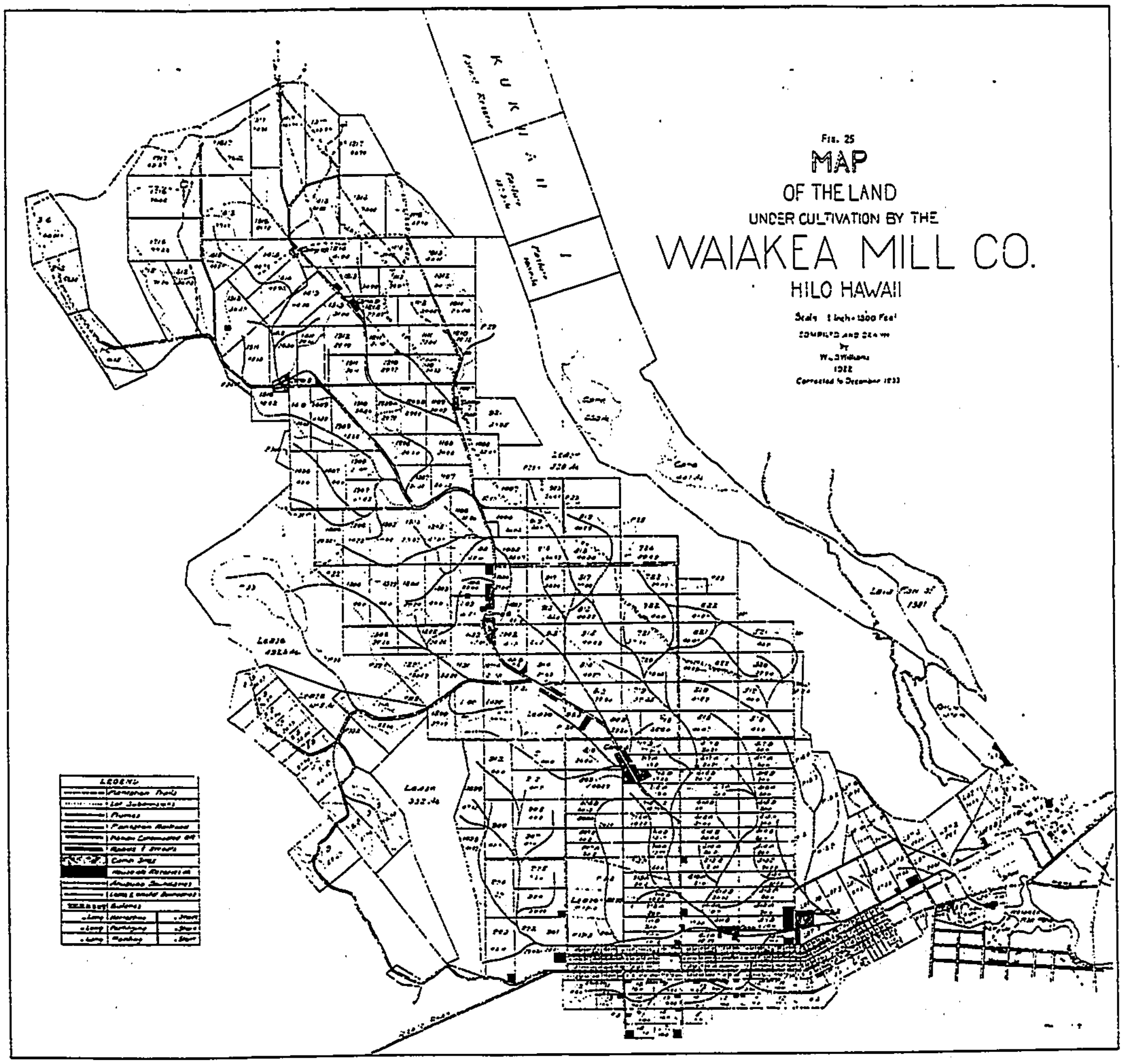


Figure 6 Waiākea Mill Co. Map ca. 1930, Showing Homestead, Cane Lots, and Camps

fields supported dairy cows for Hilo's several dairies" (*Ibid.*).

In 1918 the 30-year lease of the Waiākea Mill Co. expired and because Hawaii had become a Territory the "land fell under homesteading laws that required the government to put some of it up for lease to homesteaders who would be willing to grow sugar cane on it. Waiākea Mill was to grind the crop for them. A total of about 700 acres of land was divided into cane lots (between 10 and 76 acres each) and house lots ranging from 1 to 3 acres..." (Kelly, Nakamura, Barrère 1981:121). The present study area includes a portion of cane lot #16 (refer to Figure 6). The homestead and cane lots eventually reverted to the overall mechanized cultivation of the mill company as the homestead and cane lots "experiment was declared a failure" (*Op. cit.*:121).

By the 1920s the Waiākea Mill Co. had some 7,000 acres in cane production. Also, in the 1920s large tracts of remaining forest in Waiākea were "designated as forest reserve" (McEldowney 1979:42). The main reason appears to have been for maintaining the "forest as a 'watershed' to capture, retain, and support the continuous flow of water necessary to the sugar industry" (*Ibid.*). Clearly, sugar was the dominate economic factor during this period including the formation of settlements (i.e. camps).

Mid 1900s till present

Plantation life dominated the early portion of this time span but in 1948 Waiākea Mill Co. was liquidated (Condé and Best 1973:119). However, a major industry associated with cane by-products, canec, was begun in 1928. The canec plant was located adjacent to Waiākea Mill with bagasse, the cane by-product utilized, pumped through pipes from the mill to the plant. The canec plant shut down operations in 1966.

During this period major construction jobs started in the 1920s were completed.

These major construction jobs, in part, included Hilo Bay, wharfs and breakwater and bridges.. Some of these projects were actually major reconstruction work form damage during the winter of 1923, which included storm surf in January and a tidal wave in February (Kelly, Nakamura and Barrère 1981:171). During the World War II period in Hilo, expansion and designation of Hilo airport as General Lyman Field and the construction of the Saddle Road were major projects undertaken as part of the military presence on the island, which was very substantial.

Prior to the closing of the Waiākea Mill Co. there were at least 10 "camps" or plantation villages. Only Camp 1 was within the coastal zone with Camps 2 to 10 within the upland agricultural zone with Camp 10 the highest at ca. 1300 ft. a.m.s.l. (Refer to Figure 6). The present study area included active mechanized cane cultivation probably right up until closing (1948), and leased pasture lands. The lease of the Waiākea pasture lands during this period was to a Mr. Kazuo Miyasaki (G.L. #2751 exp. 6/17/60). Specific use of the pasture is not known, but as mentioned previously, dairy cattle pasturage is a distinct possibility.

After statehood (1959) and with the closing of the mill and canec plant, tourism was looked at as the next economic mainstay. In Waiākea, C. Brewer & Co. built a hotel complex at the site of the old canec plant. Other hotels were built along the Hilo Bay frontage of Waiākea near Coconut Island or Mokuola. Large tracts of former Waiākea Homestead and Cane lots were converted to housing or sub-division tracts adjacent to the study area. U.H. Hilo campus was expanded as it continues to do presently. The study area itself ceased to be utilized for pasturage (ca 1960s?) and recently there has been construction of the School of Agriculture building and the Joint Astronomy building.

Summary

In summary, the traditional settlement pattern included, almost exclusively, permanent coastal habitation with associated intensive agriculture. Immediately upslope of the coastal zone was an area cleared for extensions of agricultural production though not as intensively utilized as in the coastal zone. Beyond or *mauka* of the cleared upland agricultural zone was forest which ranged from dense rain forest to sub-alpine forest at the upper limit of Waiākea (ca. 6,000 feet). Habitation for the zones beyond the coastal zone was essentially temporary in nature, associated with exploitation of forest products. This pattern changed over time as the historically introduced religion(s), economy, and socio-political system replaced the traditional Hawaiian system. The major impetus for change was the development of commercial sugar cane within Waiākea. Settlement patterns during the period from the mid 1800s to the mid 1900s were almost exclusively set by the Waiākea Mill Co. Camps for immigrant laborers were constructed at specific locations based on the plantation organization. Most of these permanent housing locations were in areas previously associated with sparsely scattered temporary habitations in the upland agricultural zone of Waiākea. Because most of the study area was too rocky (i.e. exposed pahoehoe) for commercial cane, associated camps were not present. It appears that historically most of the study area was utilized as pasture land.

Hilo eventually became the second largest urban center in the State of Hawaii. Permanent housing is no longer dependent on a specific set of environmental conditions as it was during traditional Hawaiian times. The large acreage involved in subsistence agriculture and utilization of resources specific to certain elevations is no longer a necessity because of the market-based economy of today.

PREVIOUS ARCHAEOLOGICAL RESEARCH

There have been a number of archaeological and historic studies that are pertinent to the *ahupua'a* of Waiākea within which the study area lies. Notable among these somewhat regional studies are, Alfred E. Hudson's 1930s East Hawaii Site Survey, Holly McEldowney's "Archaeological and Historical Literature Search and Research Design, Lava Flow Control History," and "Hilo Bay: A Chronological History" (Marion Kelly, Barry Nakamura and Dorothy B. Barrère 1981). Review of these documents, and others, indicated that no previously documented sites with state site numbers were located within the present study area. These regionally oriented studies, however, were the basis for describing the settlement pattern specific to Waiākea *ahupua'a*. The discussion of settlement patterns is contained within Cultural History section of this report.

Additionally, a "Summary of Prior Archaeological Work" compiled by Ms. Jadelyn J. Moniz (1992) for Waiākea list ten studies ranging from field inspections to inventory surveys. The studies include research from 1979 to 1992. The description of each of the ten previous studies includes a basic review of findings and relating "adequacy" for the individual reports in terms of inventory level survey," based on Title 13, Subtitle 6, Chapter 147: Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports" (Moniz 1992).

The following discussion of previous research will focus on work specifically related to the present study area (Figure 7).

There have been no previous inventory-level archaeological surveys specific to the current study area. However, "field inspections" and a reconnaissance-level survey for the proposed Puainako Street Extension (Hunt, 1992) indicate the presence of archaeological sites in an area adjacent to the present study area.

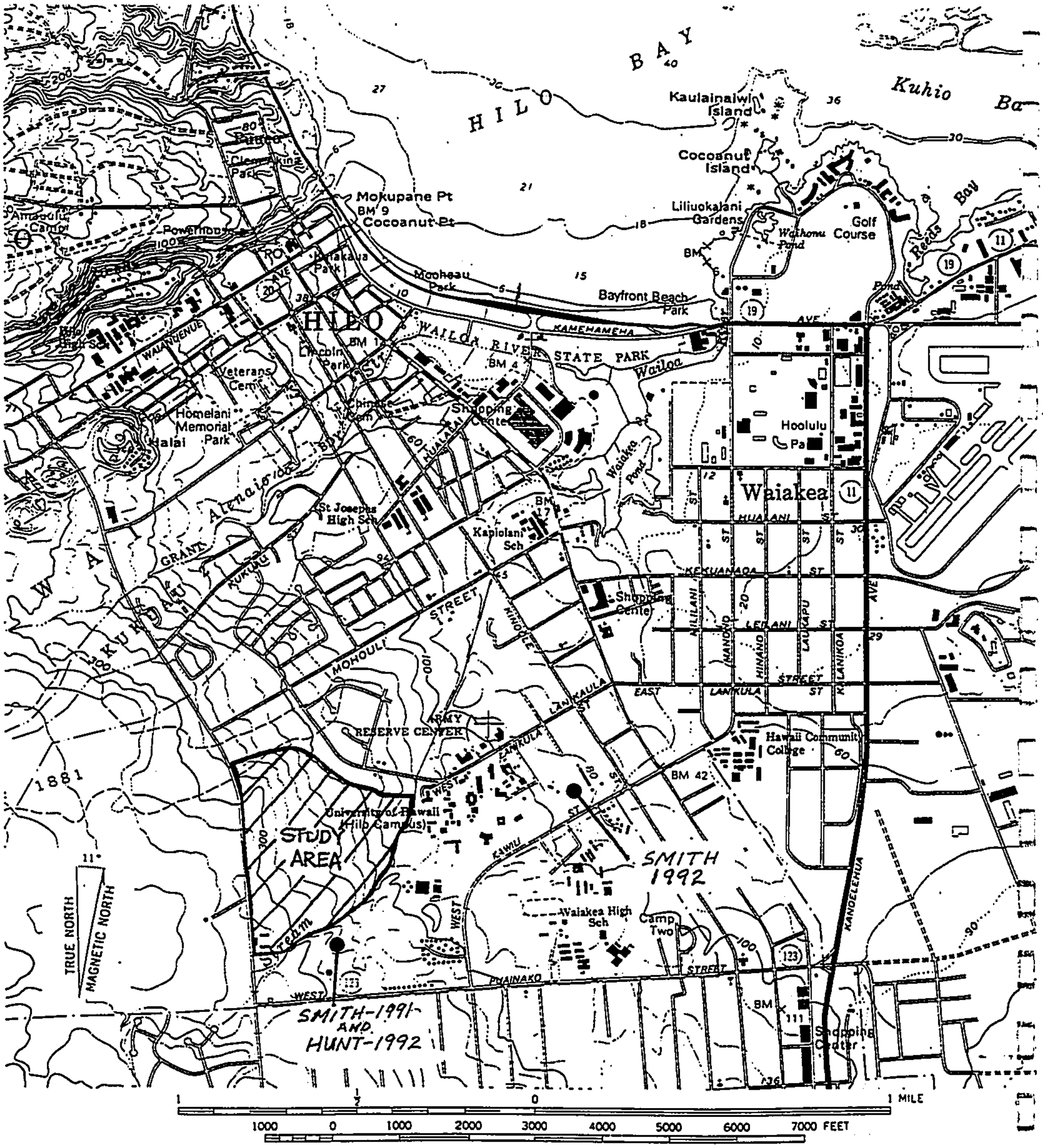


Figure 7 Portion of USGS Topographic Map, Hilo Quadrangle Showing Areas of Study Adjacent to the Present Project Area

Field inspections were conducted by Mr. Marc Smith, a staff member of the State Historic Preservation Division of the Department of Land and Natural Resources (SHPD/DLNR). The locations of the inspections include portions of the present study area and an undeveloped lot (Waiākea Cane Lots) abutting Ululani St.

Field inspections in to the present study area were conducted in October 1991. The impetus for these inspections were "calls from concerned students and faculty of University of Hawaii-Hilo about the possible presence of historic sites in the proposed Research & Technology Park" (SHPD/DLNR 5/7/92). Marc Smith conducted three separate field checks, October 18, 24, and 27, 1991. Observed during the field checks were a number of historic sites including "large faced platforms, modified outcrops, enclosures which may be house sites, and a large walled enclosure" (Smith 11/8/91).

Additionally, Smith noted three different lava flows in the area. The flows include: 1) a portion of the 1881 Mauna Loa pahoehoe flow; 2) a pahoehoe flow "dating to 1.5 - .75 KA (1,500 to 750 B.P)"; and 3) the oldest flow which has "a more level soil surface" and dates to ">4,0 KA (greater than 4,000 B.P.)" (*Ibid.*). The lava-flow age determinations are based on work by Lovelace as referenced in Marc Smith's letter.

The age of the flows has a direct correlation to site distribution. The only sites observed were "on the >4,000 year old flow," except one site which "appears to be constructed along the margin of the 1,500-to-750-year-old flow, suggesting others may exist" (Smith 11/8/91). Based on the field checks it was recommended that an inventory survey be conducted for the proposed area of the construction of utilities.

In December 1991 Marc Smith (SHPD/DLNR) conducted a field inspection for the proposed Department of Water Supply Office project site. The project area, bounded by Ululani, Kawili, and Kapiolani Streets, is located within the former "Waiākea Cane Lots" with "apparently the same soil type and flow underlying archaeological site types recorded above the University of Hawaii Hilo in the proposed Research and Technology Park" (Smith, 1/3/92). Observed within the parcel were "several stacked stone walls and linear mounds, ... a large rectangular enclosure ... several wall remnants and C-shapes" (*Ibid.*). An inventory level survey was recommended prior to any land disturbance.

The survey for the proposed Puainako Street Extension (Hunt 1992) covered an area approximately 150 ft. wide from the 200 to 1500 feet in elevation, through "multiple *ahupua'a* including Waiākea, Kukuau 1 and 2, and a small part of Ponohawai" (*Op. cit.*:5). A total of 48 sites were observed and recorded. Site types included "walls, mounds, platforms, and faced terraces" (*Op.cit.*:9). The highest concentration of sites is "in one area... Alternative B (Lower section) near the University of Hawaii-Hilo" (*Op.cit.*:11). This cluster of sites, which "appear to be associated with Hawaiian occupation and cultivation along the intermittent drainage during prehistoric and historic times" (*Ibid.*)[1], includes some of the same sites observed by Marc Smith during his field inspections of the proposed Research and Technology Park (Smith 11/8/91). The sites are situated within the former Waiākea Cane Lots and also appear to be on the same soil-mantled lava flow (i.e., >4,000 B.P.) as described by Marc Smith (Smith 11/8/91 and 1/3/92).

Based on the field checks by Smith and survey by Hunt, the site distribution (including that within the present study area) correlates to the lava-flow ages. The three different ages and relative degrees of soil development include: 1) a small portion of the 1881 flow with no soil cover or development; 2) the 1500-to-750-year-B.P. pahoehoe flow with no soil or weathering-related development but with some pockets of organically derived soil (i.e., leaf litter) - this flow covers the majority of the study area; and 3) the soil-mantled >4,000- year B.P. flow. Archaeological sites within and near the present

[1] Additional survey and archival findings showed all sites to be plantation era structures (Hunt 1994)

study area are confined to the oldest, soil-mantled flow associated with the former Waiākea Cane Lots. Site types, function and probable ages have ranged from agricultural mounds and platforms, habitation enclosures, and platforms with both prehistoric- and historic-era usage hypothesized.

Based on the information gathered from the field inspections and reconnaissance-level survey discussed above, three expectations regarding site distribution in the current study area can be stated. First, the 1881-flow portion of the study area would contain no sites. Second, the 1500-to-750-year-old pahoehoe flow comprising the majority of the study would contain few sites concentrated along the perimeter or edge of the flow. Third, the oldest flow would contain a higher site density with the understood possibility that earlier (i.e., prehistoric) sites might have been altered for commercial sugar cane cultivation.

SURVEY RESULTS

Methodology

The study area was surveyed by traversing the property on foot. The dense vegetation in disturbed areas was a seriously inhibiting factor in visibility, horizontally as well as of the actual ground surface.

The most difficult vegetation to survey through was *uluhe* or false staghorn fern which predominated in the western portion of the study area especially between Komohana Street and the existing "Road B" alignment that extends to the south of existing "Road A" as a previously bulldozed strip. Range of the *uluhe* conforms closely with the reconnaissance soils type of rLW or pahoehoe lava, and with the mechanically disturbed areas. North-south traverses were pushed through the forest north of "Road A" (Figure 8), and east-west traverses through the triangular parcel delineated by Komohana Street, "Road A", and the previously bulldozed powerline easement. The *uluhe* covers as much as 70 percent of this area *mauka of the "Road B"* alignment.

Roughly east-west traverses were walked through the remaining land east or *makai* of "Road B" and north of the powerline easement. The existing "Road A" and the powerline easement were used to guide on through the dense stand of strawberry guava (*Psidium cattleianum*) which covers this portion of the study area. The trees grow on the average less than 12 inches apart making passage extremely difficult, but are only one to 4 or 5 centimeters thick and visibility is surprisingly good. One can see a minimum of 20 to 30 feet horizontally and the ground underfoot is clear except for leaf litter and sphagnum moss on the unweathered pahoehoe lava of low undulating topography.

East-west traverses were also made through the lands south of the powerline easement, which completed the coverage of the entire study area. The undeveloped

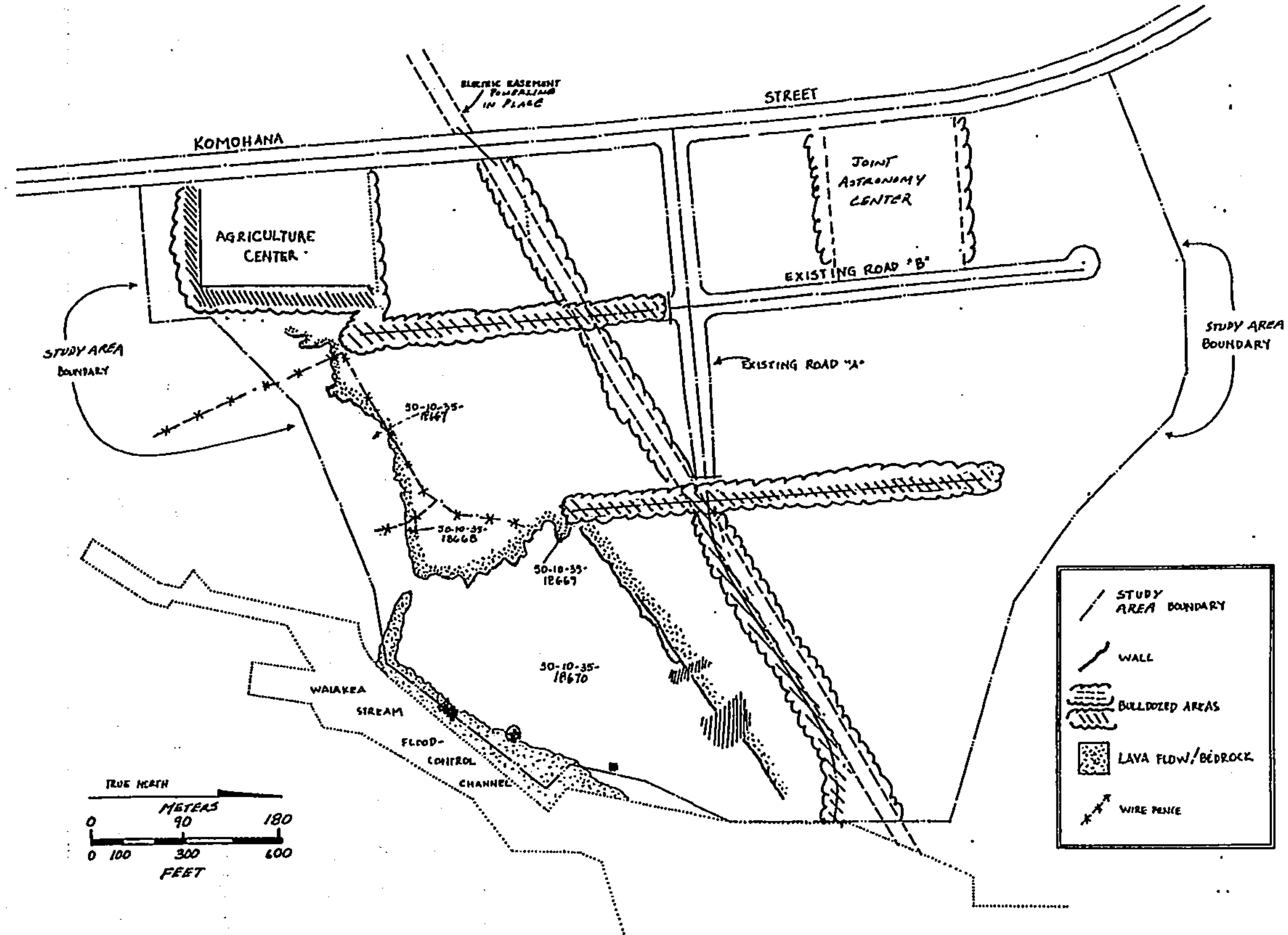


Figure 8 Study Area, Showing Existing Roads, Powerline Easement and Areas of Previous Bulldozing

portion of this land between Komohana Street, the powerline, and the bulldozed extension of the "Road B" alignment is covered with *uluhe*. The undeveloped southern extension of "Road B" and a portion *makai* have been bulldozed and since revegetated. Going *makai* on the south side of the powerline the ground underfoot changes to the undisturbed, little weathered pahoehoe lava supporting the strawberry guava thicket, and visibility of the ground becomes good again.

Traverses througout the study area were done by two to six individuals at intervals from one another of 20 feet to 100 feet depending upon vegetation.

Test excavations were done and the testing process included: pre-excavation photographs, removal of rocks from the specified test unit; excavation of soil by natural stratigraphic layer (or 10 cm. level within natural strata); screening of all soil sediments through 1/8" mesh screen; recovery of all cultural material (artifacts, midden, charcoal); one profile and stratigraphic description per unit; post excavation photographs; and reconstruction of test unit locale.

The site of the existing School of Agriculture is at the southwest corner of the study area. The Waiakea Stream floodplain and its associated alluvial sediments extends along the southern study area boundary widening to *makai*. This is the old sugarcane field and vegetation here is larger guava trees with almost no understory. As much as 90 percent of the ground is bare with excellent visibility.

Fieldwork

The archaeological survey and testing located archeological sites in the southern portion of the study area. Four sites were described and mapped to scale. Two of the sites - 18668, and 18669 - and a mound-feature within a third site - 18667 - were tested by hand excavations to document stratigraphy in the sites and to search for cultural remains to help in dating the sites.

The larger of the sites are two (2) expansive historic, agricultural fields (sites -18667 and -18670) bounded by low rock walls and fences that follow the natural boundaries of stream bank and unweathered lava flow (Figure 9). Field-rock clearing mounds are dispersed throughout both fields. The two other sites identified were assigned State site numbers 18668 and 18669 and were tested by excavation. These latter two sites each have a low wall defining their interiors and have historic bottles on the surface within the sites. The sites and the test excavation results are described in detail in the following Site Descriptions section.

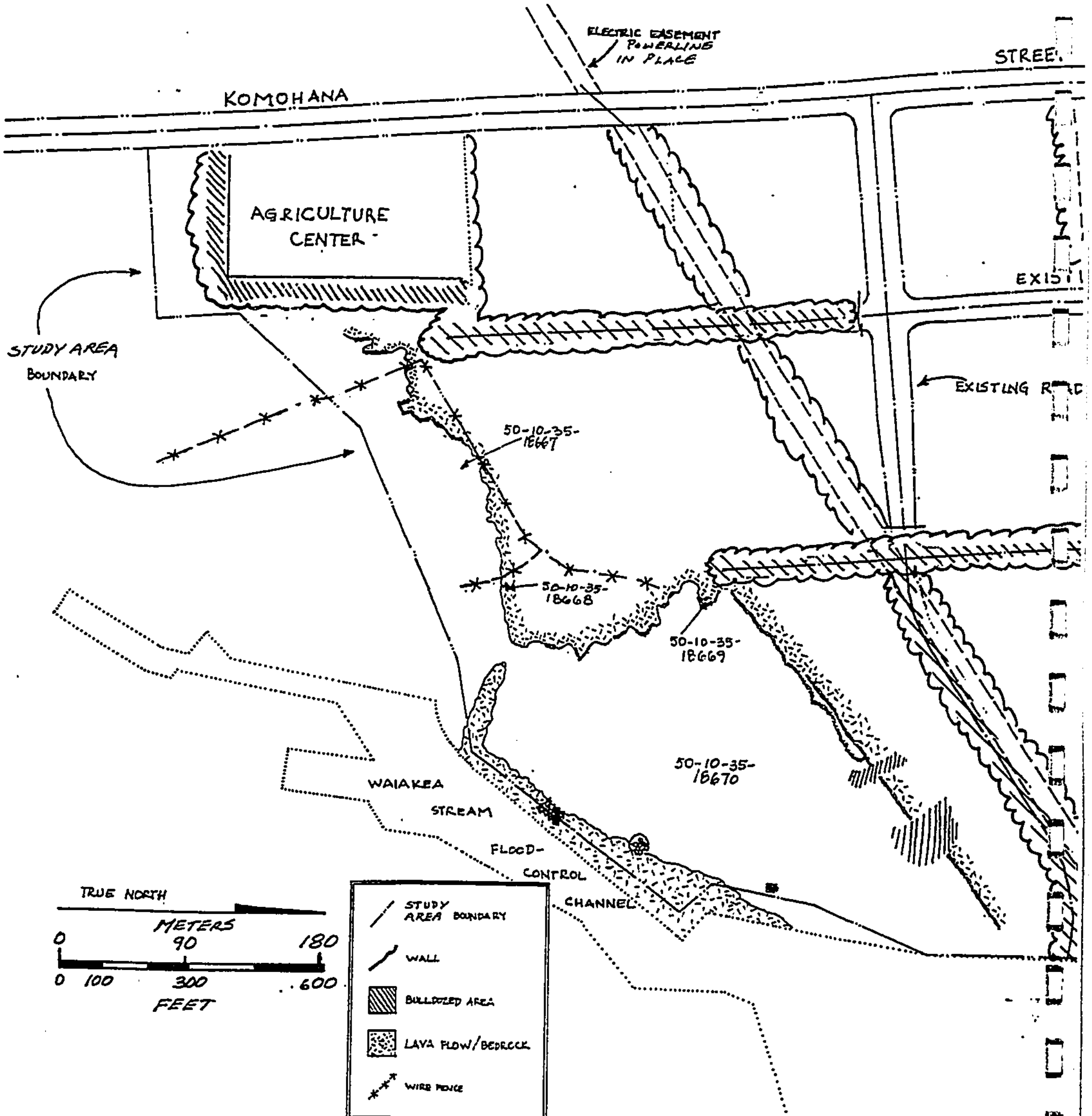


Figure 9 Portion of Study Area Showing Archaeological Sites

SITE DESCRIPTIONS

The table below summarizes the basic site information. It is followed by a detailed description of sites.

Table: Site Summary of Survey Area

State Site #50-10-35-	CSH Site #	Site Type	Function	Signi-ficance	Age	Recommen
18667	10	Field Complex	Agriculture	D	Historic	NFW
18668	11	Enclosure	20 century camp	D	1900s	NFW
18669	40	Enclosure/Wall	Lunch station	D	1900s	NFW
18670	12&13	Field	Agriculture	D	1900s	NFW

D - Site may be likely to yield information important in prehistory or history
NFW - No Further Work

State Site # 50-10-35-18667 **CSH Site:** 10
Site Type: Field Complex
Function: Agriculture
Features (#): 3
Dimensions: 6500.0 m^2 (21325.2 ft^2)

Description: Site 18667 (Figure 10) is a large area consisting of two discontinuous and separate walls and numerous (approx. 25) mounds. The site is located in the southwest corner of the study area and Feature A, a wall, in part runs along the study area boundary. To the south of Feature A, outside of the study area, there is what appears to be an old stream gulch. A large undulating expanse of guava forested terrain lies to the north of Feature A - dotted intermittently by mounds (Feature B). Feature C is a wall

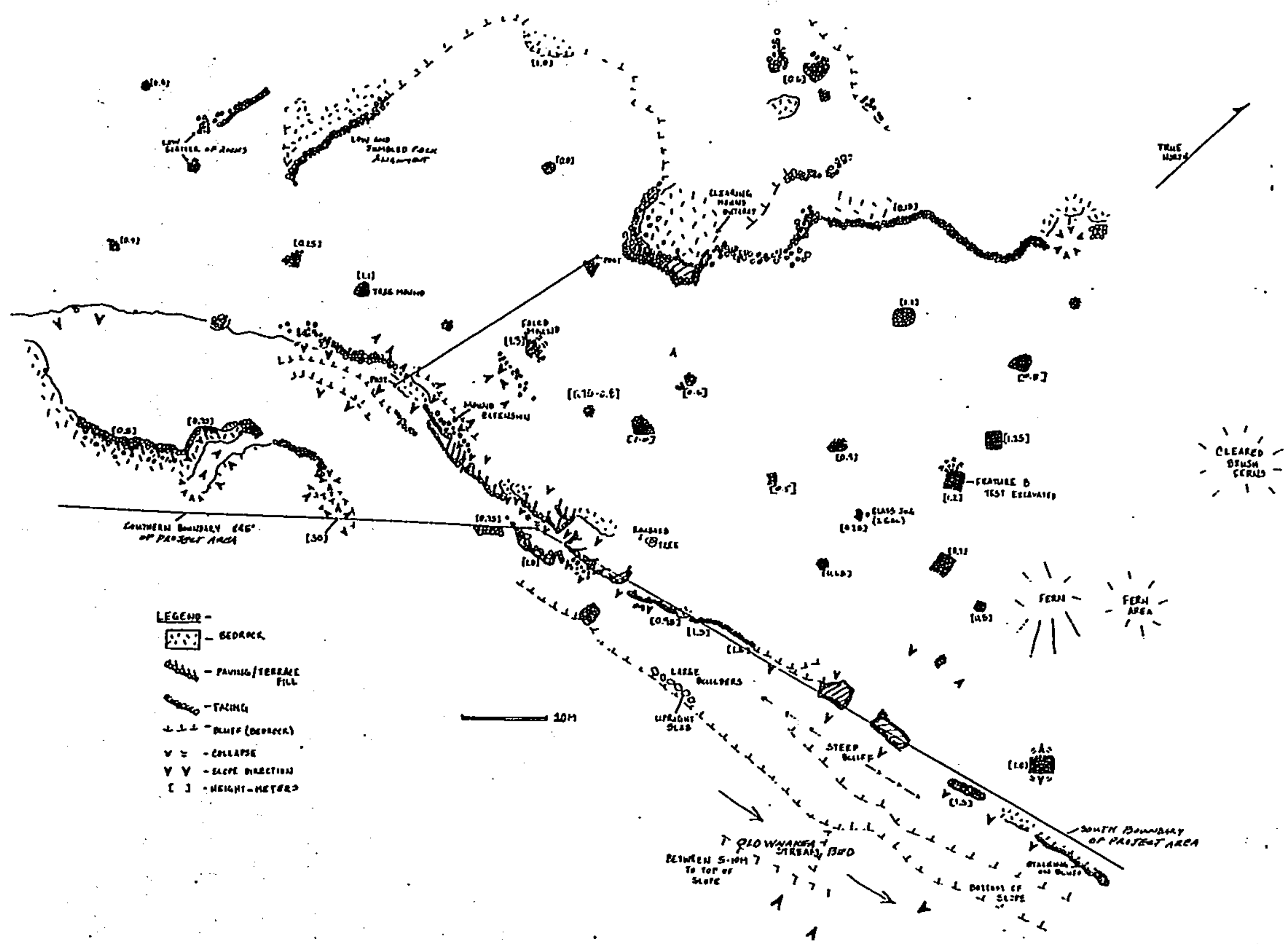


Figure 10 State Site 50-10-35-18667, Plan View

which runs roughly parallel to Feature A but is generally more discontinuous and in poorer condition than Feature A. Feature C lies between 40-60 m. (131.2 ft. to 196.8 ft.) to the north of Feature A. The mounds are located between the walls.

Feature A is a long and discontinuous wall which runs along the upper bank of the old stream gulch. Feature A is oriented roughly northeast/southwest. The entire length of Feature A measures approximately 140.0 m. (459.2 ft.). The wall is generally well-faced to the downslope side, toward the stream. Facing in these sections measures to a maximum height of 1.5 m. (4.9 ft.). Several constructed breaks exist along the wall and appear to serve as pathways through the wall to the stream. Toward the northeast end of the feature the wall becomes thicker and resembles narrow platforms or "ramparts." The wall varies in width from 1.0 m. (3.3 ft.) to 3.0 m. (9.8 ft.) at the "ramparts."

Parallel sections of wall lie to the south of Feature A. One parallel section is located at the southwest end of Feature A in the stream bottom and runs approximately 35.0 m. (114.8 ft.) long, at a distance of 10.0 m. (32.8 ft.) south of Feature A. A second parallel section is located approximately midway along the length of Feature A. This section measures 10.0 m. (32.8 ft.) long and is nearer the top edge of the stream bank.

No midden or artifacts were observed.

Feature A is in fair condition and excavation potential is poor.

Feature B comprises approximately 25 mounds - located primarily between Features A and C. The mounds vary in both size and formality of construction. Several of the larger mounds are well-faced and measure up to 4.0 $m.^2$ (43.0 $ft.^2$). The mounds are arranged randomly; they do not appear to be aligned in rows. The mounds of Feature B range in height from 0.6 m. (2.0 ft.) to 1.4 m. (4.6 ft.). Feature B mounds are probably agricultural clearing mounds.

No midden or artifacts were observed.

The mounds of Feature B are in fair condition and excavation potential is poor (see **Testing Results** and Figure 11).

Feature C is a second wall feature located to the north of Features A and B. Feature C runs roughly northeast/southwest, but unlike Feature A, this wall follows the edge of a pahoehoe flow. Pahoehoe outcropping connects the discontinuous segments of Feature C. The construction of Feature C is poor compared to Feature A and less vertical facing was observed. Feature C measures approximately 70.0 m. (229.6 ft.) long and ranges in width from 1.0 m. (3.3 ft.) to 2.0 m. (6.6 ft.). The heights range from 0.4 m. (1.3 ft.) to 1.0 m. (3.3 ft.).

No midden or artifacts were observed.

Feature C is in poor condition.

Site 18667 complex is agricultural in function, but the age of the site is difficult to determine. However, based on historical information concerning field boundaries of the Waiākea Mill Co. it would appear that this complex represents sugar cane cultivation practices.

Testing Results

Subsurface testing was conducted at Site 18667, Feature B (See Figure 11), in an effort to better interpret site function. A 1.0 by 1.5 m. trench was placed in a single mound of Feature B. The excavation demanded that the mound be disassembled. No

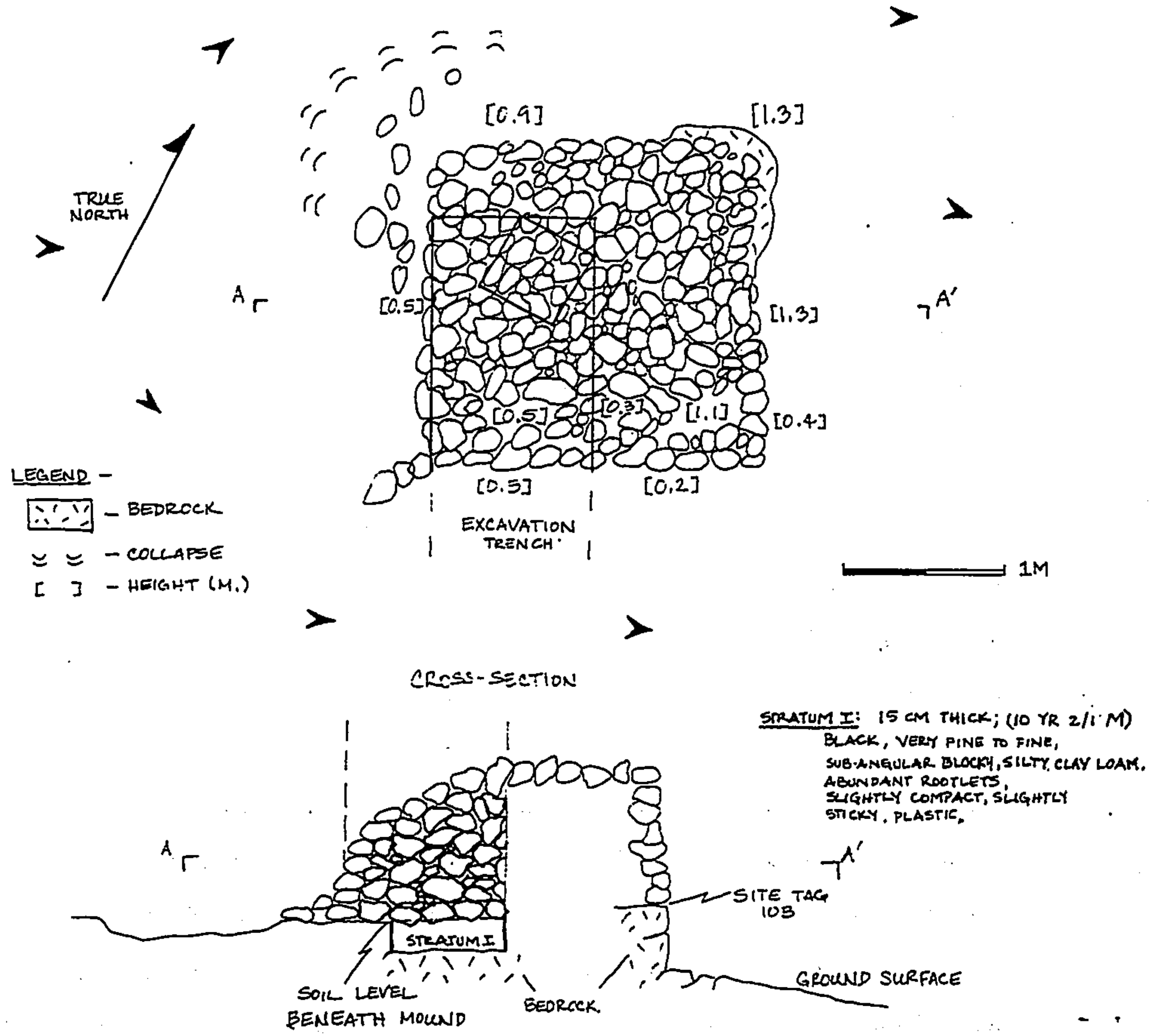


Figure 11 Site 50-10-36-18667 Feature B, Plan View of Mound (Top), and Cross Section Showing Stratigraphic Relationship of Rock Mound to Sediments (Bottom)

midden or artifacts were encountered through the mound construction. At the base of the mound was exposed bedrock and soil. The excavation continued through the 15 cm. thick deposit of soil (Stratum I) until bedrock was encountered there also. Stratum I (Munsell 10 YR 2/1 black) consisted of very fine to fine subangular, blocky, firm, slightly compact and sticky, silty clay loam. No midden or artifacts were observed. The mound was reconstructed subsequent to recording the excavation data. The excavation confirmed the rock clearing functional interpretation.

State Site #:	50-10-35-18668	**CSH Site #:** 11
Site Type:	Enclosure	
Function:	20th century camp	
Features (#):	1	
Dimension:	24.0 m.^{2} (258.2 ft.^{2})	

Description: Site 50-10-35-18668 (Figure 12) comprises an oval enclosure and adjacent L-shaped wall segment located on the edge of undulating pahoehoe terrain. In the site area, there are shallow soil deposits supporting moderately dense strawberry guava trees, ferns, three mango trees, and one royal palm tree.

The enclosure is a single course alignment of pahoehoe stones measuring 4.0 m. (13.1 ft.) N/S by 3.0 m. (9.8 ft.) E/W. The height of the alignment above the ground surface measures 0.1 m. (0.3 ft.). A pahoehoe outcrop ridge is located to the northeast of the enclosure and is approximately 1.0 m. (3.3 ft.) high. See **Testing Results** below.

The adjacent L-shaped wall segment lies directly south of the enclosure. The long leg of the wall measures 2.4 m. (7.9 ft.) long N/S and the short leg of the wall extends 1.8 m. (5.9 ft.) to the west from the long leg's south end. The wall measures 0.4 m. (1.3 ft.) thick and (2 to 3 courses) 0.8 m. (2.6 ft.) high, maximum.

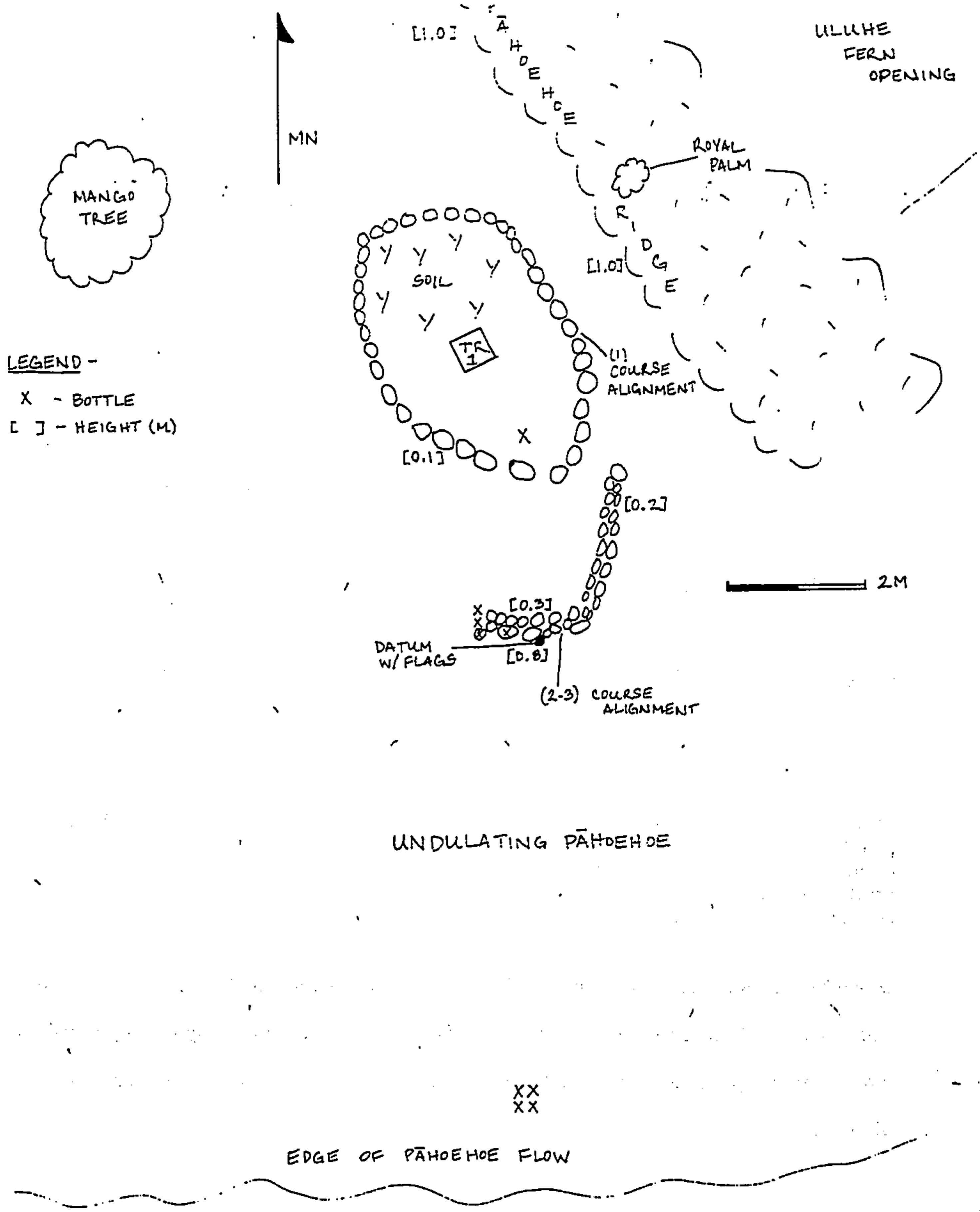


Figure 12 Site 50-10-35-18668, Plan View Showing Excavation Unit

No indigenous artifacts or midden were observed. Several clear and brown liquor glass bottles were observed at this site.

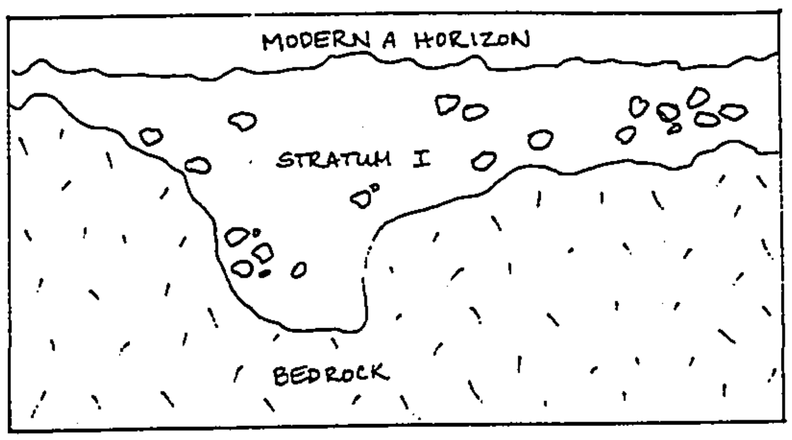
Site 18668 is probably a temporary camp with the oval single course alignment representing the perimeter of a tent pitching site.

Testing Results

Subsurface testing was conducted at Site 18668 (Figure 13). A single 0.5 m. by 0.5 m. trench was placed in the center of the enclosure. The trench was excavated through 4 cm. of modern forest litter and through Stratum I to a maximum depth of 25 cm., where bedrock was encountered. Stratum I measured between 4 to 25 cm. below the ground surface. Stratum I consisted of a dark brown to black, compact, moist, silty clay. The soil was organized into small (5 mm. diameter) peds or grains. There was high root and rootlet intrusion. Approximately 10% of Stratum I consisted of small pahoehoe cobbles. No cultural material was observed in this trench.

State Site #: 50-10-35-18669 **CSH Site #:** 40
Site Type: Site complex
Function: Lunch station
Features (#): 2
Dimension: 224 m.^{2} (2409.9 ft.^{2})

Description: State site 18669 (Figure 14, top) is a site comprised of an enclosure and a wall segment, designated Features A and B. The site is located in gently sloping terrain of moderately deep soil deposits. Vegetation at the site includes guava, ti, royal palm, and hibiscus.



STRATUM I: 25 CM. THICK; BLACK-DARK BROWN, COMPACT, STRUCTURELESS, MOIST, ROOTS AND ROOTLETS ABUNDANT, 10% COBBLE INCLUSION; NO CULTURE

Figure 13 State Site 50-10-35-18668, Trench 1 Profile: East Face

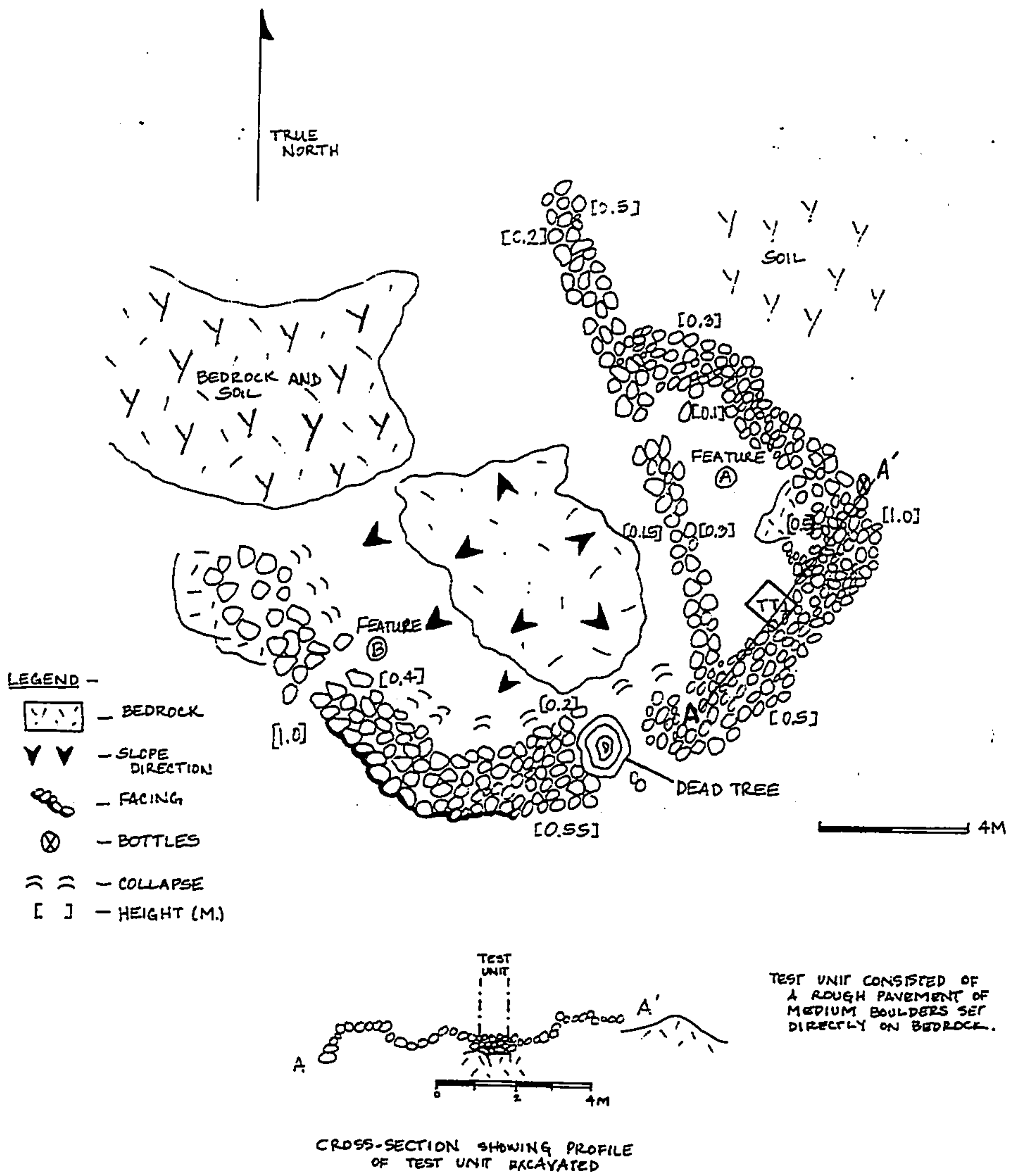


Figure 14 Site 50-10-35-18669, Plan View and Cross Section Showing Excavation Unit

Feature A is a rough, irregular, modified outcrop enclosure, measuring 11.0 m. (36.1 ft.) N/S by 6.4 m. (21.0 ft.) E/W. The walls of this enclosure are generally thick, measuring 1.8 m. (5.9 ft.) maximum, and 1.0 m. (3.3 ft.) average. A maximum wall height of 1.0 m. (3.3 ft.) is measured at the south exterior side of Feature A. The interior of the enclosure consists of a shallow soil deposit covering bedrock. At the north end of the west wall there is a constructed break measuring 0.75 m. (2.5 ft.). A 4.0 m. (13.1 ft.) long wall extends to the northwest off of the north corner of Feature A. See **Testing Results** below.

Feature B is a wall extension contiguous to the southwest corner of Feature A. The wall extends west for 6.0 m. (19.7 ft.) then doglegs to the north for an additional 2.3 m. (7.5 ft.). The wall measures 2.0 m. (6.6 ft.) thick, and 1.0 m. (3.3 ft.) high. A pahoehoe outcrop lies between Features A and B.

No midden was observed but Soda bottles, three railroad ties, and barbed wire were present at this site.

Site 18669 is in fair condition.

Testing Results

Subsurface testing was conducted at Site 18669, Feature A (Figure 14, bottom). A single 1.0 m. by 0.8 m. trench was placed in Feature A, against the south wall, near a concentration of 7 "Pacific Sodaworks" bottles. A single soil layer was present, Stratum I, which ranged in depth from 10 to 25 cmbs. Stratum I consisted of a very dark brown (Munsell 10YR 2/2) silty clay soil, slightly compact, and organized into small blocky grains or peds. No cultural materials were observed.

State Site #: 50-10-35-18670
Site Type: Field
Function: Agricultural
Features (#): 1
Dimension: 36.0 m.^{2} (387.3 ft.^{2})

CSH Site #: 12&13

Description: Site 50-10-35-18670 (refer to Figure 9) is a remnant of a commercial sugar cane agricultural field. This site is defined by a pahoehoe lava flow to the north and west by a stream gulch to the south. The lava flow and stream gulch converge at both *mauka* and *makai* ends of the site area, resulting in an "almond" shape. The site is generally level with undulations following the pahoehoe substrate. The field area has a substantial soil deposit and moderately dense guava and fern vegetation. There are also some isolated royal palm trees in areas where pahoehoe bedrock is exposed

The site area is characterized by long, shallow, and narrow furrows, oriented generally north/south (cross-slope). This cross-slope orientation of the furrows suggest that contour plowing to reduce erosion was being utilized. The furrows measure, from trough to trough, 1.4 m. (4.6 ft.) wide and 0.2 m. (0.7 ft.) deep.

Within the site area there are subfeatures indicative of rock-clearing activity. One subfeature is a square enclosure located in level pahoehoe lava terrain (Figure 15). The enclosure measures 7.0 m. (23.0 ft.) N/S by 6.5 m. (21.3 ft.) E/W. The north and south sides of the enclosure are natural, raised pahoehoe outcrop ridges, measuring 0.7 m. (2.3 ft.) high. The east and west sides are constructed of pahoehoe boulders and cobbles, measuring 0.8 m. (2.6 ft.) thick and to a maximum height of 0.55 m. (1.8 ft.). A constructed break in the west wall measures 1.2 m. (3.9 ft.) wide. Three royal palms are growing within the enclosed area. A single plastic milk crate (Foremost 1979) was observed 3.4 m. (11.2 ft.) to the south of the enclosure.

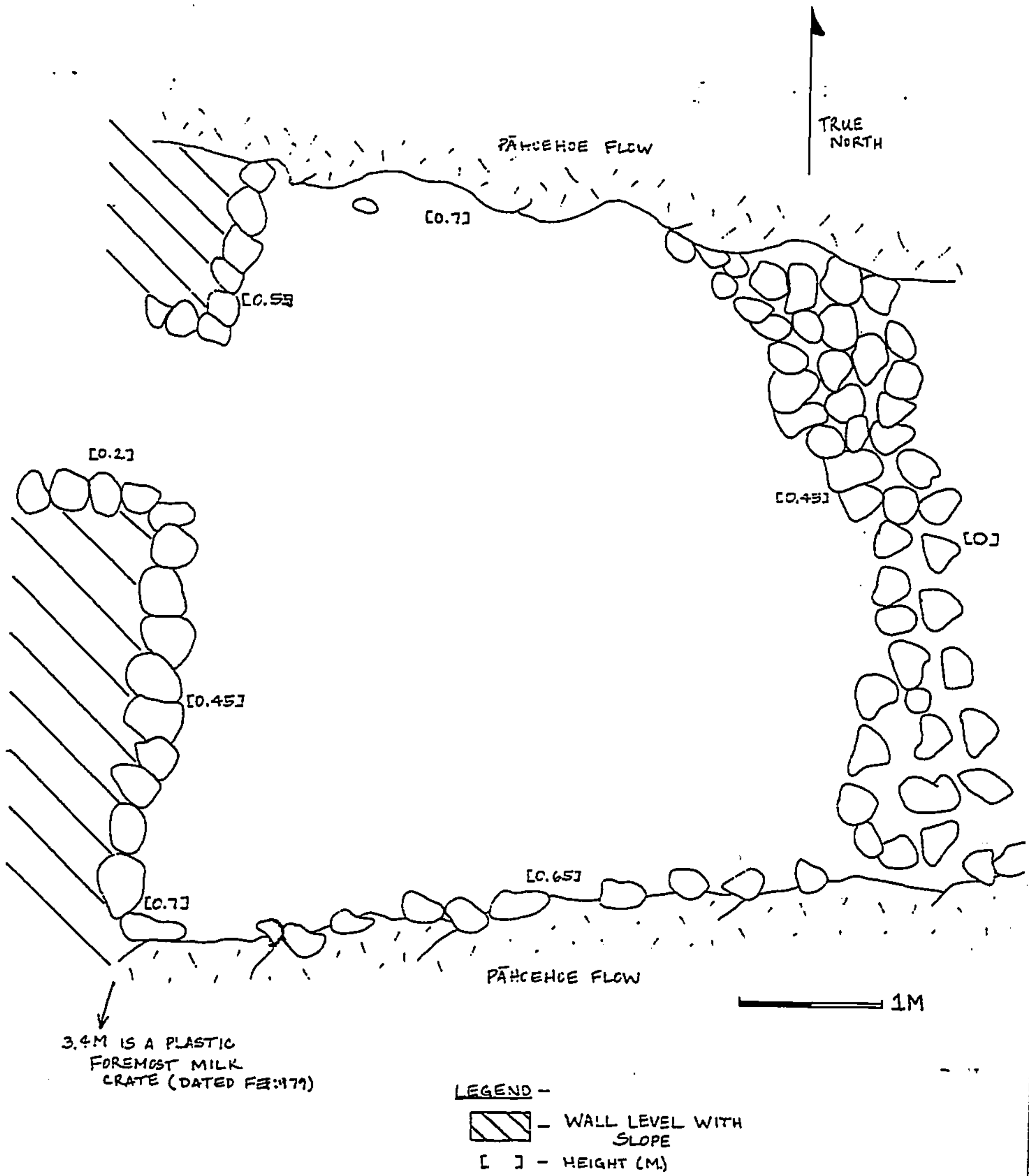


Figure 15 Enclosure Sub-Feature of Site 50-10-35-18670 (CSH12)

Another subfeature (Figure 16) example of rock-clearing is a large, rectangular mound. The mound measures 8.2 m. (26.9 ft.) N/S by 7.5 m. (24.6 ft.) E/W. The top of the mound surface measures approximately 2.5 m. (8.2 ft.) above the surrounding ground surface. Some vertical facing still exists though most of the sides are somewhat collapsed.

Approximately 14 other amorphous rock clearing features exist within the field. These consist of mounds, piled rocks on bedrock ledges and in one case a pile of rocks within a shallow bedrock drainage channel. A large banyan tree grows out of the piled rocks at the head of the channel.

Based on historic research including a review of the Waiākea Mill Co. map (See Fig. 6 in Cultural History Section) Site 18670 field was once Cane Lot #16. Lot 16 encompassed some 22 acres of which .13 was "waste" or areas of rock (i.e., clearing mounds, etc.).

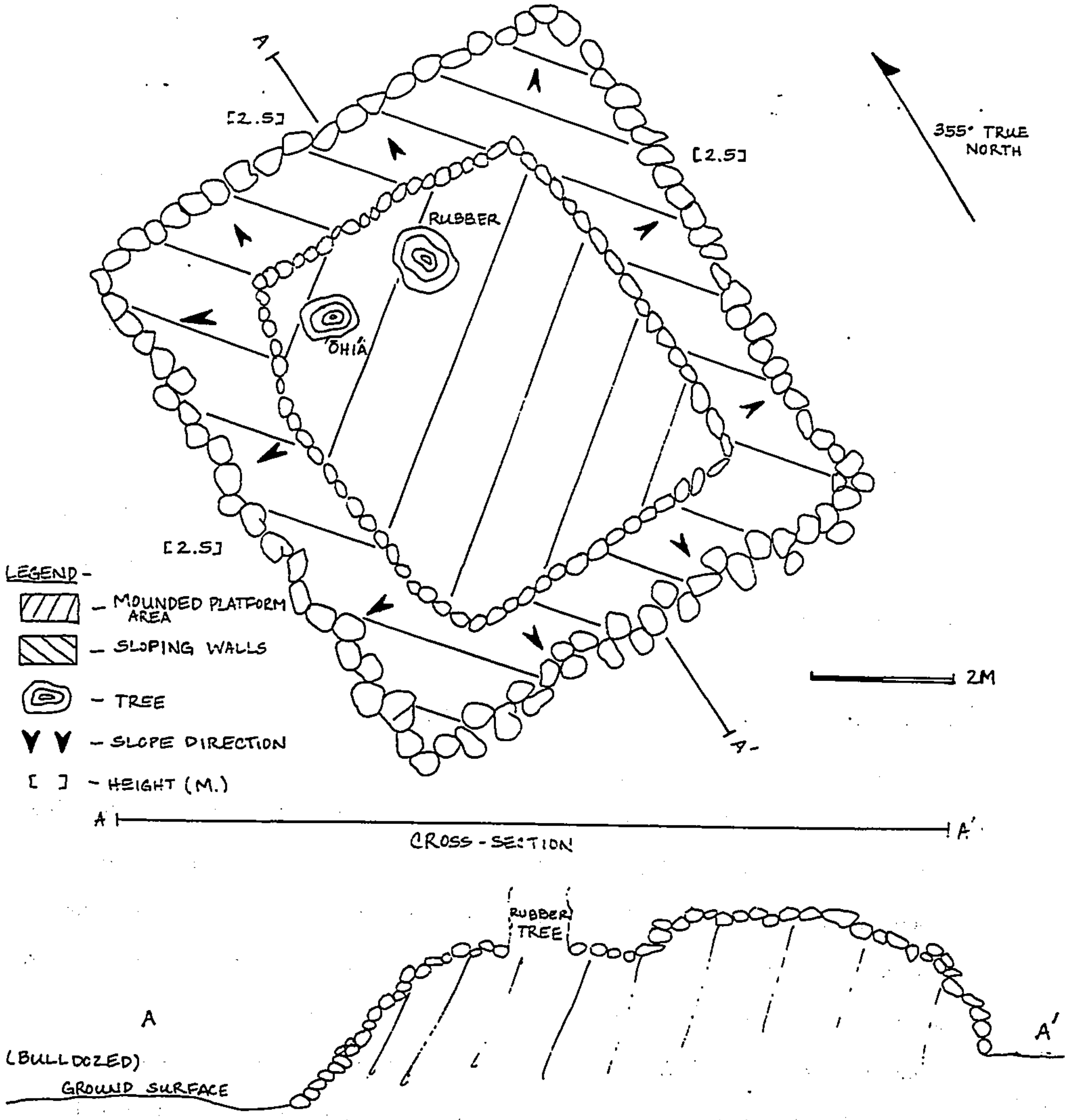


Figure 16 Larger Rock Clearance Mound within Site 560-10-35-18670, Plan View and Cross Section

SUMMARY AND SIGNIFICANCE

Archaeological survey of the land area *mauka* of the University of Hawaii at Hilo Campus has located definitive evidence that the agriculturally productive land there was plowed and planted in sugar cane as recently as the 1940s. Furrows are still visible in the tillable lands that comprise the south end of the study area, and a sample of the rock mounds tested by excavation contained no cultural material. Stratigraphically the mounds are built upon the sediments of the fields or upon shallow bedrock up-croppings, thus are contemporaneous with sugar planting in the study area - in all probability field-rock clearing mounds. The entire field is bounded by a continuous low rock wall. Along the north field boundary the wall follows the natural edge of tillable soil, delineated by the edge of a pahoehoe flow whilch has not weathered significantly from its original state. The wall along the south boundary of the field follows the natural edge of the old bed of Waiākea Stream. This wall is essentially the south boundary of the study area. At the west (*mauka*) and east (*makai*) ends of the field the wall is disturbed by the rerouting of the Waiākea Stream bed and construction of the School of Agriculture building, and by the flood control 'improvements' to the stream bed, respectively.

Two small sites - 18668 and 18669 - located along the northern fringe of the tilled land were tested and were found to contain no stratified deposits or cultural material below the surface. On the surface within the sites were twentieth century bottles, for whiskey and soda water at sites 18668 and 18689 respectively. These sites are interpreted as lunch stations - temporary or single use sites - of the sugar field workers, homesteaders, or possible the cowboys or mule skinners associated with the pasture land.

Site 18667 is nothing more than the constricting *mauka* end of the sugar field.

Furrows were not observed on the bare ground here, which is the primary reason for differentiating it from the *makai* portion of the field. The ubiquitous field-rock clearing mounds are more numerous, but smaller, generally no larger than 2 meters by 2 meters square with maximum heights of and a meter and a half. There stratigraphic relationship to the surrounding sediments is similar to the mounds in the *makai* portion of the field, that is, of recent historic age and without any cultural material to suggest they are anything other than clearing mounds.

The entire remaining portion of the study area contained no cultural resources related to archaeology. This land is comprised mostly of a pahoehoe lava flow little altered by weathering. Vegetation is supported primarily by quantities of humus and leaf litter deposited by gravity in the low basins of the lava flow's undulating surface, their roots finding moisture ponded in the basins or deep in the natural cracks and fissures of the lava sealed by a thick, but discontinuous carpet of sphagnum moss. It is likely that prehistoric use of this land was for collection of feral or wild plants and animals. Variation between this pahoehoe lava of old and the lavas of the 1881 flow that entered the study area at the northwest corner is not clearly discernable due to the mechanized land alteration and the present heavy, ground-obscuring vegetation.

Significance

Archaeological remains in the study area, which are limited to the southern portion where old sediments are present, are borderline to even be considered historical properties in that they were last in use at least as recently as the mid-1940s. Initial homesteading of these "cane lots" occurred around 1918. So it is possible that construction of some of the field-stone clearing mounds had been begun by this time, and the mounds could have been continuously added to through the years as is the nature of such mounds. Nevertheless, based on the archaeological mapping of the fields, and the testing results of type-mounds we believe all of the archaeological sites and features within the study area to be without other significance than Criterion D (i.e., site is likely to yield information important to prehistory or history) as historical properties, according to National Register significance and State Historic Preservation Division draft rules on significance criteria.

Recommendations

Archaeological work accomplished includes, scale mapping of the limits of the cane field and its boundary walls, testing of two peripheral sites, and testing of a field-stone clearing mound feature. Thus, it is felt sufficient data has been collected, analyzed, and reported on to satisfy Criterion D. Therefore, no further archaeological work is recommended for the study area.

Archaeological monitoring is not recommended for site grading and preparation work or other construction activities, based on the results of the archaeological survey and testing in the study area. However, as is the general case with historic preservation concerns in the event inadvertent discoveries are made during any phase of construction the State Historic Preservation Division shall be notified in each incidence to determine an appropriate course of action for mitigation.

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Supplemental Archaeological Survey and Testing of the Proposed University of Hawaii at Hilo Expansion Area (TMK 2-4-01:19)

by

Douglas F. Borthwick, B.A.
and
Hallett H. Hammatt, Ph.D.

for

Engineering Concepts

by

Cultural Surveys Hawaii
November 1993

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INTRODUCTION

Cultural Surveys Hawaii conducted, at the request of Engineering Concepts, an archaeological inventory survey of an approximately eleven (11) acre parcel located adjacent to the proposed U.H. Hilo Research and Technology Park. The purpose of the survey was to locate and describe any archaeological sites and/or features within the specific area through which infrastructure-related construction is proposed.

The present inventory survey project area is situated along the Waiakea Flood Control Channel adjoining (to the east) the larger parcel of the Research and Technology Park previously surveyed by Cultural Surveys Hawaii (Borthwick and Hammatt 1993) (Fig. 1). The need to conduct this additional survey was reached after survey and report production of the larger parcel was completed. The present research is thus included as a supplemental report to the previous Cultural Surveys Hawaii's study which detailed background research pertinent to the entire Research and Technology Park.

SURVEY RESULTS

Methodology

The present inventory survey was conducted by two archaeologists, Douglas Borthwick and Dr. Hallett H. Hammatt on Sept 30, 1993. The first phase of the survey included walking roughly north/south-oriented transects to locate any archaeological sites. The space between archaeologists during the transects was never greater than 15 meters and averaged 10 meters. The entire area was covered in four transects. The vegetation ranged from fairly dense grass-covered areas to open terrain under Royal Palms and/or Guava, thus ground visibility ranged from fair to good. A portion of the Waiakea Flood Control Channel is encompassed within the project area. The channel and associated land alterations generally define the southern and eastern boundaries of the project area. The northern boundary is a bulldozed swath related to existing water and overhead power lines. The western or *mauka* boundary is a surveyed line marked by survey flags, from the previous Cultural Surveys Hawaii's project, and more recently survey work by R.M. Towill Corp. The contour and boundary map developed by R.M. Towill's work was utilized to accurately plot site locations (Fig. 2).

Test excavations were conducted at two rock mounds. The testing process included: pre-excavation photographs, removal of rocks from the specified test unit; excavation of soil by natural stratigraphic layer (or 10 cm. level within natural strata); screening of all soil sediments through 1/8" mesh screen; recovery of all cultural material (artifacts, midden, charcoal); one profile and stratigraphic description per unit; post excavation photographs; and reconstruction of test unit locale.

Results

Survey of the flood control channel and the area to the east of the channel, indicated that this portion of the project area had been entirely mechanically altered. Mechanical alteration includes bulldozing, cut and fill, and channel embankment construction. Due to these modern alterations no archaeological sites exist within the channel or along the channel's embankment, including the area between the eastern embankment and the existing UH Hilo structures. The existing U.H. Hilo structures include dormitories and associated grounds (i.e., parking lot and landscaped areas).

West of the flood channel four rock clearance mounds and a rock wall were observed and plotted on the survey map (See Fig. 2). The mounds range in size from a

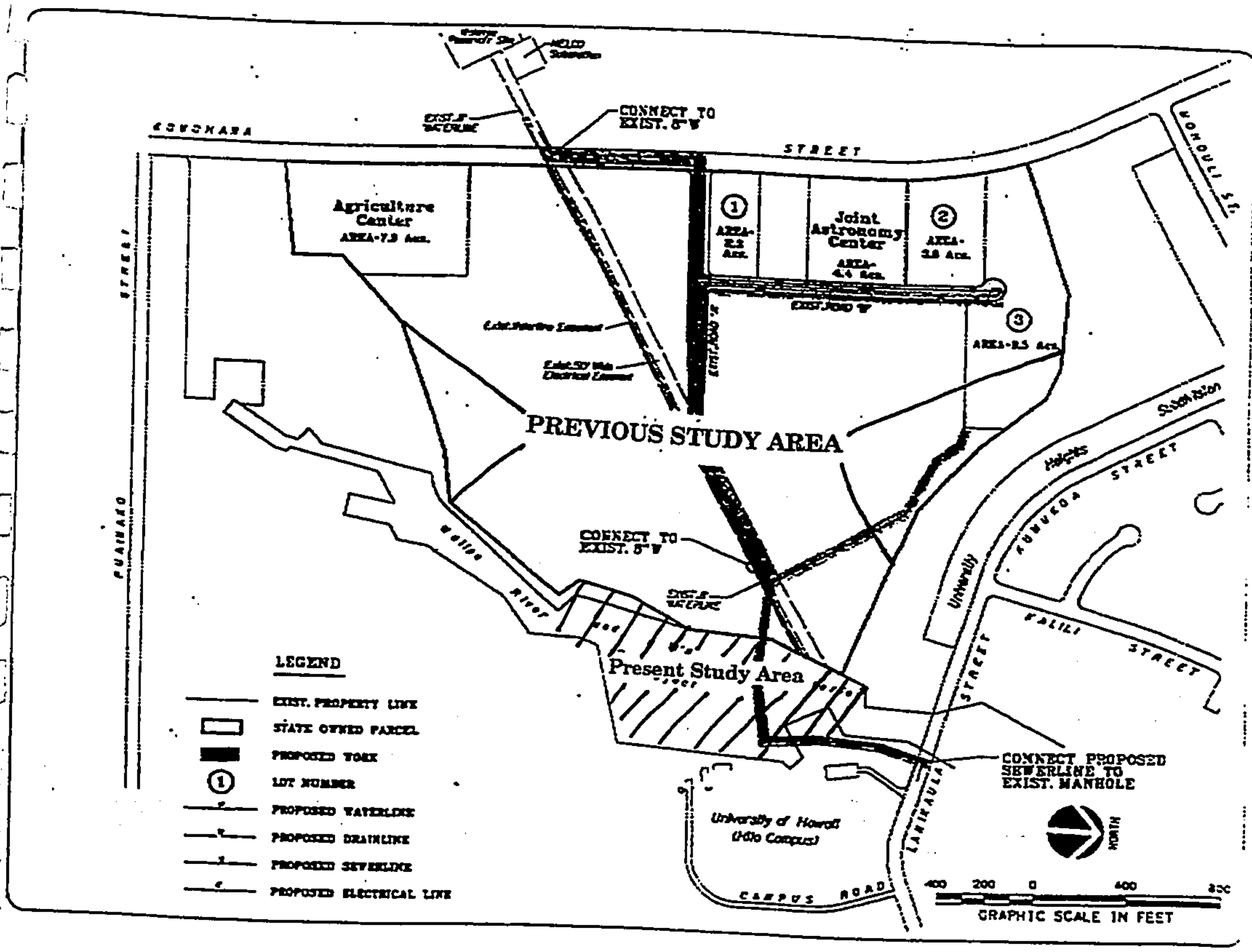


Fig. 1 Locational Map of University of Hawaii Hilo Proposed University Park, Showing Previous and Present Study Areas

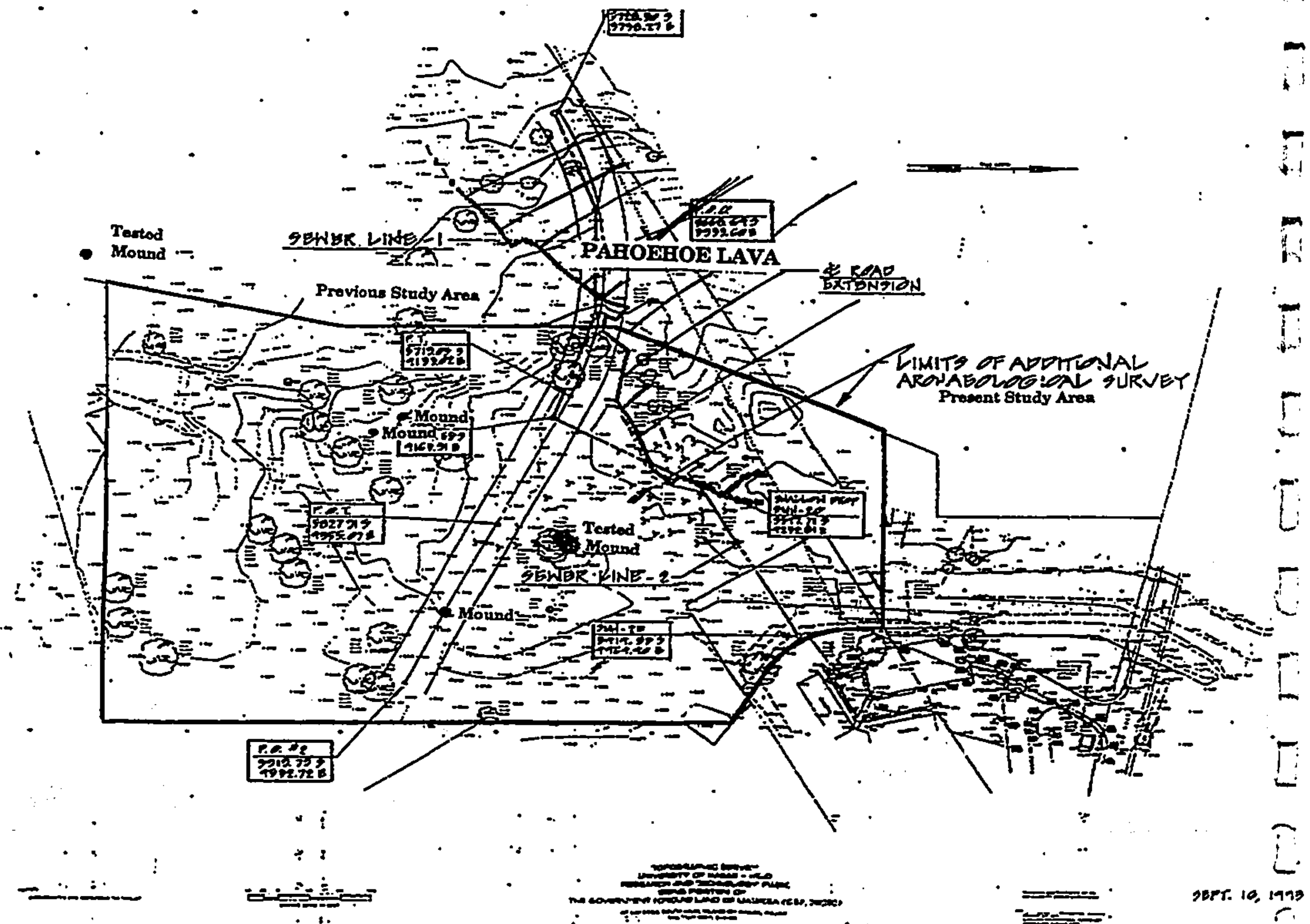


Fig. 2 Project Area Map Showing Archaeological Features

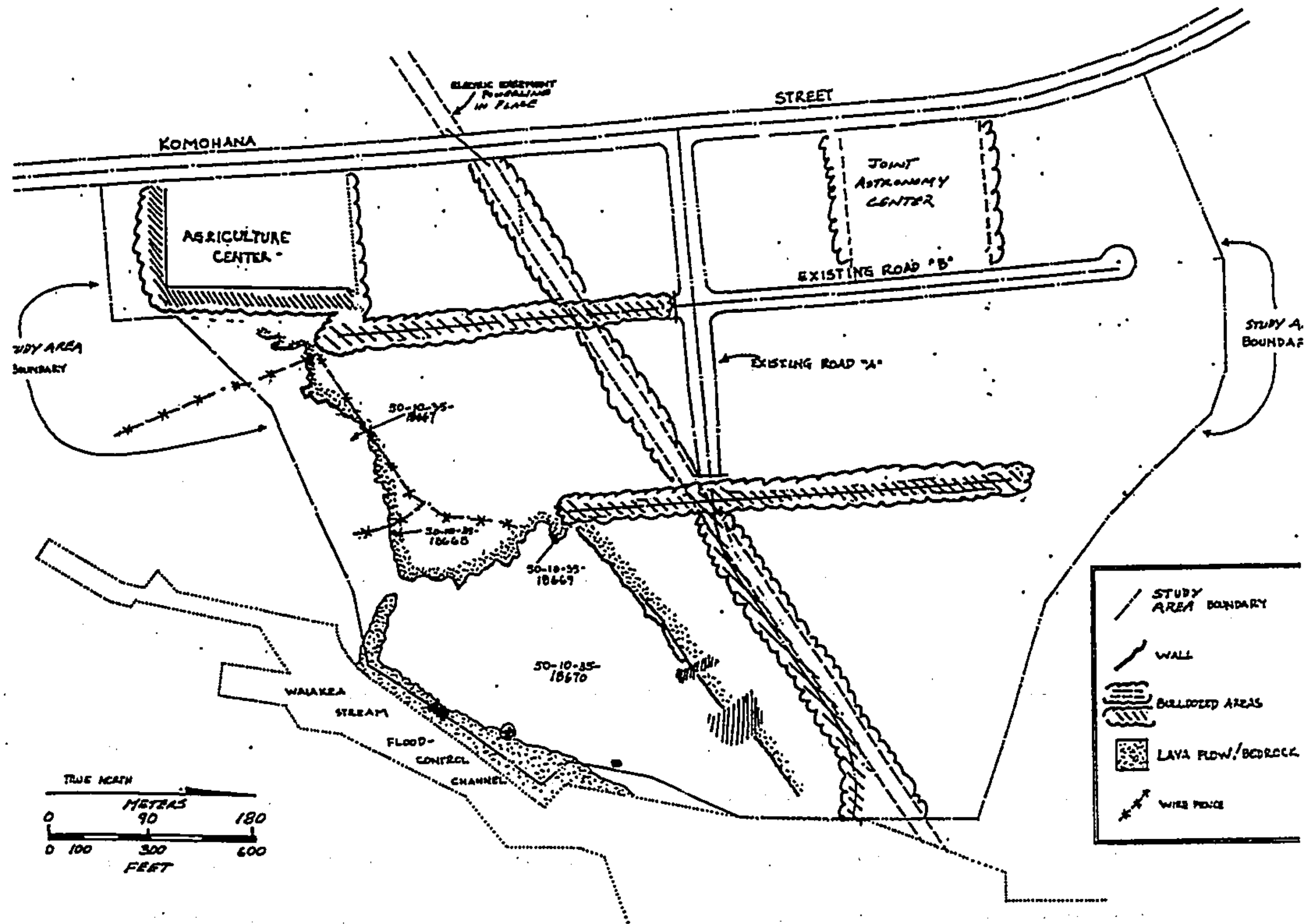


Fig. 3 Previous Study Area Map with Archaeological Sites (Borthwick et al. 1993:Fig. 8)

maximum of 5 meters by 10 meters to 2 meters by 6 meters. The mounds are constructed on high points (i.e., bedrock undulations) in the mostly soil terrain where former cane furrows are still visible. The wall observed, which is of mounded construction, is the *makai* extension of the wall noted and described previously (Borthwick *et al.* 1993:25-27, and 43) (See Fig. 3). The wall defines the interface between soil-mantled terrain to the south, which was formerly under commercial sugar cane cultivation and the non-cultivated soil-less pahoehoe terrain to the north. The wall varies greatly in condition and size throughout its length but averages 1.5 m. wide and .50 m. in height.

The largest, most visibly distinct of the four newly identified mounds, was mapped to scale (Fig. 4), photographed and subjected to limited surface testing. A 1 m. by 2 m. test unit was excavated into the roughly faced west edge of the mound. The excavation revealed a maximum thickness of rock construction of 50 cm. The construction was of loosely piled boulders, of fairly consistent size (15-25 cm. in diameter), with no filtered soil matrix. No cultural material (artifacts, midden, or charcoal) was present within the rock fill. Below the rock structure three soil stratigraphic layers (I, II and III) were encountered (Fig. 5). Stratum I was 2 to 4 cm. thick, and consists of very loose, very dark grayish brown (10YR 3/3) silt loam with a high percentage of organics (leaf litter). Stratum I represents the modern filtered forest litter postdating the mound's construction. Stratum II was a maximum of 25 cm. thick and consists of loose dark brown (7.5YR 3/2) silt loam with 5 to 10 percent rockiness. One fragment of volcanic glass (.9 grams) and a piece of *kukui* nut (.2 grams) were recovered from Stratum II. Stratigraphically, Stratum II represents a natural soil layer predating the construction of the mound, thus the volcanic glass and *kukui* nut fragments are not associated with construction and/or use of the mound. Stratum III consists of slightly compact rocky dark yellowish brown

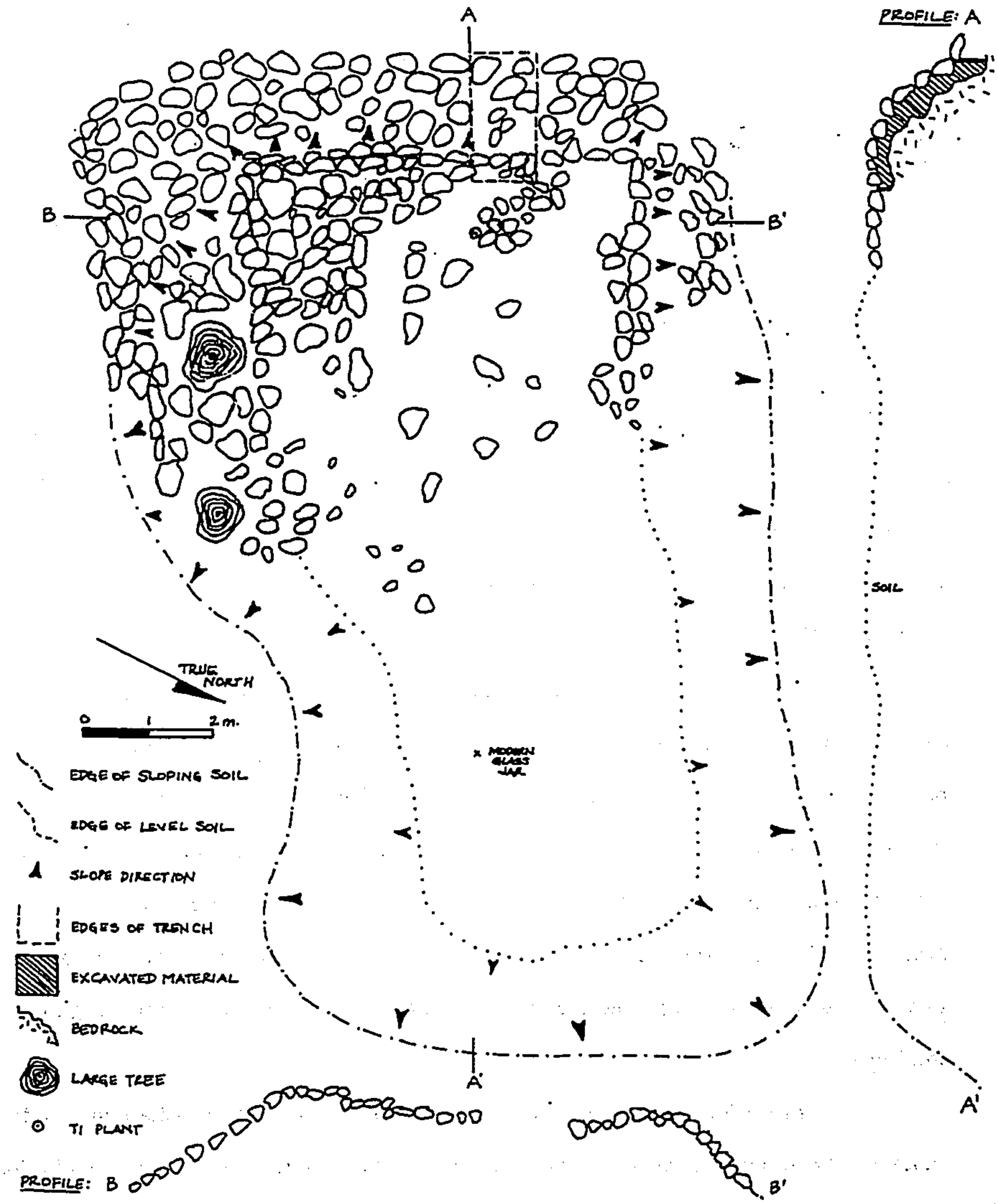


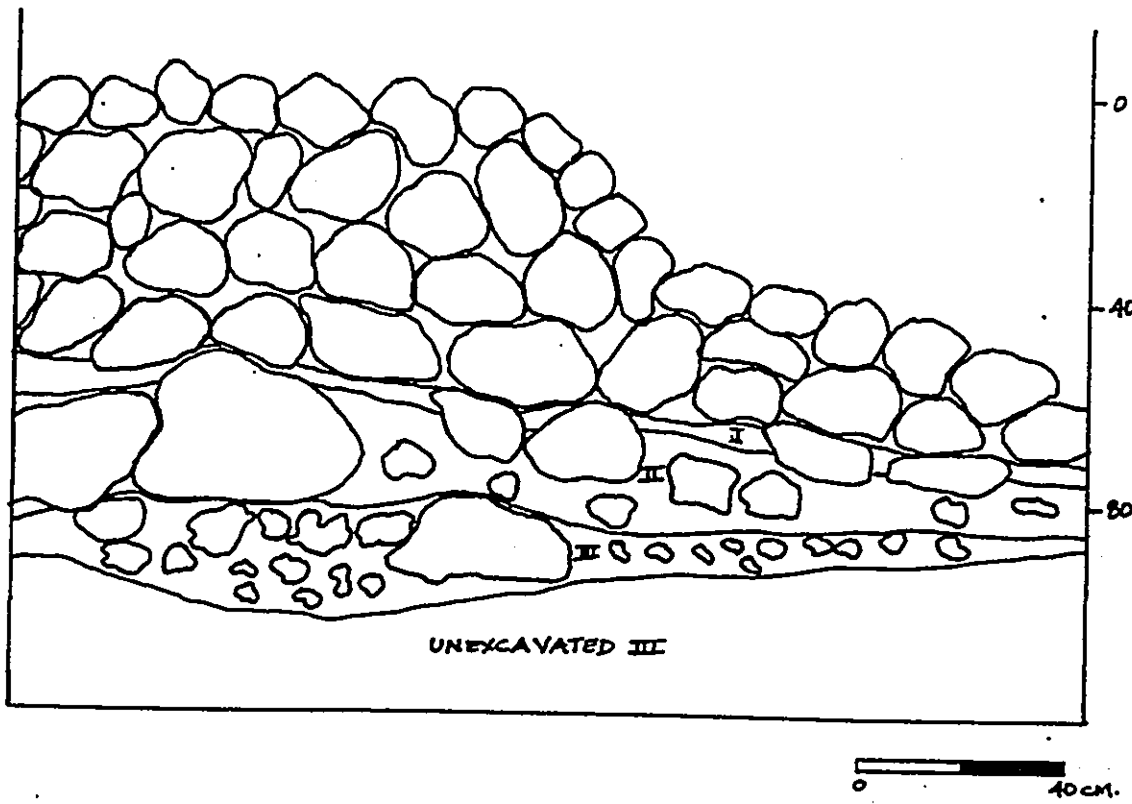
Fig. 4 Plan View and Cross Section of Tested Mound within Present Project Area, Feature of Site -18670

(10YR 3/6) silt loam. Stratum III represents the parent material soil layer or C Horizon which contains a high percentage of soft decomposing rock. No cultural material was within Stratum III.

The survey and testing within the present project area and previous background research for the Research and Technology Park (Borthwick *et al.* 1993:6-23) indicates that the features observed were associated with commercial sugar cane cultivation. Specifically, the features are situated within the former Waiakea Cane Lots (Portion of Lot #16). During the previous study a State Historic Site number (50-10-35-18670) was allotted for the cane lots' associated features within that specific project area (*ibid.*:39-42) (See Fig. 3). Since the four newly identified mounds were also associated with the same lot or sugar cane field we are including these features under the same State site number, 50-10-35-18670.

To further address functional interpretation, feature association, and sampling concerns, another mound within Site -18670 was subjected to sub-surface testing. The particular mound was chosen because of its size and location. The mound represents the largest, best defined stacked stone feature within Site -18670 boundaries (Fig. 6). The mound had been previously noted and drawn to scale (Borthwick *et al.* 1993:41,42), and accurately plotted on the study area map (*ibid*, Figure 8:25) thus facilitating locational and feature type sampling choices as well as necessary field tasks (i.e., mapping and location).

A roughly 1.5 m. by 1.5 m. test unit was excavated into the southern side of the mound. The excavation revealed that the rock structure of the mound consists of a loose network of small boulders with no paving, no cultural material (i.e., midden or artifacts), and no filtered soil matrix. The mound is essentially sitting on top of underlying soil



STRATUM I: 4 cm. THICK; (10 YR 3/2) VERY DARK GRAYISH BROWN SILT LOAM; HIGH % ORGANICS; VERY LOOSE GRANULAR STRUCTURE; NO CULTURE

STRATUM II: 25 cm. THICK; (7.5YR 3/2) DARK BROWN SILT LOAM; LOWER % ORGANICS; GRANULAR AND LOOSE; 5-10% ROCKS; ONE PIECE OF VOLCANIC GLASS AND ONE BURNT KUKUI SHELL

STRATUM III: 22+cm. THICK; (10YR 3/6) DARK YELLOWISH BROWN SILT LOAM; "C HORIZON"; NO CULTURE.

Fig. 5 South Profile of Test Unit within Tested Mound in Present Project Area, Feature of Site -18670

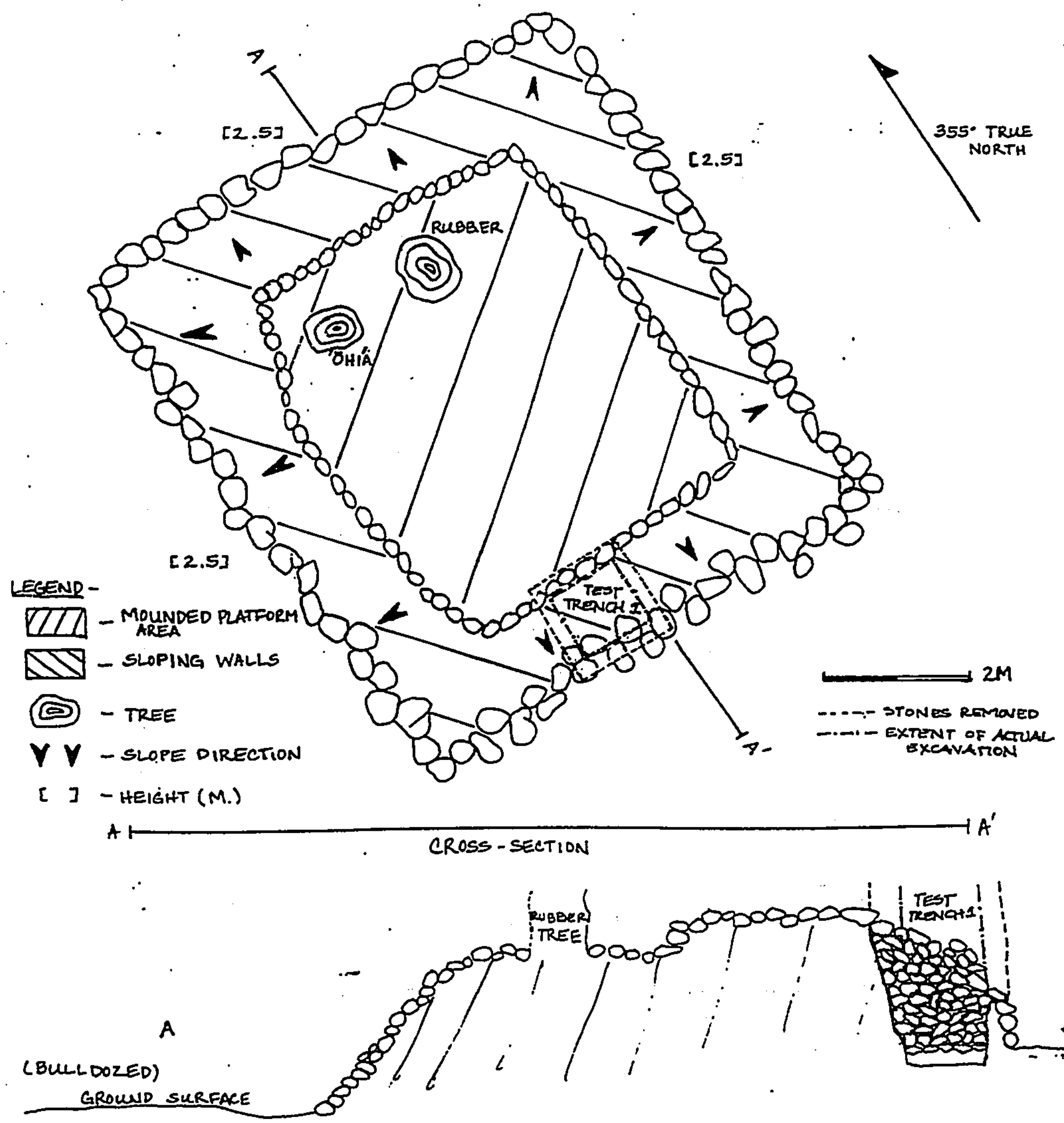
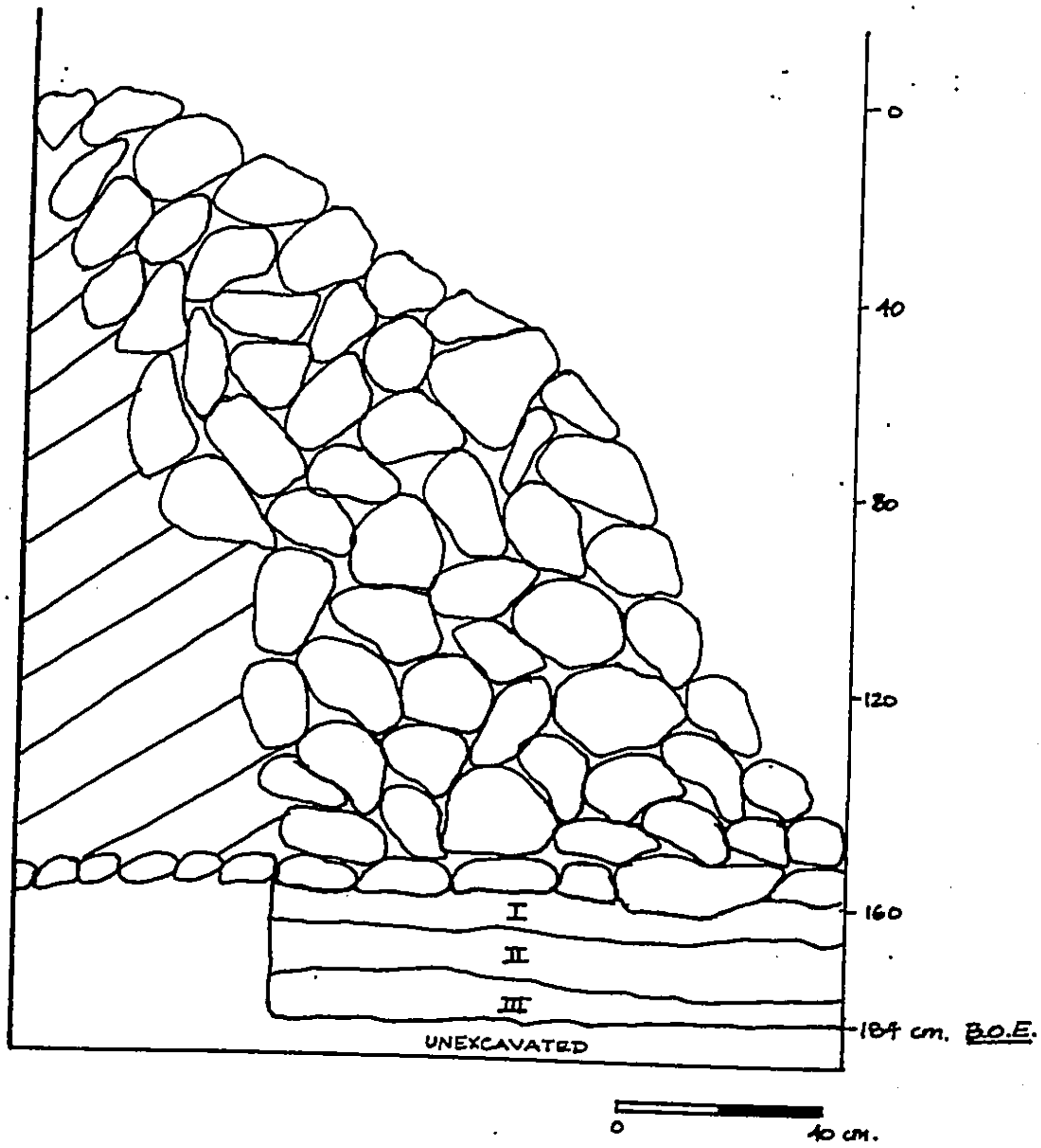


Fig. 6 Plan View and Cross Section of Tested Mound in Previous Study Area Portion of Site -18670 (Based on Figure 16 Borthwick *et al.*:42)

layers which, inclusive of the above-listed attributes, indicates the structure is relatively youthful age as there has not been sufficient time for soil to have filtered through the rocks and accumulated as a soil matrix within the mound. Additionally, the absence of cultural material and surface paving (pebble and/or coarse surface) argues against traditional Hawaiian usage (i.e. habitation and/or ritual).

Below the rock structure three soil stratigraphic layers (I, II and III) were encountered. No cultural material (midden, artifacts or charcoal) was within any of the strata which ranged from very dark brown (10YR 2/2) silty clay loam (Str. I) to dark yellowish brown (10YR 3/4) silty clay loam (Str. III). The degree of rockiness increased with depth ranging from 10% rockiness in Stratum I to a maximum of 40% in Stratum III. The soil layers clearly predate the construction of the mound and the profile represents natural *in situ* soil development (Fig. 7).

The sub-surface testing of this large mound did not reveal any evidence of traditional Hawaiian usage associated with the mound. The rock free, furrowed soil area surrounding the mound, construction style, and absence of cultural material indicate that the mound is a rock clearance feature associated with historic commercial sugar cane cultivation practices.



STRATUM I: 9 CM. THICK; (10 YR 2/2) VERY DARK BROWN SILTY CLAY LOAM TO SILT LOAM; 10% ROCKS

STRATUM II: 10 CM. THICK; (10 YR 3/2) VERY DARK GRAYISH BROWN SILTY CLAY LOAM; 10-20% ANGULAR PEBBLES

STRATUM III: 10+CM. THICK; (10 YR 3/4) DARK YELLOWISH BROWN SILTY CLAY LOAM; 20-40% ANGULAR PEBBLES; STRONG CRUMB STRUCTURE

Fig. 7 East Profile of Test Unit within Previously Located Mound, Site -18670

SUMMARY AND RECOMMENDATIONS

The present project area includes four rock clearance features (mounds) and a portion of a stacked boulder wall. The features were constructed and maintained historically as part of Waiakea Mill Co.'s sugar cane operations. The construction and maintenance of the mounds and wall were done to increase the cultivatable soil area by removing rocks from the fields and piling them into mounds and/or along field edges (e.g., the wall).

The extremely sparse material collected from the roughly 3 square meters of excavation (1 volcanic glass fragment and 1 *kukui* nut fragment) precludes any meaningful analysis. Both items could be naturally occurring within Waiakea Flood Plain soils. The volcanic glass fragment has not been utilized as a tool, based on absence of edge wear and/or retouching, as well as the poor vesicular quality of the material. The burnt *kukui* nut fragment may indicate previous forest clearing. However, such an assumption (or any other) based on a single .2 gram fragament is tentative at best.

Research for the proposed Pu'ainako Street Extension (Hunt and McDermott 1993), which includes similar stacked stone features within the former Waiakea Cane Lots, also indicated commercial sugar cane-related construction and maintenance of the rock structures. Hunt and McDermott, after "compiling diverse lines of complimentary evidence," which included oral interviews, photographs, newspaper articles, historic map analysis, inventory survey, and sub-surface testing, conclude that "The archaeological structures documented in the inventory survey are plantation-era in origin dating to the late nineteenth and early twentieth" (*ibid.*:93, 94).

The same conclusions were reached independently for the structural features reported on in our original report (Borthwick *et al.* 1993) for the survey of the Research and Technology Park. The four mounds and wall, noted during the present survey are component features of the furrowed field (portion former Cane Lot #16) given State Site number 50-10-35-18670 (*ibid*:39-42) and thus should be included under the same (-18670) site designation.

Site -18670 was preliminarily (Cultural Surveys Hawaii recommendation) assessed solely under Significance Criterion D (site may be likely to yield information important in prehistory or history) and we are recommending inclusion of the four newly identified mounds (wall is already part of -18670) under the same significance assessment. That is, we are still recommending Criterion D only for Site -18670 and that the four mounds become part of the site.

The present study has neither altered significance assessment nor the recommendations of the original survey, for no further archaeological work specific to Site -18670, inclusive of the four newly-identified mounds. Sufficient data has been collected, analyzed, and reported on to define age and functional interpretation of Site -18670. Therefore it is our opinion that no further archaeological work is necessary. These significance assessments and recommendations are consistent with those made previously, for Site -18670 and described previously in the main body of the report.

REFERENCES

Borthwick, Douglas F. and Hallett H. Hammatt
1993 *Archaeological Survey and Testing of Lands Proposed for Research and Technology Lots at the University of Hawaii at Hilo (TMK 2-4-01:40 and 157)*, Cultural Surveys Hawaii, Kailua, Oahu.

Hunt, Terry L. and Matthew McDermott
1992 *Interim Report: Archaeological Inventory Survey Puainako Street Extension Project: Lands of Waiākea, Kukuau 1 and 2, and Ponohawai, South Hilo District, Island of Hawai'i.*

APPENDIX *F*

SOCIAL IMPACT ASSESSMENT
(by Earthplan)

Proposed University Park at UH Hilo

Social Impact Assessment

Prepared for Engineering Concepts

by Earthplan

March 1997

Contents

Tables and Figure

Figure

1. Background and Introduction

The University of Hawai'i is proposing to develop the University Park in Hilo, Hawai'i. An Environmental Impact Statement, or EIS, is being prepared pursuant to Chapter 343 of the Hawai'i Revised Statutes. This report contains the social impact assessment of the proposed action; it is summarized in and appended to the EIS.

1.1 Report Preparation and Organization

This report was prepared by Earthplan, whose offices are located at 81 South Hotel Street, Suite 211, in Honolulu, Hawai'i. Berna Cabacungan, principal of Earthplan, was project manager, and primary researcher, analyst and writer. Assistance was provided by Traver Carroll, an independent contractor. He compiled census statistics and conducted research related to student housing.

The remaining portions of this section describes the proposed action. Section 2 provides a profile of the existing community, including a description of public policies which guide the future of the project area. Section 3 contains an assessment of potential social impacts including population and related housing impacts, change to the character of the area, and impact on public facilities and services.

1.2 Description of the Proposed Action

The University of Hawai'i at Hilo, hereafter referred to as UHHilo, is one of the university's nine campuses. UHHilo was established in 1970. It is a comprehensive undergraduate institution that offers certificates in various vocational fields and baccalaureate degrees.

Located in Hilo, Hawai'i, the project site is situated adjacent to the existing Hilo campus of the University of Hawai'i. The existing campus covers 117 acres, and is bounded by Lanikaula, Kapi'olani, Kawili, and Puainako Streets, as well as the Wailoa Flood Control Channel along Waiakea Stream.

The project site is west of the UHHilo campus. It encompasses 116 acres and is designated as Tax Map Key 2-4-01, parcels 7 and 41. The site is bounded by Komohana Street to the west and Waiakea Stream, which is part of the Wailoa Flood Control Project, to the east. North of the project site is the University Heights residential subdivision and to the south is vacant land abutted by Puainako Street residences further south.

Two existing roads traverse the project site. Nowelo Street is perpendicular to Komohana Street and aligned in an east-to-west direction. Aohoku Street is parallel to Komohana Street.

Along Nowelo and Aohoku Streets are two existing facilities which partially comprise the Research and Technology Park. These are the CALTECH Submillimeter Observatory on Nowelo Street, and the Joint Astronomy Centre on Aohoku Street. Just north of the Joint Astronomy Centre is the Subaru Astronomical Observatory which is presently under construction. The Institute for Astronomy is also planned to be located in the Research and Technology Park.

Further, the Komohana Agricultural Complex is located on Komohana Street in the southwest corner of the site.

The State proposes to develop the site to expand the Research and Technology Park, and add academic facilities, recreational facilities and student housing. To support the development, the State proposes to construct a bridge across Waiakea Stream, between the existing campus and the project site. Roadway improvements are proposed to facilitate circulation between the two campuses and traffic circulation in the project vicinity. An off-site water reservoir and water line are also proposed. These improvements will occur in the first increment of construction.

The proposed development is designed to accommodate a total UH Hilo student population of 5,000 students.[1] The long range development plan for the site is based on a "spine concept" in which the proposed pedestrian spine and pedestrian paths between the existing and proposed campuses will help create a sense of order and hierarchy. The spine will serve as the primary path within the campus and secondary paths will extend from this pathway to the parking areas, open spaces and housing facilities.

1. *The current UH Hilo enrollment is 2,800.*

2. Profile of the Existing Community

This section provides a profile of the social context in which this project is being proposed. Section 2.1 presents statistical information derived from the 1990 U.S. Census. Section 2.1.1 discusses selected demographic information, and Section 2.1.2 provides information about Study Area households and housing units. In Section 2.1.3, labor force characteristics are presented. To understand how the social context may be altered regardless of project implementation, a discussion of public policies is provided in Section 2.2.

This study selected a Primary Study Area based on proximity to the project site, and likelihood for potential for social impacts. The Primary Study Area comprises three census tracts (CT) which are generally between Komohana Street and Kanoelehua Avenue in a west to east direction. The project site is located in CT 205 which extends from Mohouli Street to West Puainako Street. CT 204 is located just north of CT 205 and extends further north to Ponahawai Street. CT 207.01 is south of CT 205, and extends to Haihai Street.

For comparison purposes, information is also presented for the Hilo Census Designated Place and Hawai'i County. The Hilo Census Designated Place includes nine census tracts and extends from Wainaku in the north to the South Hilo - Puna District border. This region includes Ponahawai, Kaumana, Kukuau 2 and Waiakea. *Figure A* delineates the Study Area for this report.

2.1 Community Characteristics

2.1.1 Selected Demographics

In 1990, Hawai'i County had a resident population of 120,317 persons. The Hilo Census Designated Place (CDP) accounted for approximately 32 percent of the island's population, with 37,728 persons. The Primary Study Area had a population of 13,587 persons, which is 36 percent of the Hilo CDP population.

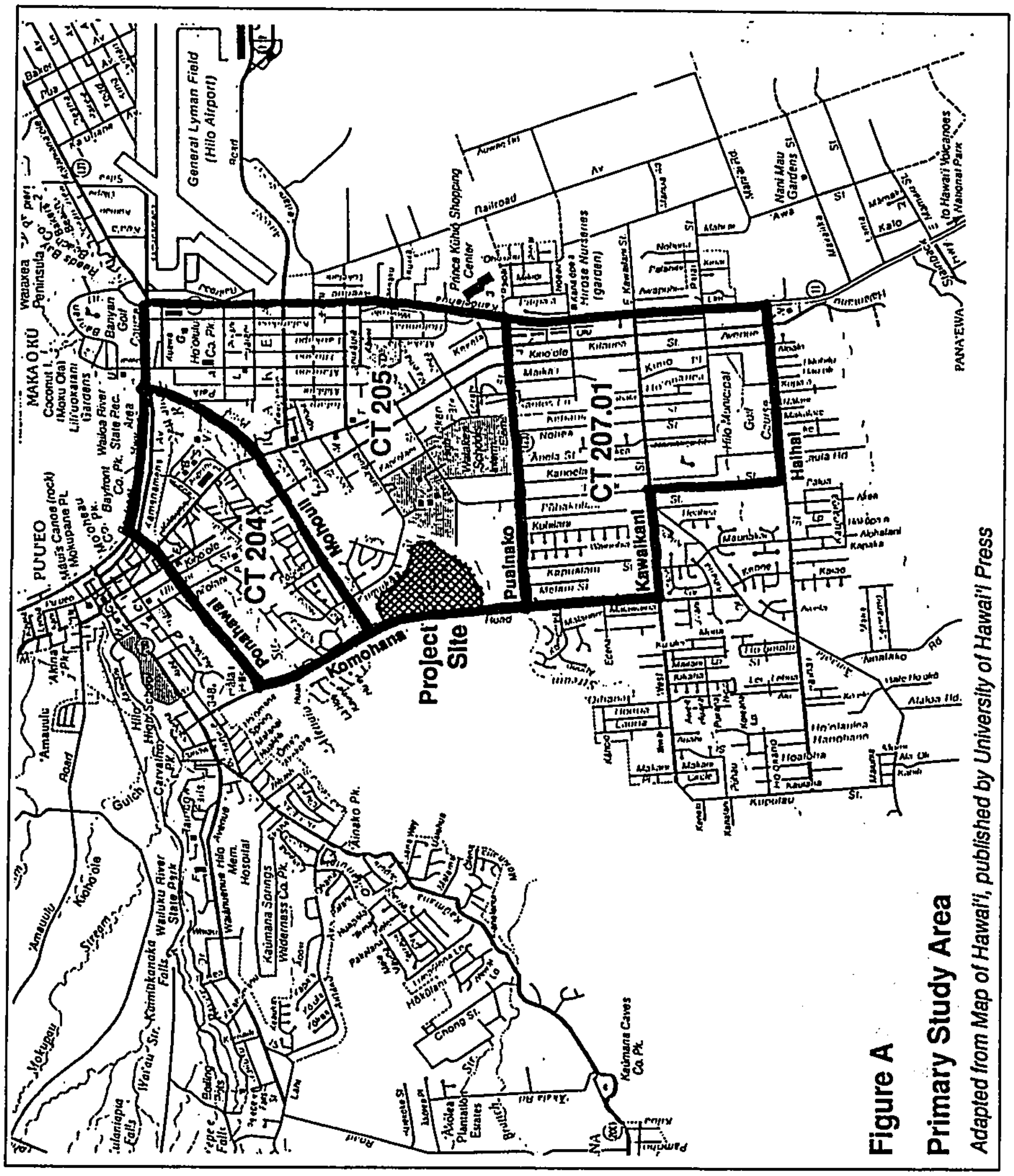


Figure A
Primary Study Area
Adapted from Map of Hawai'i, published by University of Hawai'i Press

Table 1 shows that, at 34.7 years, the median age in the Primary Study Area was similar to the County's median age of 34.3 years. The overall Hilo CDP tended to be older, with a median age of 35.1 years.

Table 1: Selected Demographics

	Hawai'i County	Hilo Census Designated Place	Primary Study Area [a]
Population	120,317	37,728	13,587
Median age	34.3 years	35.1 years	34.7 years
Ethnicity *(in percent)*			
Japanese	21.6	36.6	37.5
Caucasian	39.8	26.8	23.7
Hawaiian	18.8	18.7	19.2
Filipino	12.8	9.0	8.5
Chinese	2.0	2.7	3.2
Other	5.0	6.2	7.9
Total Households	41,461	13,327	5,065
Average household size	2.86 persons	2.79 persons	2.64 persons
Median household income [b]	$29,712	$30,014	$24,103
Family households as part of the total households	74%	73%	70%
Family household size	3.33 persons	3.28 persons	3.18 persons

Table 1: Selected Demographics

	Hawai'i County	Hilo Census Designated Place	Primary Study Area [a]
Family median income [c]	$33,186	$35,370	$30,086

a. The Primary Study Area comprises Census Tracts 204, 205 and 207.01
b. Calculated as a weighted mean of medians.
c. Calculated as a weighted mean of medians.
Source: U. S. Bureau of the Census, 1992 and 1991.

The Study Area differs from Hawai'i County in terms of ethnicity. County-wide, the largest ethnic group is Caucasian, which accounts for almost 40 percent of the total population. In the Hilo CDP and the Primary Study Area, the largest ethnic group is Japanese with 37 and 38 percent, respectively.

Caucasians comprise the second largest ethnic group in Hilo CDP, with 27 percent, and in the Primary Study Area, with 24 percent. This is followed by Hawaiians with 19 percent in both the Hilo CDP and the Primary Study Area.

Households are generally smaller in the Study Area than the County-wide average household size of 2.86 persons. In the Hilo Study Area, an average of 2.79 persons lived in a household; in the Primary Study Area, 2.64 persons.

Median household incomes varied. In Hawai'i County, the total households had a 1990 median income of $29,712. Hilo CDP's median was slightly higher at $30,014, but the Study Area's household median income was low at $24,103.

The Primary Study Area is slightly less family-oriented than Hawai'i County and the Hilo CDP, where, respectively, 74 and 73 percent of the households were family households. In the Primary Study Area, only 70 percent of the total households were families. Family sizes in the Primary Study Area were also smaller, with the average as 3.18 persons. Hawai'i County and the Hilo CDP had average family sizes of 3.33 and 3.28 persons, respectively.

Family household income generally followed the trend of household income with Hilo CDP's 1990 family median income of $35,370 was higher than Hawai'i County's median ($33,186) and that of the Primary Study Area ($30,086).

2.1.2 Housing Units

In 1990, Hawai'i County contained 48,253 housing units, of which 29 percent, or 13,327 were located in the Hilo CDP. *Table 2* contains census information about housing units.

The Primary Study Area had 5,065 housing units. Renters lived almost half of the occupied units (49 percent), and five percent were reportedly vacant in 1990. This was significantlyl higher than both Hawai'i County and Hilo CDP, where renters lived in, respectively, 33 and 37 percent of the occupied units.

Table 2: Housing Units

	Hawai'i County	Hilo Census Designated Place	Primary Study Area [a]
Housing Units	48,253	14,135	5,332
Occupancy *(in percent)*			
Owner-occupied	52.5	56.9	46.0
Renter-occupied	33.4	37.4	49.0
Vacant	14.1	5.7	5.0
Median cost of owner-occupied units [b]	$111,400	$110,000	$106,000
Median rent in renter-occupied units [c]	$490	$417	$304
Housing units per Structure *(in percent)*			
Single family, detached	76.4	72.4	64.7

Table 2: Housing Units

	Hawai'i County	Hilo Census Designated Place	Primary Study Area [a]
Multi-family	21.8	26.1	33.6
Other	1.8	1.5	1.7

a. *The Primary Study Area comprises Census Tracts 204, 205 and 207.01*
b. *Calculated as a weighted mean of medians.*
c. *Calculated as a weighted mean of medians.*
Source: U. S. Bureau of the Census, 1992 and 1991.

Housing costs in the Primary Study tended to be lower than those in Hawai'i County and the overall Hilo CDP. The 1990 median cost of owner-occupied units in the Primary Study Area was $106,000, compared to $110,000 in the Hilo CDP and $111,400 in Hawai'i County. Likewise, Primary Study Area 1990 median rent was low at $304, when compared to Hilo CDP ($417) and Hawai'i County ($490).

The 1990 housing supply in the Primary Study Area differed further in that the area contained proportionally more multi-family units than Hawai'i County and the overall Hilo CDP. In the Primary Study Area, 34 percent of the housing units were multi-family units, compared to 22 percent in Hawai'i County and 26 percent in Hilo CDP.

2.1.3 Labor Force Characteristics

Labor force characteristics presented in *Table 3* suggest the high presence of students in the Primary Study Area. Only 58 percent of the Primary Study Area population participated in the civilian labor force in 1990. Almost 42 percent of the eligible force did not participate, which is significantly high, compared to 36 percent in Hawai'i County and 37 percent in the Hilo CDP.

Table 3: Labor Force

	Hawai'i County	Hilo Census Designated Place	Primary Study Area [a]
Labor Force *(in percent for people 16 years and older)*			
Participating in civilian labor force	64.0	62.6	58.2
In armed forces	0.2	0.3	0.1
Not participating in the labor force [b]	35.8	37.1	41.7
Unemployed	4.6	4.3	4.9

a. *The Primary Study Area comprises Census Tracts 204, 205 and 207.01*
b. *Non-participation in the labor force is when a person is not part of the labor force due to full-time educational activities, illness, injury, lifestyle choice or other reason. Such a person is not considered unemployed.*
Source: U. S. Bureau of the Census, 1992 and 1991.

2.2 Public Policies

A discussion of public policies extends the baseline information because it indicates the forces for change may affect future change in the vicinity of the project site, as well as on the site. This section reviews State projections and policies in Section 2.2.1, and looks at County plans in Section 2.2.2.

2.2.1 State Projections and Policies

State M-K Series

The State Department of Business, Economic Development, and Tourism (DEBDT) regularly publishes long-range population and economic projections commonly known as the M-K series. This series offered county-level future scenarios based on historical and existing trends at the time of release. The last complete set of M-K projections for Hawai'i County was run in 1988, before the economic recession occurred. Further, the 1990 census results were unavailable for incorporation in the M-K base assumption. [3]

Nevertheless, the M-K series remains the best indicator of projected long term growth. Though the actual figures may be overstated, the general patterns are expected to hold true.

The M-K series projections for Hawai'i County for 2000 is 160,400 persons; for 2010 is 206,100 persons. [4] These projections suggest a 34 percent population increase between 1990 and 2000, and a 71 percent increase between 1990 and 2010.

State Land Use Boundary Review

In 1992, the Office of State Planning (OSP) conducted a statewide policy-oriented examination of the land use district classifications. The resulting Five-Year Boundary Review allows the State Land Use Commission to review urbanization proposals in the context of an overall planning horizon, rather than solely on the merits of individual cases.

As part of the review process, OSP comprehensively analyzed urban areas. It gauged the sufficiency of urban-zoned lands and the ability of those lands to accommodate expected population and economic growth. The Boundary Review's population projections for Hawai'i County and the South Hilo region derive from the earlier discussed M-K projections.

OSP projected a 2010 population of 55,520 persons for South Hilo, the district in which the project site is located. [5] This projection implies a population increase of 24 percent over the 1990 South Hilo population of 44,639 persons.

The Boundary Review's projections, taken with the present supply of urbanized lands and remaining vacant developable lands, suggest that the overall Hawai'i County has 22,745 acres of vacant developable urban lands, of which 3,592 acres are located in the South Hilo district.

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3. *Preliminary figures of an updated M-K were released in July 1996, but are still being revised based on recent release by the U.S. Bureau of the Census. County-specific projections are scheduled for release in spring 1997. Information on the status of the M-K projections was provided by Bob Shore and Dr. Tu Duc Pham of the State Department of Business, Economic Development and Tourism.*
4. *Office of State Planning, 1992.*
5. *Office of State Planning, 1992.*

The Boundary Review estimates that South Hilo will require 1,527 acres of Urban land in 2000, which means that the district currently has a surplus of over 1,800 acres of Urban land. There are no boundary changes recommended for the immediate vicinity of the project site.

2.2.2 Relevant County Plans

The General Plan for Hawai'i County

Underlying Hawai'i County policies, plans and rules is the General Plan, which was originally adopting in 1971, and comprehensively revised in 1989 through County Ordinance 89-142.

The General Plan contains three sets of population projections; the variable factor in these sets is the rate of growth of the visitor industry. Series A assumes modest expansion in the visitor industry, and Series C optimistically assumes an increase of 17,800 visitor units plus condominium units. Series B is designed to serve as the medium range.

The 2005 population projections for South Hilo range from 44,115, to 55,335, to 65,790 persons.[6] Series A suggest a slight decrease of population from the 1990 population count of 44,639 persons. The Series B projection is a 24 percent increase over the 1990 population; Series C, a 47 percent increase.

The General Plan states courses of action for each of the island's districts. Generally the courses of action for South Hilo call for the encouragement of some commercial endeavors similar to the Prince Kuhio Plaza. The Plan also encourages the development of UH Hilo, but warns that the development of this public facility relies on State funds, and that Hawai'i County needs to compete with other counties for these funds.

Several courses of action refer specifically to the proposed project, as follows:

6. *County of Hawai'i Planning Department, 1990.*

- ***Economic development*** -- The General Plan directs the County to encourage the State to provide necessary funds for the development of the university complex, and to provide necessary support services and facilities to aid the development of these complexes.
- ***Housing*** -- The General Plan encourages the State to provide student, faculty, and staff housing for UH Hilo.
- ***Public Facilities*** -- The General Plan directs the County to actively participate in the development of student and faculty housing for the university. It also directs the County to support the expansion of the University system, specifically as related to the campus master plan.
- ***Land use*** -- The General Plan directs the County to support UH Hilo and aid in its development of programs which assist agriculture. Further, the commercial zoned lands near the UH Hilo shall be allocated as the need arises.[7]

The project site is designated for "University Use" on the General Plan map.

7. *County of Hawai'i Planning Department, 1990.*

3. Potential Social Impacts

This section identifies potential social impacts which may be generated by the proposed project. Section 3.1 discusses potential population impacts, particularly as related to housing needs. Section 3.2 looks the impacts of the project on the character of the neighborhood and Section 3.3 identifies potential impacts on public services and facilities.

3.1 Population and Housing Impacts

3.1.1 Population

Currently, there are 2,800 students enrolled in the UH Hilo regular credit program. In addition, the existing campus accommodates 2,463 students of Hawai'i Community College. [8]

The proposed project is intended to accommodate 3,067 students on the expanded campus.[9] This increase is part of the long-range plan intended to address current facility problems and build on the strengths of the existing programs. The existing UH Hilo currently has problems associated with an inadequate selection of majors, courses and time offerings, and the project is proposed to expand facilities and provide more academic choices.

There are several sources for the targeted increase in student enrollment. UH Hilo hopes to attract Hawai'i's college bound population who want to leave current residences but cannot afford the tuition and housing costs of similar mainland institutions. The increase in program variety, new undergraduate programs and new masters level programs are also expected to help increase enrollment, as well as the improvement in the overall on-campus experience. [10]

8. *Provided in a memo dated 25 February 1997 from Lo-Li Chih of Facilities Planning of UH Hilo to Gina Ichiyama, Project Management Office of the State Department of Accounting and General Services.*
9. *Provided in a memo dated 9 September from Kay Muranaka, Engineering Concepts, to Lo-Li Chih UH Hilo Facilities.*
10. *From a draft dated 30 October 1996of the UH Hilo Strategic Plan.*

In terms of faculty and staff, the project is estimated to require 558 persons. The total de facto population is 3,625 persons.

Table 4 summarizes the population impacts due to the de facto on-site population.

Table 4: Project Maximum Population Impact Over 1990 Population

	1990 Population	Project Maximum Increase Over 1990 Population [a]
Hawai'i County	120,317	3.0%
South Hilo	44,639	7.5%
Hilo CDP	37,728	8.8%
Primary Study Area	13,587	21.1.%

a. The level of increase lessens as the students originating from Hawai'i County increases.

The increase in on-site population is likely to affect the areas nearest the project site. As discussed in Section 2, the Primary Study Area comprises the neighborhoods most likely to house and interact with the future students. As of 1990, approximately 13,600 people lived in the Primary Study Area. The net addition of 3,625 persons will impact the Primary Study Area population by increasing it a maximum of 21 percent.

In terms of population projections, the population increase due to the proposed project will have a very minor impact on Hawai'i County and South Hilo. The increase of 2,200 students will account for one percent of the 206,100 persons projected for Hawai'i County, and four percent of the 55,520 persons projected for South Hilo. [11]

11. Note that estimates of the project's impacts on population are based on the assumption that all of the additional students will originate outside of Hawai'i County, and are therefore the worst-case scenario.

3.1.2 Housing

The net addition in UH Hilo students will increase the need for housing primarily in the immediate vicinity of the project site. Currently, the UH Hilo campus has 646 dormitory beds; the proposed project will add 750 dormitory beds for a total of 1,396 on-campus beds.

Currently, the Housing Office of UH Hilo provides assistance in finding off-campus housing and seven different apartment complexes in the vicinity of the project site are listed for students as possible rentals. These seven complexes and their vacancies are presented in *Table 5*.

Table 5: Apartment Complexes Near UH Hilo

Apartment Complex	Maximum Number of Persons That Can be Housed	Approximate Vacancy as of March 1997
Hale Kawili	414	10%
Ali'i Kai	104	50%
Country Club Apartments/ Hawai'i Condo Hotel	224	0%
Kapi'olani Manor	296	12%
Kawili Regency	120	10%
Tohbi Hale	64	25%
Waiakea Villas	360	10%
Approximate number of vacant beds		Approximately 200 beds

Rents in these complexes range from $350 per month for a 2-bedroom unit to $800 for a four bedroom units. The apartment complexes are managed by resident managers, and some are managed by real estate companies. They have various requirements for occupancy and offer a wide range of quality and amenities.

In addition to these apartments, several homes in the immediate vicinity are rented to students, or have single rooms available for student rentals.

The increase in students will increase competition for housing rentals in the project vicinity. Given current economic conditions, it is expected that the impact of this increase can be somewhat mitigated based on the following:

- ***There is high vacancy in the current housing market.*** Realtors have indicated that the housing market in the Hilo area has become a renter's market. They reported high vacancy rate last year which caused rents to lower up to $100 per month. They felt that high vacancies will likely continue under current economic conditions, and that future students will have a choice of units as the campus expands.
- ***Plans to build student housing near the University Park will offset long-range impacts.*** UH Hilo is currently in preliminary discussions with private developers to build student housing on Kawili Street adjacent to Waiakea High School. The total number of units would exceed 1,000 and construction would be phased based on need and market. The overall development would also include commercial uses. [12]

3.2 Change to the Character of the Area

3.2.1 Project Relationship to Long-Range Objectives for This Area

The proposed project is consistent with public goals and policies for the future of the project site and the areas surrounding the University Park. As discussed in Section 2.2, County policies, as expressed through the General Plan, consistently call for the establishment and expansion of the UH Hilo campus, as well as for support facilities such as student housing. In addition to the project site, lands west of Komohana Street are designated for university use.

12. *Personal communication with Lo-Li Chih, Facilities Planning, UH Hilo, March 1997.*

Because the project is consistent with public policies for this area, it is likely to be compatible with community expectations for the future. No significant negative impact is therefore anticipated relative to long-range objectives; no mitigation is required.

3.2.2 Impact on Nearby Uses

Two uses are in the vicinity of the project site, including the educational activities related to UH Hilo and Hawai'i Community College, and residential uses.

The project is intended to improve the overall campus experience, including new and expanded academic programs, new student housing, and improved circulation. The overall impacts are therefore expected to be positive and no mitigation is necessary.

Nearby residences are located to the north and south of the project site. To the south are homes along Puainako Street. These single family homes are mostly one-story wooden structures with open garages. The University Heights subdivision is located to the north. The subdivision was built in four phases in the 1960s, and homes of the first and second phases are located on West Lanikaula Street and are situated nearest the site. These homes vary in construction and type. There are both one- and two-story structures and a wide range of landscaping techniques.

There are three types of impacts on these residences. First, construction activities will impact nearby residences by possible increases in noise and dust levels. The level of significance of this impact is directly related to the proximity between the campus and the residences:

- The houses along Puainako Street may be minimally impacted by construction activities. These residences are separated from the project site by vacant land, and the distance between the houses increases in a west to east direction. The vacant land may act as a buffer between the houses and construction activities.

- In the University Heights subdivision, there are approximately 15 homes which are situated along the Wailoa Flood Control Project. The project site is located on the other side of the drainageway, and these homes are the closest to the site. The other homes are buffered from the site by vacant open space.

Mitigation of impacts due to construction can occur through compliance with public rules and regulations governing such activities. Additional mitigation can occur through direct communication between UH Hilo and its neighbors. The university should inform nearby residences of the construction schedule, particularly if there is specific activity which may temporarily cause a significant increase in noise and other problems.

Second, on a long-term basis, the increase in people and activity may affect the current quiet residential character on a daily basis. There will be more structures, more people traveling through the area, and more noise, particularly during gatherings at the proposed intramural field and multi-purpose center.

The level of significance of this impact is directly related to the proximity between the campus and the residences. The homes identified relative to construction activities will be most impacted. This change in character is an inevitable and irreconcilable impact. UH Hilo can help lessen the impact by informing neighbors of major activities to help residents form reasonable expectations of the nature and timing of changes. Further, neighbors should be informed of events at the intramural field and multi-purpose which may temporarily increase noise levels.

Third, for the general vicinity of the project site, the increase in people will mean more vehicular and pedestrian traffic in the vicinity of the campus. From a social perspective, increased traffic can be translated into inconvenience and, if there is a significant increase in traffic, higher levels of stress. Increases in people and activity is an inevitable impact. To help the community understand what may occur in the area, UH Hilo should conduct an information program which provides project-related information and responds to community inquiries. [13]

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13. Specific traffic analysis and mitigation measures were not part of this study.

3.3 Impacts on Public Facilities and Services

3.3.1 Police Protection Services

Hawai'i County is divided into eight police districts. The project site is located in South Hilo, Patrol District 1, which extends from Hakalau in the north, to the mid-point on Kanoelehua Avenue between Hilo and Kea'au in the south, to the Saddle Road in the west.

Patrol District 1 includes the main police station, located at 349 Kapi'olani Street. On each watch, the District has an average of ten police officers on patrol and two supervisors. More than half of the District's patrol officers are assigned to the City of Hilo proper. The main police station is located five minutes travel time from the project site. [14]

The proposed project will impact police protection services because it will generate more people and more traffic. Of primary concern is traffic safety. The Police Department expects that road improvements included in the project plans will mitigate most of the problems associated with the increase in traffic anticipated at the completion of the project. Further mitigation occurs due to the timing of traffic. Arrival and departure times at UH Hilo are spread throughout the day and evening, which helps to alleviate traffic build-up. The Department expects the current level of personnel to provide adequate service for the area when the project is completed.[15] No mitigation is necessary.

3.3.2 Fire Protection Services

The project site is served by the Kawailani Fire Station located at 411 Kawailani Street. This station is staffed by an average of four firefighters 24 hours a day and contains a first line fire truck. The station is three to five minutes travel time from the project site.

Backup service would be provided by the Central Fire Station, located at 466 Kino'ole Street. The station contains two ambulances and a first line fire truck. There are an average of ten to twelve firefighters stationed at Central station. Travel time from the

14. *Personal communication with Captain Charles Chi, South Hilo, Patrol District 1, Hawai'i Police Department, March 1997.*
15. *Personal communication with Captain Charles Chi, South Hilo, Patrol District 1, Hawai'i Police Department, March 1997.*

Central station to the project site is three to five minutes. Additional backup would be provided by the Waiakea Rescue Station and the Kaumana Station with its HAZMAT team, which would be used in the event of a chemical spill. [16]

The proposed project will impact fire protection services because it will increase the service population and add structures to the service area. The Hawai'i Fire Department recommends that, in the consideration of fire safety, roadways at the project site be at least 20 feet wide and that the water volume from the new reservoir not be constrained by inadequate underground pipes. The Department also suggests the inclusion of sprinkler systems wherever possible. These recommendations notwithstanding, the Fire Department anticipates that their facilities and existing personnel levels will provide adequate services to the project site. [17]

3.3.3 Medical Services

Hilo Hospital is the major medical facility in the vicinity of the project site. It is located at 1190 Waianuenue Avenue. The hospital is approximately ten minutes travel time from the project site. Hilo Hospital contains 274 beds, of which approximately 60 percent are in use at any given time.

Ambulance service in Hilo is provided by the Hawai'i Fire Department, which can serve the project site from the Central Fire Station in three to five minutes.

The project will impact medical and emergency services because it will increase the service population. It is anticipated that the project can be adequately served by the existing hospital and ambulance service, however, and no mitigation is necessary.[18]

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16. Personal communication with Richard Kihara, Chief Fire Inspector, Hawai'i Fire Department, March 1997.
17. Personal communication with Richard Kihara, Chief Fire Inspector, Hawai'i Fire Department, March 1997.
18. Personal communication with John McCarthy, Planner, State Health Planning and Development Agency, State Department of Health; and Phoebe Lambreth, Assistant Administrator, Hilo Hospital, March 1997.

3.3.4 Recreational Facilities

The entire South Hilo District contains 54 parks totaling 590 acres. The immediate area of the project site is served by two neighborhood parks, including University Heights Park and Mohouli Park, both of which cover approximately four acres. Both are located within walking distance of UH Hilo.

The UH Hilo campus contains recreational facilities used for basketball, baseball, tennis, volleyball, and soccer. In all, the facilities encompass approximately 15 acres on the existing campus. Additionally, between ten and 20 acres along the Waiakea Stream, which separates the existing campus from the project site, have been dedicated to the County of Hawai'i for garden and recreational use as well as for flood control. The County has given its approval in principle to the dedication proposal and is waiting for detailed plans in order to issue a final approval. It is anticipated that sufficient recreational facilities exist and/or are planned to serve the project's proposed increase in population at the campus. [19]

The project will impact recreational facilities because it will add more people to the area and increase competition for parks and recreational space. Some mitigation will occur through the development of the on-site intramural field.

19. *Personal communication with Glenn Miyao, Planner, Hawai'i County Parks Department; and Lo-Li Chih, Planner/Architect, Facilities Planning Office, UH Hilo*

APPENDIX G

TRAFFIC NOISE STUDY
(by Y. Ebisu & Associates)

TRAFFIC NOISE STUDY FOR THE UNIVERSITY OF HAWAII AT HILO UNIVERSITY PARK PROJECT
Hilo, Hawaii, Hawaii

Prepared for:

ENGINEERING CONCEPTS, INC.

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1126 12th Avenue, Room 305
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February 1997

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CHAPTER I. SUMMARY

This study evaluated the potential noise impacts in the immediate vicinity of and attributable to the proposed development of the University Park Project within the University of Hawaii at Hilo complex on the island of Hawaii. The possible changes in traffic volumes and noise levels along the existing and proposed roadways surrounding the University Park Project were also investigated.

Existing noise sensitive dwelling units along the west and east sections of Kawili Street are not expected to be adversely impacted by the development of the University Park Project. The reason for this conclusion is that the traffic volumes and noise levels along Kawili Street are not anticipated to increase significantly as the result of the University Park Project. The resulting increases in traffic noise levels along Kawili Street are anticipated to be 0.5 dB or less, which are considered to be insignificant. Also, traffic noise levels at these dwelling units are not predicted to exceed federal or local noise standards and criteria.

The greatest increase in traffic noise levels are expected to occur within the University Park complex and along the new access road to Lanikaula Street, which crosses through the main campus of the University of Hawaii, Hilo. This is due to the relatively low existing background ambient noise levels within the interior areas of the University Park and the university campus, which are removed from the existing roadways. Traffic noise levels at the student dormitory, classroom, and office buildings along the access roadway to Lanikaula Street are expected to increase by approximately 3 to 10 dB as a result of project and non-project traffic. This degree of increase is considered to be large, but traffic noise mitigation measures are not required by federal and local noise standards for residences, classrooms, and offices.

Unavoidable construction noise impacts are possible during construction of the new access roadway to the University Park Project between Waiakea Stream and Lanikaula Street. Mitigation of construction noise to inaudible levels will not be practical in all cases due to the intensity of construction noise sources (80 to 90+ dB at 50 FT distance), and due to the exterior nature of the work (rock breaking, grading and earth moving, trenching, concrete pouring, hammering, etc.). The use of properly muffled construction equipment should be required on the job site. The use of plywood noise barriers is also possible where close-in construction work is unavoidable. The incorporation of State Department of Health construction noise limits and curfew times, which are now applicable on the island of Hawaii, is another noise mitigation measure which can be applied to this project. In addition, scheduling of the noisier portions of the construction work during non–classroom hours is also suggested.

CHAPTER II. NOISE DESCRIPTORS AND THEIR RELATIONSHIP TO LAND USE COMPATIBILITY

A general consensus has developed for use of the Day–Night Sound Level (Ldn) in describing environmental noise in general, and for relating the acceptability of the noise environment for various land uses. The Day–Night Sound Level represents the 24–hour average sound level for a typical day, with nighttime noise levels (from 10:00 PM to 7:00 AM) increased by 10 decibels prior to computation of the 24–hour average.

The Ldn descriptor employs a process of averaging instantaneous A–Weighted sound levels as read on a standard Sound Level Meter, which are normally referred to as meter readings in dBA. A brief description of the acoustic terminology and symbols used are provided in APPENDIX B. The average noise level during a one hour period is called the hourly equivalent sound level, and is designated as Leq(h) or Leq. The maximum A–Weighted sound level occurring during an intermittent event (or single event) is referred to as the Lmax value. The mathematical product (or integral) of the instantaneous sound level times the duration of the event is known as the Sound Exposure Level, or Lse, and is analogous to the energy of the time varying sound levels associated with the intermittent noise event. Current noise standards and criteria which associate land use compatibility or adverse health and welfare effects with various levels of environmental noise are normally described in terms of Ldn rather than the single event (Lmax or Lse) noise descriptors. The reasons for this are based on the relatively good correlation between the cumulative Ldn descriptor and annoyance reactions of the exposed population. However, at very low levels of environmental noise (55 Ldn or less), other attitudinal variables and biases (besides noise) of the exposed population tend to influence annoyance reactions, and the correlation between annoyance reactions and Ldn levels deteriorates.

TABLE 1, extracted from Reference 1, categorizes the various Ldn levels of outdoor noise exposure with severity classifications. Land use compatibility guidelines for various levels of environmental noise as measured by the Ldn descriptor system are shown in FIGURE 1. A general consensus among federal agencies has developed whereby residential housing development is considered acceptable in areas where exterior noise does not exceed 65 Ldn. This value of 65 Ldn is used as a federal regulatory threshold for determining the necessity for special noise abatement measures when applications for federal funding assistance are made.

Federal agencies (HUD and EPA) recognize 55 Ldn as a desirable goal for exterior

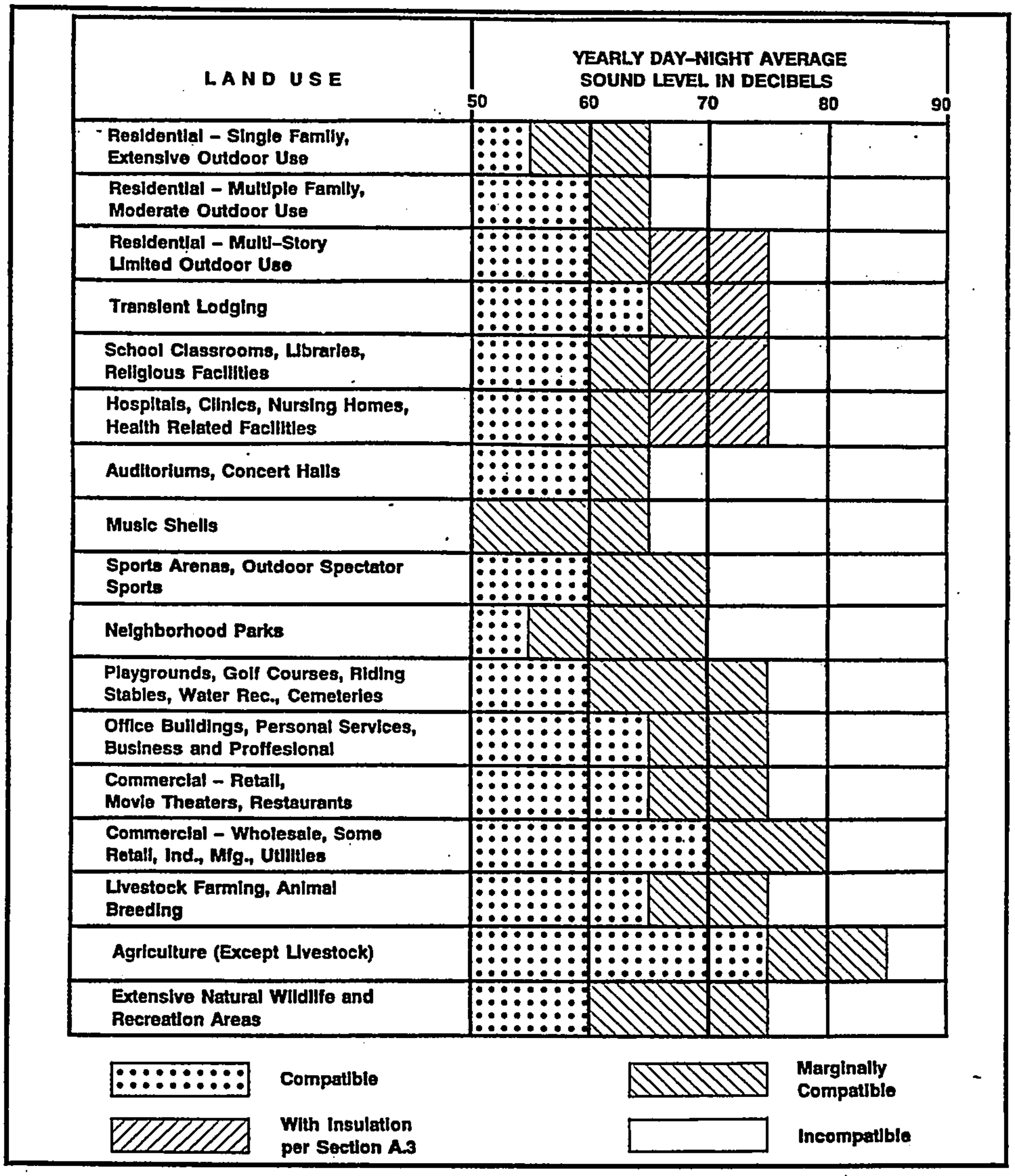
TABLE 1

EXTERIOR NOISE EXPOSURE CLASSIFICATION (RESIDENTIAL LAND USE)

NOISE EXPOSURE CLASS	DAY–NIGHT SOUND LEVEL	EQUIVALENT SOUND LEVEL	FEDERAL (1) STANDARD
Minimal Exposure	Not Exceeding 55 Ldn	Not Exceeding 55 Leq	Unconditionally Acceptable
Moderate Exposure	Above 55 Ldn But Not Above 65 Ldn	Above 55 Leq But Not Above 65 Leq	Acceptable(2)
Significant Exposure	Above 65 Ldn But Not Above 75 Ldn	Above 65 Leq But Not Above 75 Leq	Normally Unacceptable
Severe Exposure	Above 75 Ldn	Above 75 Leq	Unacceptable

Notes: (1) Federal Housing Administration, Veterans Administration, Department of Defense, and Department of Transportation.

(2) FHWA uses the Leq instead of the Ldn descriptor. For planning purposes, both are equivalent if: (a) heavy trucks do not exceed 10 percent of total traffic flow in vehicles per 24 hours, and (b) traffic between 10:00 PM and 7:00 AM does not exceed 15 percent of average daily traffic flow in vehicles per 24 hours. The noise mitigation threshold used by FHWA for residences is 67 Leq.



LAND USE COMPATIBILITY
WITH YEARLY DAY-NIGHT AVERAGE SOUND LEVEL
AT A SITE FOR BUILDINGS AS COMMONLY CONSTRUCTED
(Source: American National Standards Institute S12.40-1990)

FIGURE 1

noise in residential areas for protecting the public health and welfare with an adequate margin of safety (References 2 and 3). Although 55 Ldn is significantly quieter than 65 Ldn, the lower level has not been adopted for regulatory purposes by federal agencies due to economic and technical feasibility considerations.

The U.S. Federal Highway Administration (FHWA) uses the Leq or L10 descriptors rather than the Ldn noise descriptor in assessing highway noise impacts and noise mitigation requirements (Reference 4). The L10 descriptor represents the noise level exceeded ten percent of the time during the peak traffic hour of interest. The Leq is normally evaluated during the peak traffic hour. For traffic noise levels in the project area, the Leq and Ldn levels are essentially identical (within 1 dB). TABLE 2, which was extracted from Reference 4, presents the current FHWA Noise Abatement Criteria which are normally applied in evaluations of potential noise impacts on federally–sponsored roadway improvement projects. In general, the 67 Leq threshold for Activity Category B is applied at all residences in the vicinity of these roadway improvement projects. The Hawaii State Department of Transportation (HDOT) uses a 66 Leq threshold in place of the 67 Leq FHWA standard as its noise abatement criteria. In addition, HDOT considers a substantial increase in traffic noise levels to be one which is "greater than 15 dB" (Reference 5). The FHWA and HDOT standards and criteria are typically used on federally–funded roadway and bridge improvement work, and may not apply to all projects.

TABLE 2

FHWA NOISE ABATEMENT CRITERIA
[Hourly A–Weighted Sound Level––Decibels (dBA)]

ACTIVITY CATEGORY	LEQ (h)*	DESCRIPTION OF ACTIVITY CATEGORY
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the areas are to continue to serve their intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, activity sports areas, parks, residences, motels, hotels, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	––––––	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

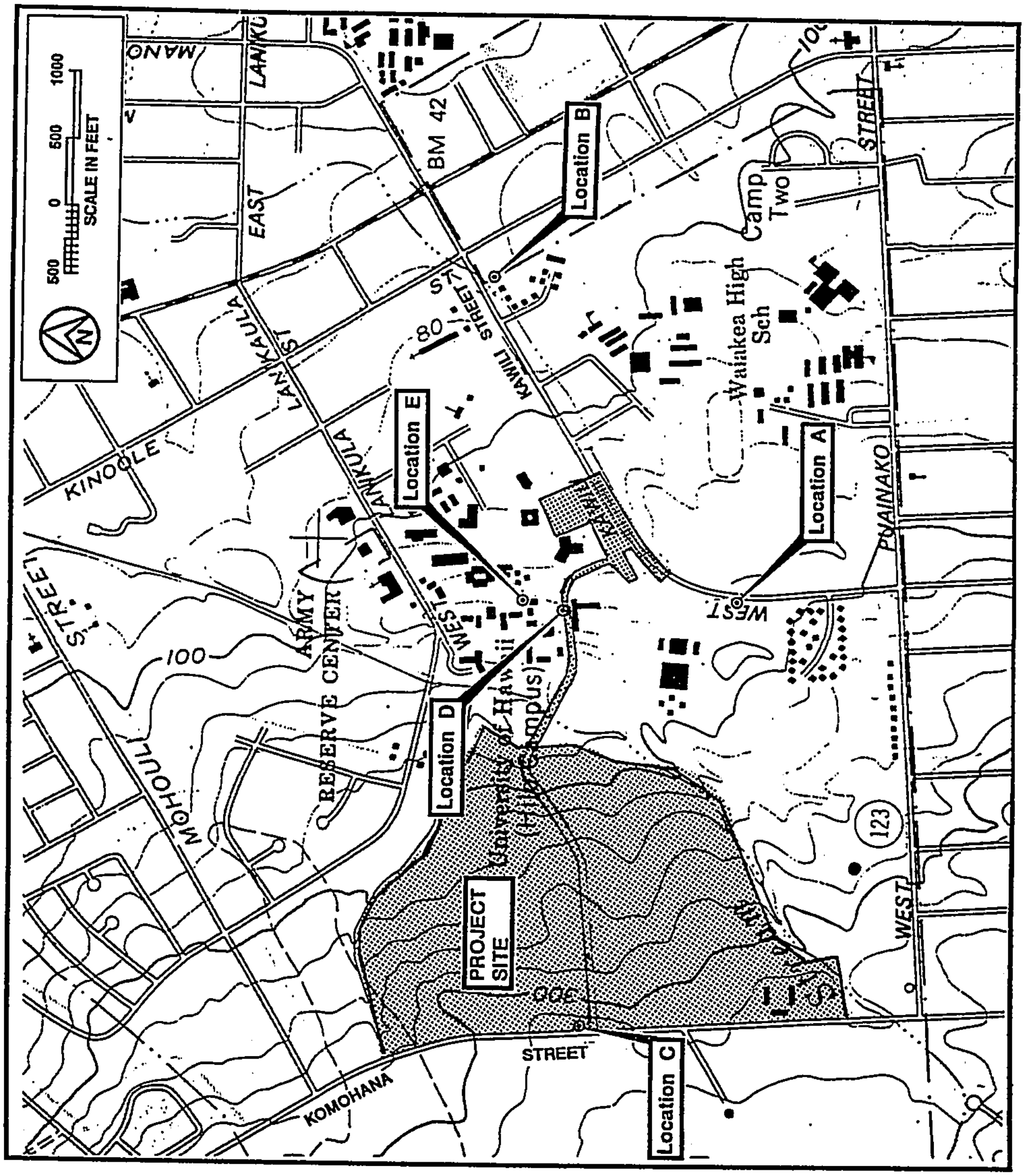
* The Hawaii State Department of Transportation, Highways Division, utilizes Leq criteria levels which are 1 Leq unit less than the FHWA values shown.

CHAPTER III. GENERAL STUDY METHODOLOGY

Existing traffic and background ambient noise levels were measured at five locations in the project environs to provide a basis for describing the existing traffic and background ambient noise levels and for calibrating the Federal Highway Administration (FHWA) Highway Noise Model. The FHWA model was used to predict the traffic noise levels along the existing and future roadway sections servicing the University Park Project. The noise measurements were performed during the month of May 1996. The noise measurement Locations A thru E are shown in FIGURE 2, and the measurement results are included in TABLE 3 and FIGURES 3 thru 7. TABLE 3 also includes a comparison of the measured traffic noise levels with predictions of the FHWA Highway Noise Model.

The Federal Highway Administration (FHWA) Traffic Noise Prediction Model Reference 6) was used as the primary method of calculating the existing and future traffic noise levels, with model parameters adjusted to reflect terrain, ground cover, and local shielding conditions. The measured traffic noise levels at Locations A thru C were compared with model predictions to insure that measured and calculated noise levels for the existing conditions were consistent and in general agreement. As indicated in TABLE 3, spot counts of existing traffic volume were obtained during the noise measurement periods and were used to generate the Equivalent Sound Level (Leq) predictions shown in the table. The agreement between measured and predicted traffic noise levels was considered to be good and sufficiently accurate to justify use of the highway noise model to formulate the existing and future traffic noise contours.

The potential noise impacts associated with the planned connection of the University Park Site via the Waiakea Stream Bridge to the main campus and to the Lanikaula Street access were examined. Future traffic noise levels for CY 2010 conditions with and without the implementation of the University Park Project were developed along the existing and new roadways in the environs of the park project. Reference 7 was used to develop the existing (CY 1996) and future (CY 2010) peak hour traffic volumes with and without the project along the roadways servicing the University Park Project References 8 thru 10 and FIGURES 8 thru 10 were used to estimate the relationships between the AM and PM peak hour Leq's and the 24–hour Ldn's along the roadways of interest. Traffic vehicle mixes along the existing roadways were assumed to remain constant between CY 1996 and CY 2010. The Day–Night Sound Level (Ldn) noise descriptor was used in addition to the hourly Leq descriptor to evaluate potential traffic noise impacts and to allow for direct comparisons of the existing and future traffic noise levels with the 65 Ldn FHA/HUD noise standard.



LOCATIONS OF NOISE MEASUREMENT SITES

FIGURE 2

TABLE 3

TRAFFIC AND BACKGROUND NOISE MEASUREMENT RESULTS

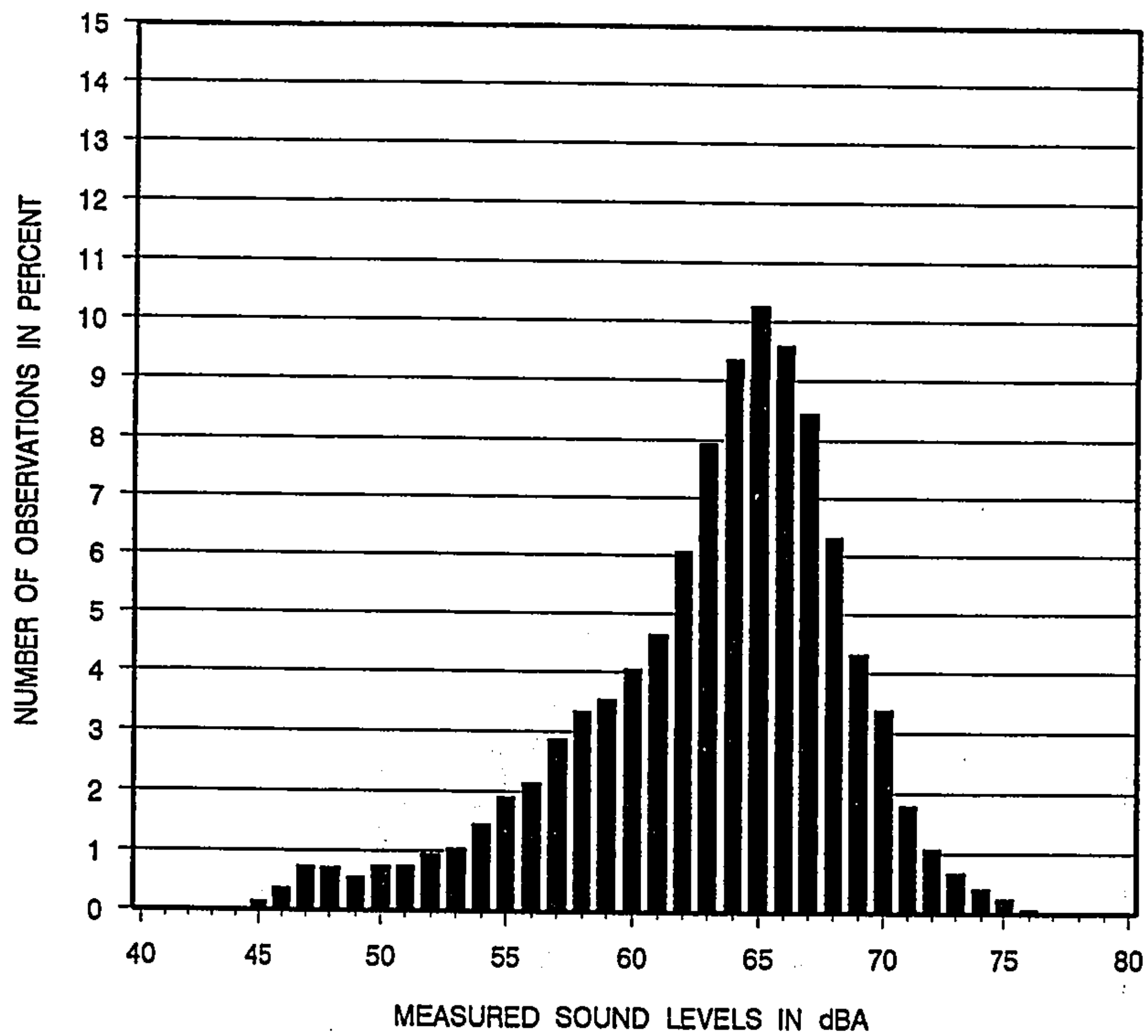
LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	--Hourly Traffic Volume-- AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
A. 50 FT from the center-line of W. Kawili St. (5/15/96)	1115 TO 1215	45	527	13	3	62.7	62.8
A. 50 FT from the center-line of W. Kawili St. (5/16/96)	0715 TO 0815	45	1,064	4	5	64.9	65.0
B. 84 FT from the center-line of W. Kawili St. (5/14/96)	0715 TO 0815	35	1,002	10	11	58.6	58.7
C. 50 FT from the center-line of Komohana St. (5/13/96)	1615 TO 1721	50	1,207	11	4	67.3	67.1
D. 750 FT from the center-line of W. Kawili St. (5/15/96)	0955 TO 1055	45	N/A	N/A	N/A	51.2	N/A
E. 620 FT from the center-line of Lanikaula St. (5/16/96)	0715 TO 0815	40	N/A	N/A	N/A	49.2	N/A

FIGURE 3

HISTOGRAM OF MEASURED SOUND LEVELS AT LOCATION "A"

DATE: MAY 16, 1996
TIME: 0715–0815 HOURS

METER RESPONSE: FAST



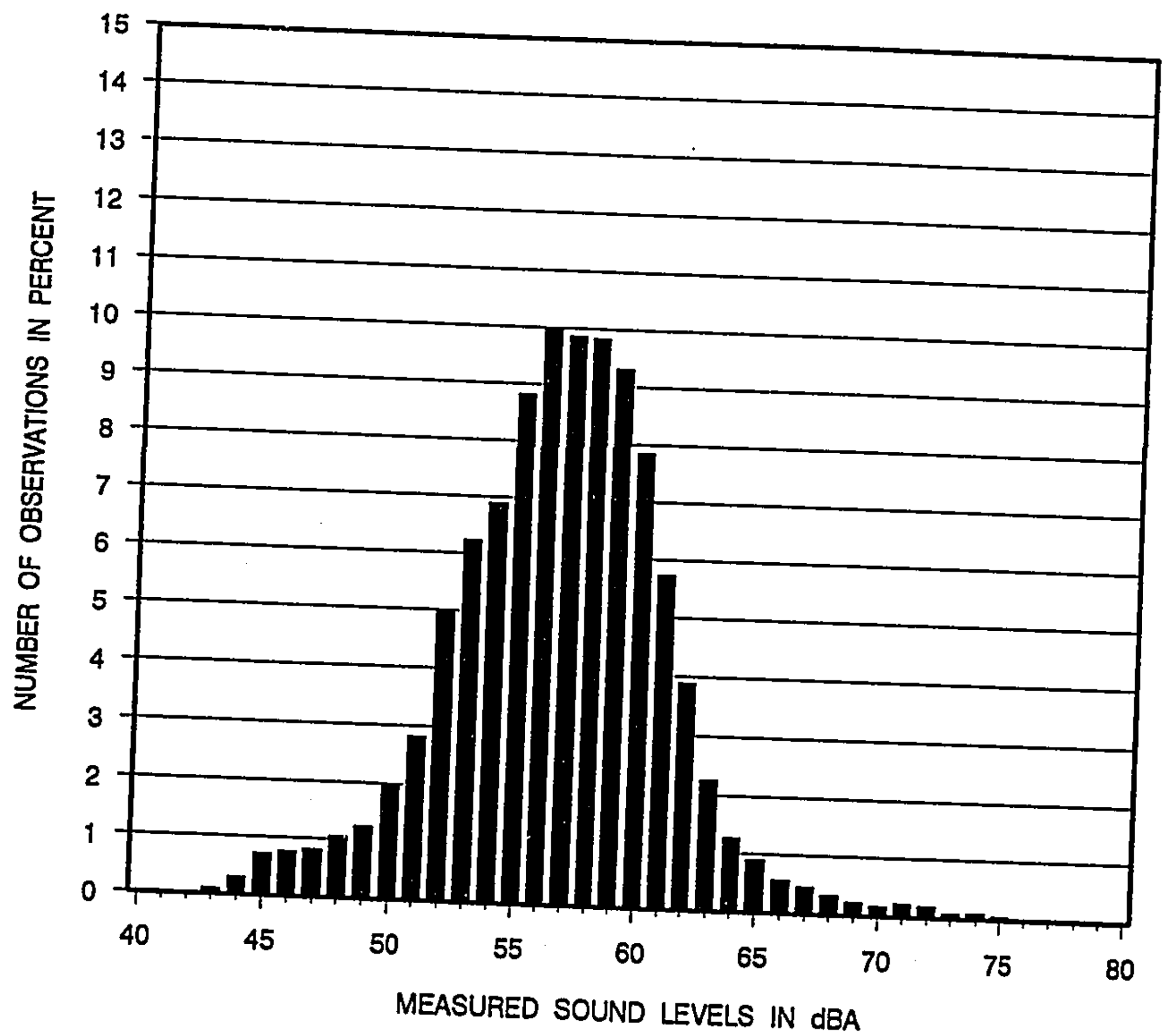
Lmax:	77.2 dBA
L10:	68.1 dBA
L50:	63.6 dBA
Leq:	64.9 dBA
Lmin:	43.6 dBA

FIGURE 4

HISTOGRAM OF MEASURED SOUND LEVELS AT LOCATION "B"

DATE: MAY 14, 1996
TIME: 0715–0815 HOURS

METER RESPONSE: FAST



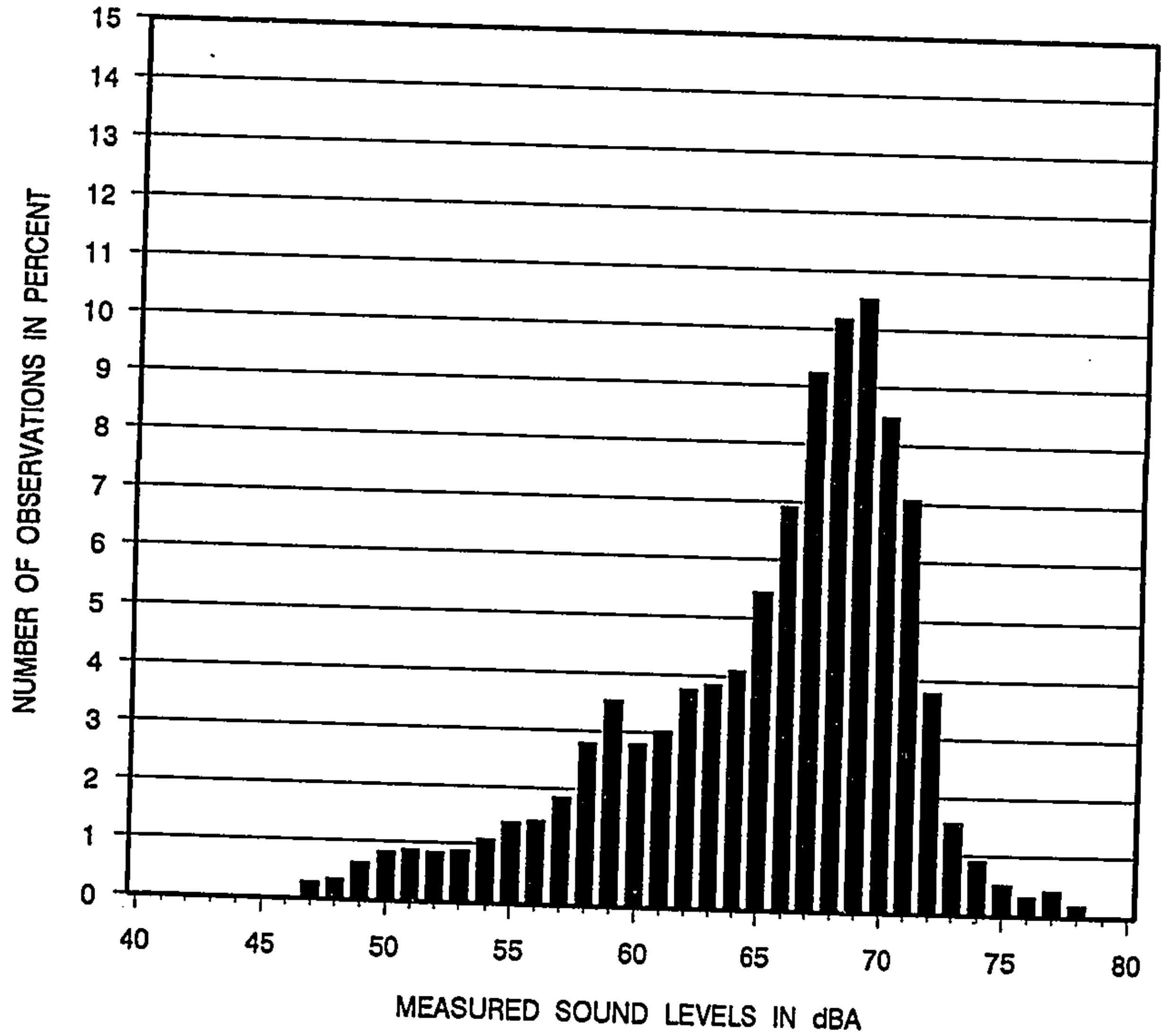
Lmax: 78.1 dBA
L10: 61.1 dBA
L50: 56.1 dBA
Leq: 58.6 dBA
Lmin: 42.0 dBA

FIGURE 5

HISTOGRAM OF MEASURED SOUND LEVELS AT LOCATION "C"

DATE: MAY 13, 1996
TIME: 1706–1721 HOURS

METER RESPONSE: FAST



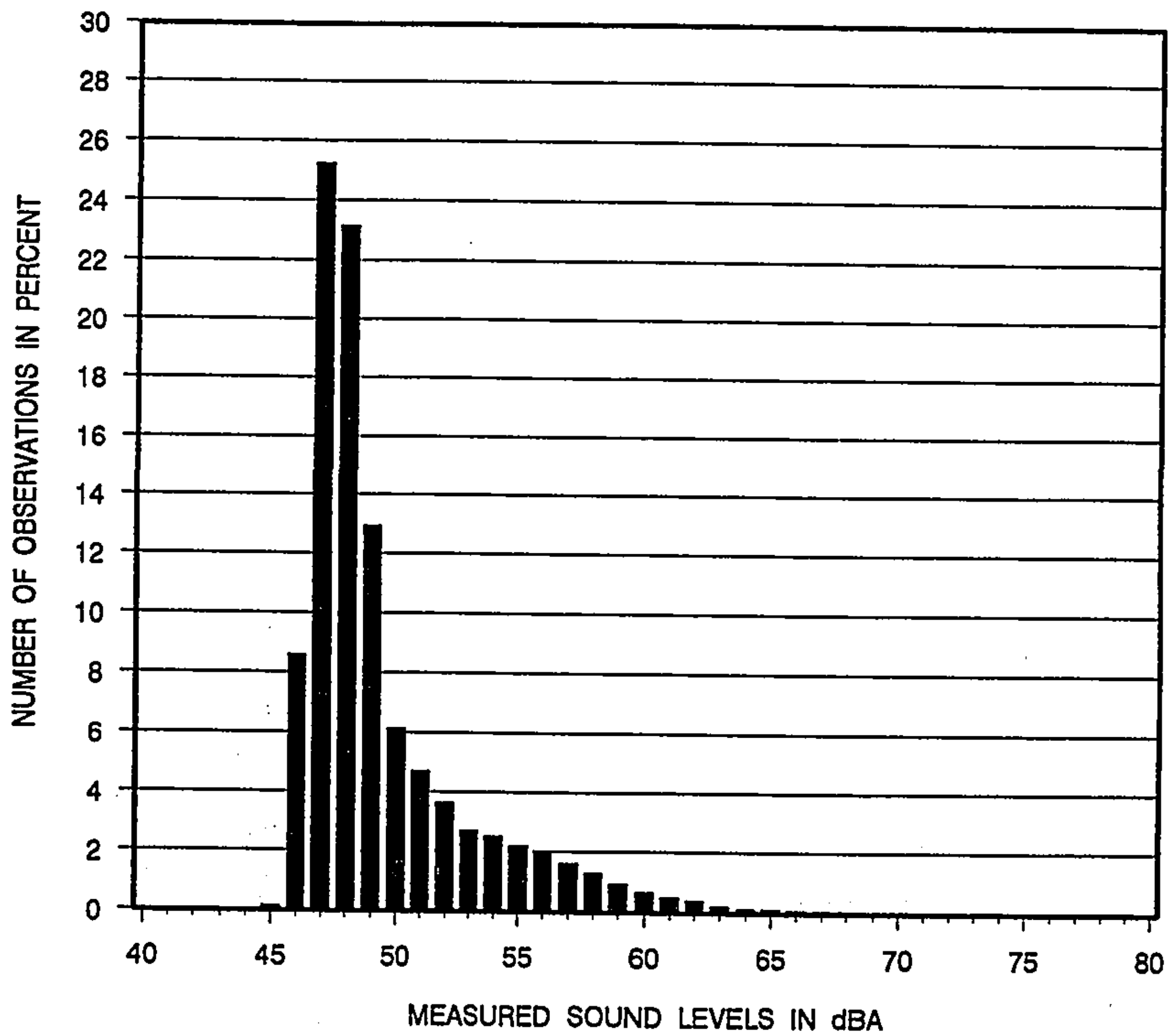
Lmax: 78.0 dBA
L10: 70.6 dBA
L50: 66.1 dBA
Leq: 67.3 dBA
Lmin: 45.7 dBA

FIGURE 6

HISTOGRAM OF MEASURED SOUND LEVELS AT LOCATION "D"

DATE: MAY 15, 1996
TIME: 0955–1055 HOURS

METER RESPONSE: FAST



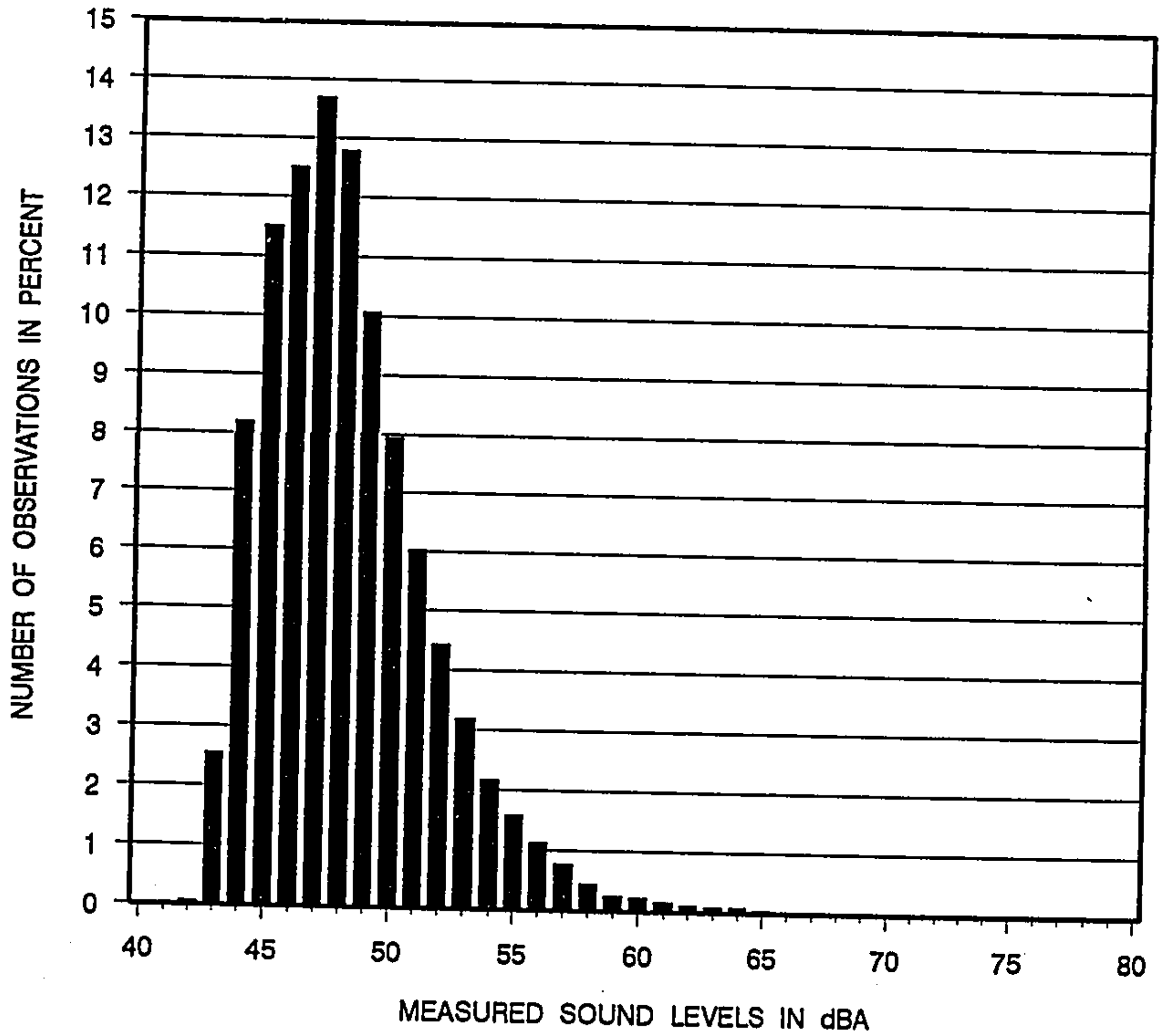
Lmax: 73.4 dBA
L10: 54.1 dBA
L50: 47.6 dBA
Leq: 51.2 dBA
Lmin: 44.5 dBA

FIGURE 7

HISTOGRAM OF MEASURED SOUND LEVELS AT LOCATION "E"

DATE: MAY 15, 1996
TIME: 1425–1525 HOURS

METER RESPONSE: FAST



Lmax: 65.7 dBA
L10: 52.1 dBA
L50: 47.1 dBA
Leq: 49.2 dBA
Lmin: 41.3 dBA

FIGURE 8

HOURLY VARIATIONS OF TRAFFIC NOISE AT 100 FT SETBACK DISTANCE FROM THE CENTERLINE OF WEST KAWILI ST. AT PUAINAKO ST.
(JULY 5, 1994)

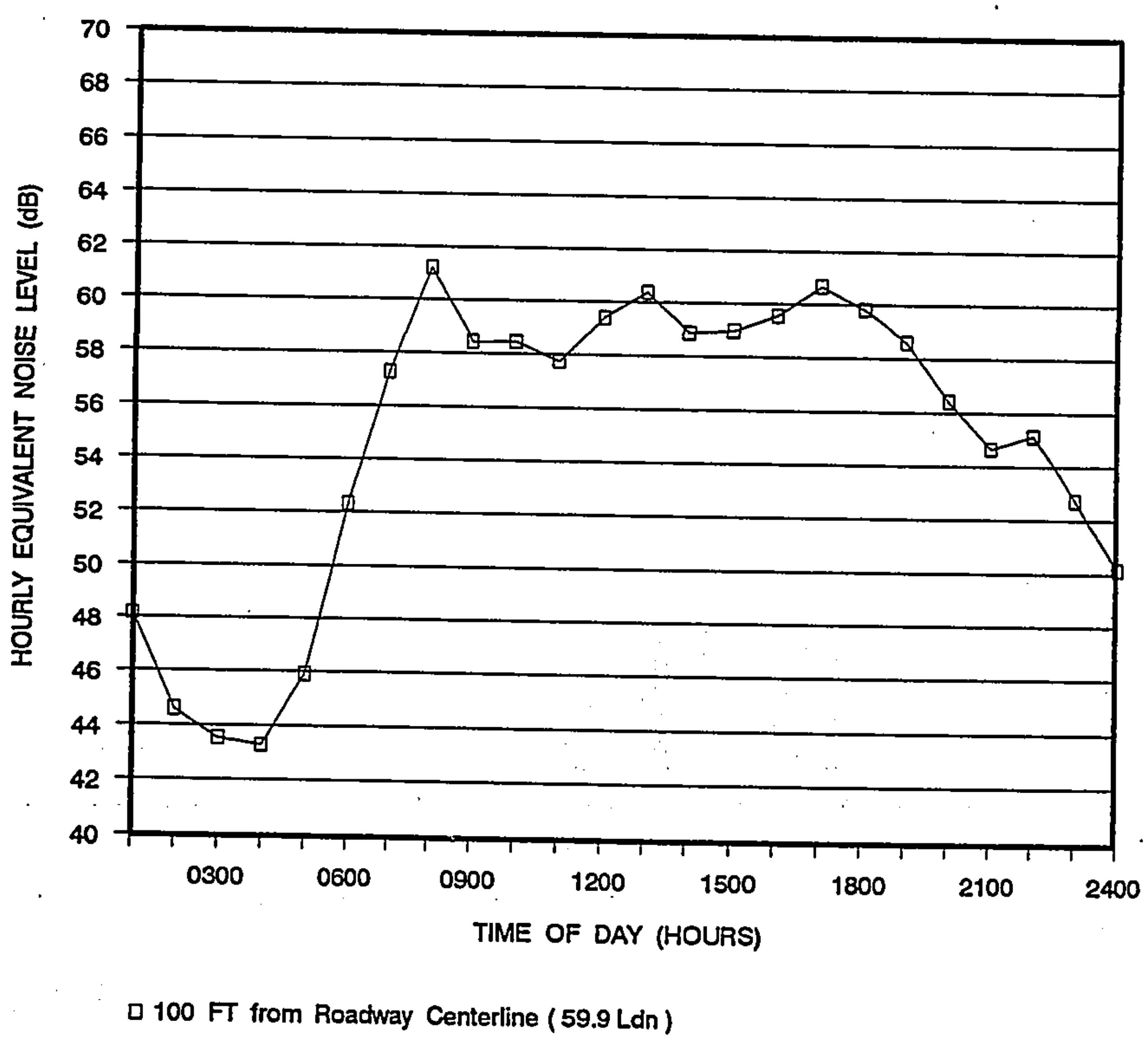


FIGURE 9

HOURLY VARIATIONS OF TRAFFIC NOISE AT 100 FT SETBACK DISTANCE FROM THE CENTERLINE OF KOMOHANA ST. SOUTH OF PONAHAWAI ST. (JUNE 27, 1994)

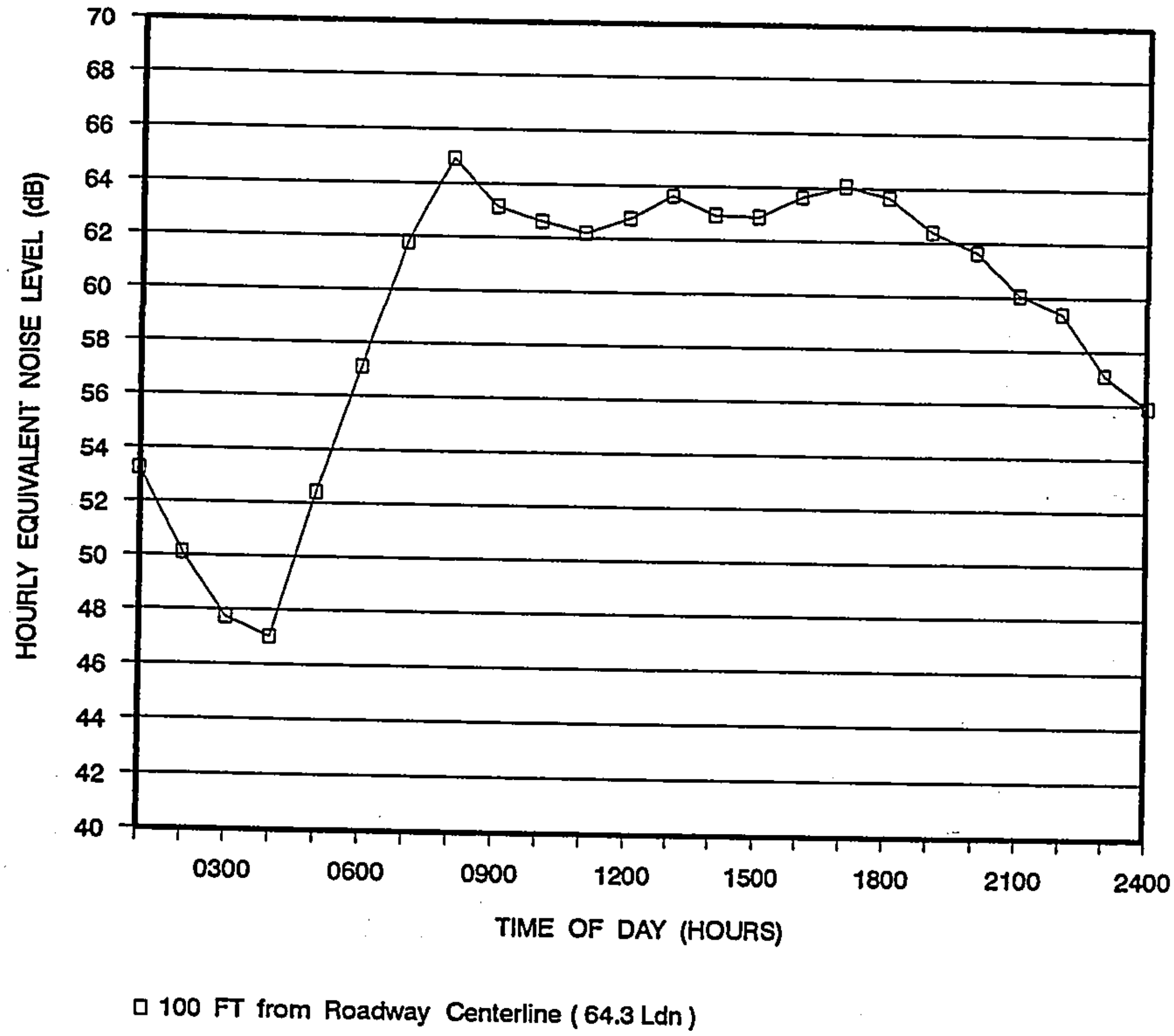
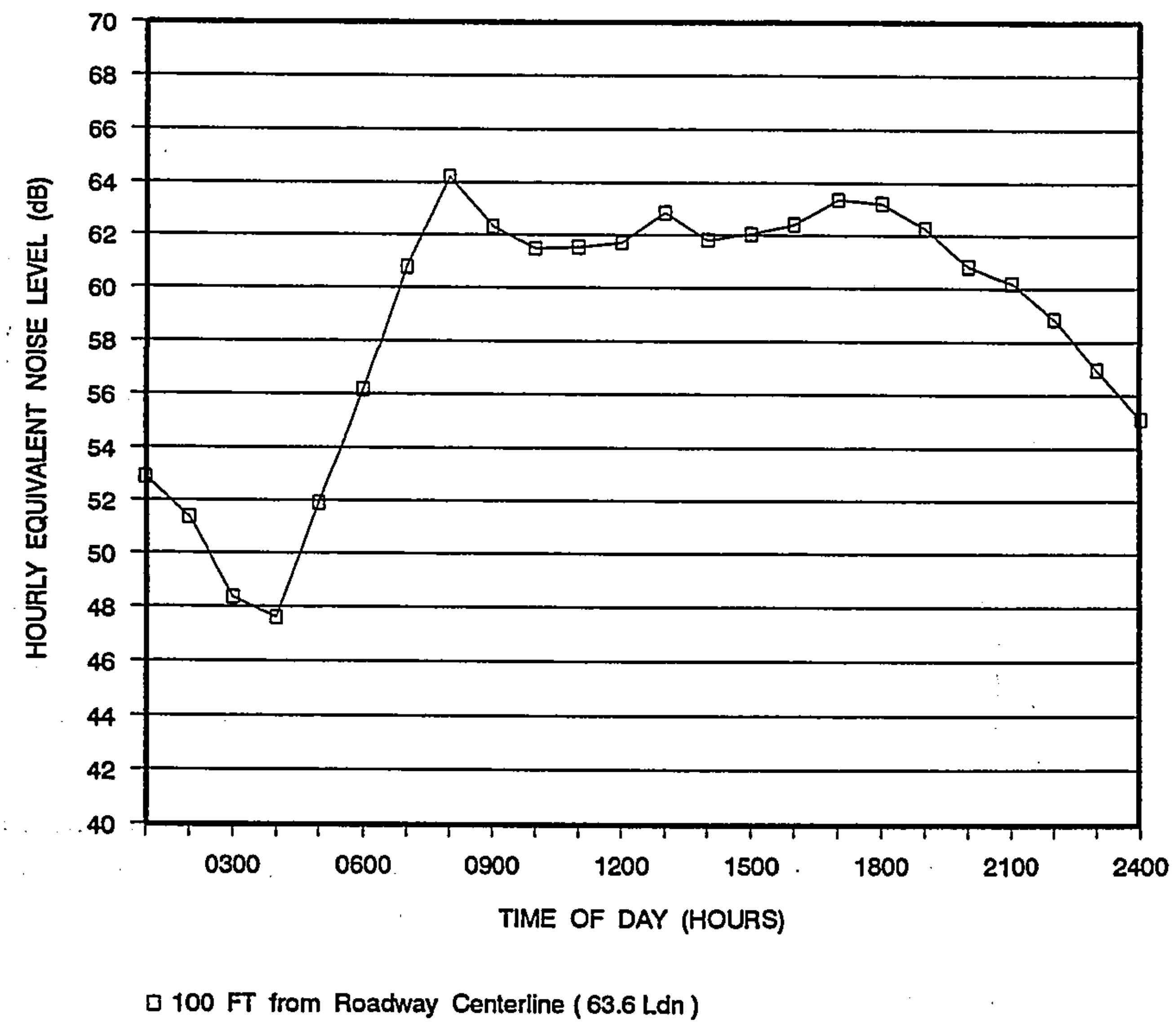


FIGURE 10

HOURLY VARIATIONS OF TRAFFIC NOISE AT 100 FT SETBACK DISTANCE FROM THE CENTERLINE OF KOMOHANA ST. AT PUAINAKO ST. (JUNE 28, 1994)



The predicted CY 2010 traffic noise levels at noise sensitive receptors in the project environs were evaluated. The predicted future traffic noise levels were compared with existing noise levels as well as with the 65 Ldn FHA/HUD noise abatement criteria to identify specific locations where noise abatement measures might be necessary. These evaluations were performed for CY 2010 conditions with and without implementation of the University Park Project. Evaluations of potential noise impacts and the need for possible mitigation measures at the existing university student dormitory, classroom, and office buildings were also performed due to the anticipated increase in traffic noise along the interior roadways between the proposed Waiakea Bridge and the Lanikaula Street access.

CHAPTER IV. EXISTING AND FUTURE TRAFFIC NOISE ENVIRONMENT

Existing Traffic Noise Levels. The existing traffic noise levels in the project environs are in the "Moderate Exposure, Acceptable" and "Significant Exposure, Normally Unacceptable" categories along the Rights-of-Way of Komohana Street, Lanikaula Street, and West Kawili Street. Traffic noise levels along the Right-of-Way of a roadway generally represent the worst case (or highest) levels due to the proximity of the Right-of-Way to the traffic noise sources. Existing traffic noise levels are highest along Komohana Street at approximately 70 Ldn at 50 FT distance from the street's centerline. Along West Kawili Street, existing traffic noise levels are approximately 67 Ldn at 50 FT distance from the centerline. Existing traffic noise levels are lower (between 62 to 63 Ldn) along the eastern end of Kawili Street and along Lanikaula Street.

Calculations of existing traffic noise levels during the AM and PM peak traffic hours are presented in TABLES 4A and 4B. The hourly Leq (or Equivalent Sound Level) contributions from each roadway section in the project environs were calculated for comparison with forecasted traffic noise levels with and without the implementation of the University Park Project by CY 2010. The existing setback distances from the roadways' centerlines to their associated 55, 60, and 65 Ldn contours were also calculated as shown in TABLE 5. The contour line setback distances do not take into account noise shielding effects from walls or buildings, or the additive contributions of traffic noise from intersecting street sections.

Traffic noise levels at the existing student dormitory buildings of the university along West Kawilli Street (near noise measurement Location "A") currently range from approximately 50 to 60 Ldn. On campus, near the Hale Ikena Dormitory, existing background ambient noise levels are in the order of 50 Ldn. Current traffic noise levels at the student dormitory buildings are considered to be compatible for residential uses, and are below the FHA/HUD noise abatement standard of 65 Ldn. Existing traffic noise levels at these college dormitory buildings are also less than the FHWA and HDOT noise abatement criteria of 67 Leq and 66 Leq, respectively.

Future Traffic Noise Levels. Calculations of future (CY 2010) traffic noise levels during the AM and PM peak traffic hours are presented in TABLES 4A and 4B for conditions following completion of the new access roadways within the University Park and the university campus. The future setback distances from the roadways' centerlines to their associated 55, 60, and 65 Ldn contours were also calculated as shown in TABLE 5. The contour line setback distances do not take into account noise shielding effects from

TABLE 4A

COMPARISONS OF BASE YEAR (CY 1996) AND FUTURE (CY 2010) TRAFFIC NOISE LEVELS ALONG ROADWAYS SERVICING THE PROJECT (AM PEAK HOUR AND 50 FT FROM ROADWAY CENTERLINE)

LOCATION	SPEED (MPH)	VPH	**** HOURLY LEQ IN dB **** AUTO	MT	HT	ALL VEH
BASE YEAR (CY 1996) AM PEAK HR. TRAFFIC:						
W. Kawili Street (W. of U.H. Parking Lot)	45	1,125	64.1	55.4	60.2	66.0
W. Kawili Street (E. of U.H. Parking Lot)	35	1,125	60.0	51.7	57.5	62.3
Komohana Street (South of Project)	50	1,355	66.7	57.8	62.1	68.4
Komohana Street (North of Nawelo St.)	50	1,548	67.3	58.3	62.7	69.0
Komohana Street (South of Nawelo St.)	50	1,541	67.2	58.3	62.7	68.9
Nawelo Street	25	41	40.1	32.4	39.5	43.2
Lanikaula Street (West of Access #7 Rd.)	40	486	58.5	50.0	55.3	60.6
Lanikaula Street (East of Access #7 Rd.)	40	538	59.0	50.5	55.7	61.1
Access #7 Road	25	136	45.3	37.6	44.7	48.4
FUTURE CONDITIONS (CY 2010) AM PEAK HR. TRAFFIC:						
W. Kawili Street (W. of U.H. Parking Lot)	45	1,520	65.4	56.7	61.5	67.3
W. Kawili Street (E. of U.H. Parking Lot)	35	1,595	61.5	53.2	59.0	63.8
Komohana Street (South of Project)	50	1,300	66.5	57.6	62.0	68.2
Komohana Street (North of Nawelo St.)	50	2,495	69.3	60.4	64.8	71.0
Komohana Street (South of Nawelo St.)	50	2,450	69.3	60.3	64.7	71.0
Nawelo Street	25	740	52.6	44.9	52.1	55.8
Lanikaula Street (West of Access #7 Rd.)	40	875	61.1	52.6	57.9	63.2
Lanikaula Street (East of Access #7 Rd.)	40	1,125	62.2	53.7	58.9	64.3
Access #7 Road	25	440	50.4	42.7	49.8	53.5

Note:

The following assumed traffic mix of autos, medium trucks, and heavy vehicles were used for existing and future pm peak hour conditions along all roadways: 98.0% autos, 1.0% medium trucks, and 1.0% heavy trucks and buses.

TABLE 4B

COMPARISONS OF BASE YEAR (CY 1996) AND FUTURE (CY 2010) TRAFFIC NOISE LEVELS ALONG ROADWAYS SERVICING THE PROJECT (PM PEAK HOUR AND 50 FT FROM ROADWAY CENTERLINE)

LOCATION	SPEED (MPH)	VPH	**** HOURLY LEQ IN dB **** AUTO	MT	HT	ALL VEH
BASE YEAR (CY 1996) PM PEAK HR. TRAFFIC:						
W. Kawili Street (W. of UH Parking Lot)	45	959	63.4	54.7	59.5	65.3
W. Kawili Street (E. of UH Parking Lot)	35	959	59.3	51.0	56.8	61.6
Komohana Street (South of Project)	50	968	65.2	56.3	60.7	66.9
Komohana Street (North of Nawelo St.)	50	1,235	66.3	57.4	61.7	68.0
Komohana Street (South of Nawelo St.)	50	1,233	66.3	57.3	61.7	68.0
Nawelo Street	25	41	40.1	32.4	39.5	43.2
Lanikaula Street (West of Access #7 Rd.)	40	563	59.2	50.7	55.9	61.3
Lanikaula Street (East of Access #7 Rd.)	40	702	60.1	51.6	56.9	62.2
Access #7 Road	25	241	47.7	40.1	47.2	50.9
FUTURE CONDITIONS (CY 2010) PM PEAK HR. TRAFFIC:						
W. Kawili Street (W. of UH Parking Lot)	45	1,215	64.5	55.7	60.5	66.3
W. Kawili Street (E. of UH Parking Lot)	35	1,315	60.7	52.4	58.2	63.0
Komohana Street (South of Project)	50	1,240	66.3	57.4	61.8	68.0
Komohana Street (North of Nawelo St.)	50	2,470	69.3	60.4	64.7	71.0
Komohana Street (South of Nawelo St.)	50	2,430	69.2	60.3	64.7	70.9
Nawelo Street	25	785	52.9	45.2	52.4	56.0
Lanikaula Street (West of Access #7 Rd.)	40	1,050	61.9	53.4	58.6	64.0
Lanikaula Street (East of Access #7 Rd.)	40	1,440	63.3	54.7	60.0	65.3
Access #7 Road	25	570	51.5	43.8	51.0	54.6

Note:

The following assumed traffic mix of autos, medium trucks, and heavy vehicles were used for existing and future PM peak hour conditions along all roadways: 98.0% autos, 1.0% medium trucks, and 1.0% heavy trucks and buses.

TABLE 5

BASE YEAR AND CY 2010 DISTANCES TO 55, 60, AND 65 Ldn CONTOURS (FROM PM PEAK HOUR TRAFFIC)

STREET SECTION	55 Ldn SETBACK (FT) CY 1996	55 Ldn SETBACK (FT) CY 2010	60 Ldn SETBACK (FT) CY 1996	60 Ldn SETBACK (FT) CY 2010	65 Ldn SETBACK (FT) CY 1996	65 Ldn SETBACK (FT) CY 2010
W. Kawili Street (W. of UH Parking Lot)	226	264	105	123	49	57
W. Kawili Street (E. of UH Parking Lot)	128	158	60	73	28	34
Komohana Street (South of Project)	289	341	134	158	62	73
Komohana Street (North of Nawelo St.)	340	539	158	250	73	116
Komohana Street (South of Nawelo St.)	339	533	157	248	73	115
Nawelo Street	8	54	4	25	2	12
Lanikaula Street (West of Access #7 Rd.)	121	184	56	85	26	40
Lanikaula Street (East of Access #7 Rd.)	140	227	65	105	30	49
Access #7 Road	25	44	11	20	5	9

Notes:

(1) All setback distances are from the roadways' centerlines.
(2) See TABLE 4B for traffic volume, speed, and mix assumptions.
(3) Setback distances are for unobstructed line-of-sight conditions.
(4) Soft ground conditions assumed along all roadways.
(5) Ldn estimated to be 0.5 dB less than PM Peak Hour Leq.

walls or buildings, or the additive contributions of traffic noise from intersecting street sections.

TABLES 6A and 6B present the forecasted increases in traffic noise by CY 2010 with and without the project during the AM and PM peak traffic hours, respectively. The future traffic noise levels along the existing sections of Komohana Street, West Kawili Street, and Lanikaula Street are expected to increase moderately by 0.9 to 2.6 Ldn by CY 2010 as a result of non–project traffic. Following completion of the project and the addition of the new access roadways to University Park, additional increases between 0 and 1 Ldn unit are expected along these three main streets. The predicted increases in traffic noise associated with project traffic along Komohana, West Kawili, and Lanikaula Streets are considered to be insignificant and will be difficult to measure or perceive. Future traffic noise levels at the existing student housing complex along West Kawili Street (near measurement Location "A") as well as at the dwelling units fronting East Kawili Street (near measurement Location "B") are expected to remain below 64 Ldn, and should not exceed the FHA/HUD standard of 65 Ldn because of the University Park Project. Future traffic noise levels at these student housing and dwelling units should also be less than the FHWA and HDOT noise abatement criteria of 67 Leq and 66 Leq, respectively.

The greatest increases in traffic noise levels are expected to occur within the University Park complex, along the Nawelo Street access and its new extension to Access #7 at Lanikaula Street. These large increases are due to the relatively low existing traffic and background ambient noise levels within the interior areas of the University Park and University of Hawaii, Hilo campus. Future vehicle speeds and traffic noise levels along the access road section between Waiakea Stream and Lanikaula Street (Access #7) are planned to be controlled by speed bumps. Predicted traffic noise levels at the dormitory, classroom, and office buildings along this access road range between 55 to 60 Ldn. These future traffic noise levels along the campus access road are considered to be compatible for dormitory, classroom, and office uses, and are below the FHA/HUD noise abatement standard of 65 Ldn. Existing traffic noise levels at the college dormitory buildings are also predicted to be less than the FHWA and HDOT noise abatement criteria of 67 Leq and 66 Leq, respectively.

TABLE 6A

CALCULATIONS OF FUTURE (CY 2010) INCREASES IN TRAFFIC NOISE LEVELS (AM PEAK HOUR TRAFFIC)

STREET SECTION	NOISE LEVEL INCREASE (Leq) DUE TO: AMBIENT TRAFFIC (NO-BUILD)	PROJECT TRAFFIC (BUILD)
W. Kawili Street (W. of U.H. Parking Lot)	1.3	0.0
W. Kawili Street (E. of U.H. Parking Lot)	1.3	0.2
Komohana Street (South of Project)	−0.8	0.6
Komohana Street (North of Nawelo St.)	1.4	0.7
Komohana Street (South of Nawelo St.)	1.4	0.6
Nawelo Street	3.4	9.1
Lanikaula Street (West of Access #7 Rd.)	2.4	0.2
Lanikaula Street (East of Access #7 Rd.)	2.2	1.0
Access #7 Road	1.1	4.0

TABLE 6B

CALCULATIONS OF FUTURE (CY 2010) INCREASES IN TRAFFIC NOISE LEVELS (PM PEAK HOUR TRAFFIC)

STREET SECTION	NOISE LEVEL INCREASE (Leq) DUE TO: AMBIENT TRAFFIC (NO-BUILD)	PROJECT TRAFFIC (BUILD)
W. Kawili Street (W. of UH Parking Lot)	0.9	0.1
W. Kawili Street (E. of UH Parking Lot)	0.9	0.5
Komohana Street (South of Project)	0.5	0.6
Komohana Street (North of Nawelo St.)	2.3	0.7
Komohana Street (South of Nawelo St.)	2.3	0.6
Nawelo Street	3.2	9.7
Lanikaula Street (West of Access #7 Rd.)	2.6	0.1
Lanikaula Street (East of Access #7 Rd.)	2.3	0.8
Access #7 Road	1.2	2.6

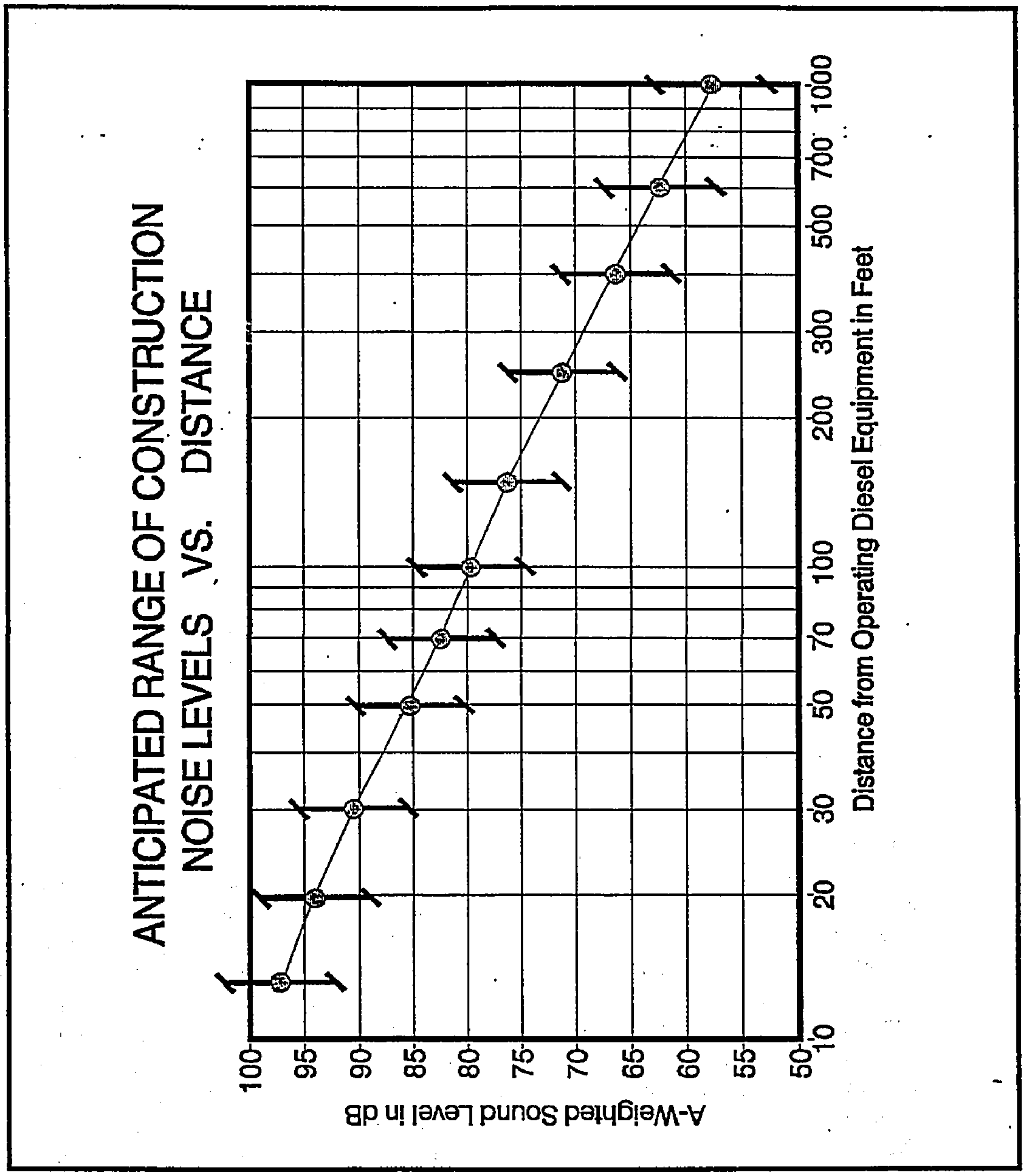
CHAPTER V. FUTURE NOISE IMPACTS AND POSSIBLE NOISE MITIGATION MEASURES

Traffic Noise. Existing noise sensitive properties along the west and east ends of Kawili Street (near noise measurement Locations "A" and "B" are not expected to be adversely impacted by increased traffic noise from the proposed University Park Project. The reason for this conclusion is that the traffic volumes and noise levels along the east and west ends of Kawili Street are not anticipated to increase significantly as the result of the planned developments within the University Park. The resulting increases in traffic noise levels from project traffic along Kawili Street are anticipated to be 0.5 dB or less, which are considered to be insignificant (see TABLES 6A and 6B). For this reason, traffic noise mitigation measures along the existing roadways are not considered necessary.

Traffic noise levels within the University of Hawaii, Hilo campus are expected to increase by 3 to 10 dB as a result of increased traffic noise along the University Park access road to Lanikaula Street. This degree of increase is considered to be large, but traffic noise mitigation measures are not required by FHA/HUD, FHWA, or HDOT standards for residences, classrooms, or office buildings. Traffic noise mitigation measures would not normally be required along the campus access road due to the relatively low-to-moderate traffic noise levels expected along the access road.

Construction Noise. Audible construction noise will probably be unavoidable during the entire project construction period. The total time period for construction is unknown, but it is anticipated that the actual work will be moving from one location on the project site to another during that period. Actual length of exposure to construction noise at any receptor location will probably be less than the total construction period for the entire project. Typical levels of noise from construction activities (excluding pile driving activity) are shown in FIGURE 11. The noise sensitive properties which are predicted to experience the highest noise levels during construction activities on the project site are the existing student dormitory, classroom, and office buildings adjacent to the Nowelo Street extension roadway to Lanikaula Street. Adverse impacts from construction noise are not expected to be in the "public health and welfare" category due to the temporary nature of the work and due to the administrative controls available for its regulation. Instead, these impacts will probably be limited to the temporary degradation of the quality of the acoustic environment in the immediate vicinity of the new and improved interior roadways.

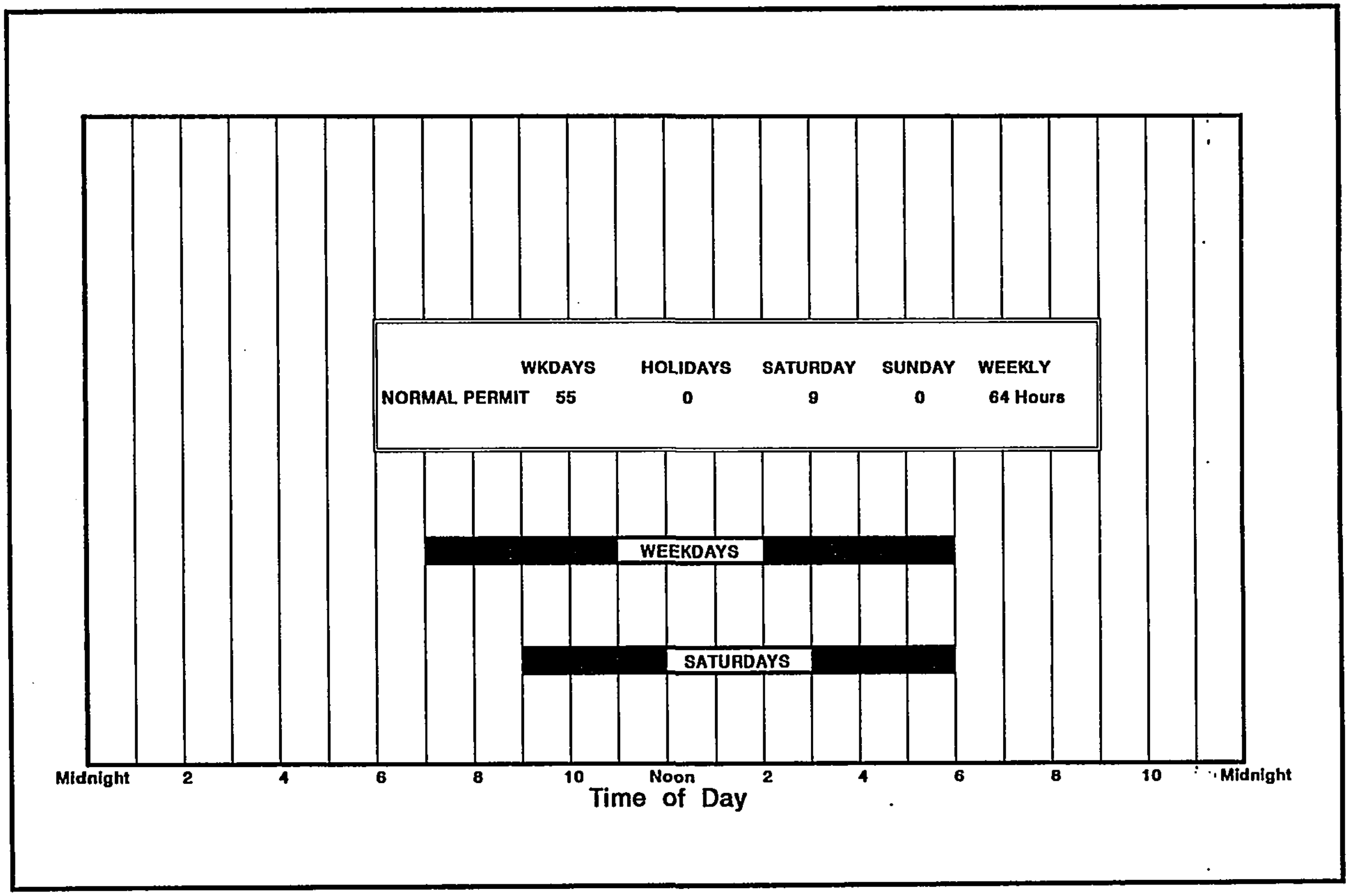
Mitigation of construction noise to inaudible levels will not be practical in all



CONSTRUCTION NOISE LEVELS VS. DISTANCE

FIGURE 11

cases due to the intensity of construction noise sources (80 to 90+ dB at 50 FT distance), and due to the exterior nature of the work (rock breaking, grading and earth moving, trenching, concrete pouring, hammering, etc.). The use of properly muffled construction equipment should be required on the job site. The use of plywood noise barriers is also possible where close–in construction work is unavoidable.The incorporation of State Department of Health construction noise limits and curfew times, which are now applicable on the island of Hawaii (Reference 11), is another noise mitigation measure which can be applied to this project. TABLE 7 depicts the normally permitted hours of construction. Noisy construction activities are not allowed on Sundays and holidays under the DOH permit procedures.



AVAILABLE WORK HOURS UNDER DOH PERMIT PROCEDURES FOR CONSTRUCTION NOISE

TABLE 7

APPENDIX A. REFERENCES

(1) "Guidelines for Considering Noise in Land Use Planning and Control;" Federal Interagency Committee on Urban Noise; June 1980.

(2) "Environmental Criteria and Standards, Noise Abatement and Control, 24 CFR, Part 51, Subpart B;" U.S. Department of Housing and Urban Development; April 1, 1995.

(3) "Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety;" U.S. Environmental Protection Agency; EPA 550/9–74– 004; March 1974.

(4) Federal Highway Administration; "Procedures for Abatement of Highway Traffic Noise and Construction Noise;" 23 CFR Chapter I, Subchapter J, Part 772; April 1, 1995.

(5) February 1, 1995 Letter from Ron Tsuzuki, State DOT to AMFAC/JMB Hawaii, Inc.; HWY–PA 2.4400.

(6) Barry, T. and J. Reagan, "FHWA Highway Traffic Noise Prediction Model;" FHWA–RD–77–108, Federal Highway Administration; Washington, D.C.; December 1978.

(7) Draft "Traffic Impact Assessment Report for University Park, University of Hawaii At Hilo;" Pacific Planning & Engineering, Inc.; October 1996.

(8) 24–Hour Traffic Counts, Station 18–AA, Kawili St. at Puainako St.; July 5–6, 1994; Hawaii State Department of Transportation.

(9) 24–Hour Traffic Counts and Vehicle–Type Classification, Station 18–HH, Komohana St. at Ponahawai; June 27–28, 1994; Hawaii State Department of Trans–portation.

(10) 24–Hour Traffic Counts, Station 18–Z, Komohana St. at Puainako St.; June 28–29, 1994; Hawaii State Department of Transportation.

(11) "Title 11, Administrative Rules, Chapter 46, Community Noise Control;" Hawaii State Department of Health; September 12, 1996.

APPENDIX B

EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE

Descriptor Symbol Usage

The recommended symbols for the commonly used acoustic descriptors based on A-weighting are contained in Table I. As most acoustic criteria and standards used by EPA are derived from the A-weighted sound level, almost all descriptor symbol usage guidance is contained in Table I.

Since acoustic nomenclature includes weighting networks other than "A" and measurements other than pressure, an expansion of Table I was developed (Table II). The group adopted the ANSI descriptor-symbol scheme which is structured into three stages. The first stage indicates that the descriptor is a level (i.e., based upon the logarithm of a ratio), the second stage indicates the type of quantity (power, pressure, or sound exposure), and the third stage indicates the weighting network (A, B, C, D, E.....). If no weighting network is specified, "A" weighting is understood. Exceptions are the A-weighted sound level and the A-weighted peak sound level which require that the "A" be specified. For convenience in those situations in which an A-weighted descriptor is being compared to that of another weighting, the alternative column in Table II permits the inclusion of the "A". For example, a report on blast noise might wish to contrast the LCdn with the LAdn.

Although not included in the tables, it is also recommended that "Lpn" and "LepN" be used as symbols for perceived noise levels and effective perceived noise levels, respectively.

It is recommended that in their initial use within a report, such terms be written in full, rather than abbreviated. An example of preferred usage is as follows:

The A-weighted sound level (LA) was measured before and after the installation of acoustical treatment. The measured LA values were 85 and 75 dB respectively.

Descriptor Nomenclature

With regard to energy averaging over time, the term "average" should be discouraged in favor of the term "equivalent". Hence, Leq, is designated the "equivalent sound level". For Ld, Ln, and Ldn, "equivalent" need not be stated since the concept of day, night, or day-night averaging is by definition understood. Therefore, the designations are "day sound level", "night sound level", and "day-night sound level", respectively.

The peak sound level is the logarithmic ratio of peak sound pressure to a reference pressure and not the maximum root mean square pressure. While the latter is the maximum sound pressure level, it is often incorrectly labelled peak. In that sound level meters have "peak" settings, this distinction is most important.

"Background ambient" should be used in lieu of "background", "ambient", "residual", or "indigenous" to describe the level characteristics of the general background noise due to the contribution of many unidentifiable noise sources near and far.

With regard to units, it is recommended that the unit decibel (abbreviated dB) be used without modification. Hence, DBA, PNdB, and EPNdB are not to be used. Examples of this preferred usage are: the Perceived Noise Level (Lpn was found to be 75 dB. Lpn = 75 dB). This decision was based upon the recommendation of the National Bureau of Standards, and the policies of ANSI and the Acoustical Society of America, all of which disallow any modification of bel except for prefixes indicating its multiples or submultiples (e.g., deci).

Noise Impact

In discussing noise impact, it is recommended that "Level Weighted Population" (LWP) replace "Equivalent Noise Impact" (ENI). The term "Relative Change of Impact" (RCI) shall be used for comparing the relative differences in LWP between two alternatives.

Further, when appropriate, "Noise Impact Index" (NII) and "Population Weighed Loss of Hearing" (PHL) shall be used consistent with CHABA Working Group 69 Report Guidelines for Preparing Environmental Impact Statements (1977).

APPENDIX B (CONTINUED)

TABLE I

A-WEIGHTED RECOMMENDED DESCRIPTOR LIST

TERM	SYMBOL
1. A-Weighted Sound Level	L_A
2. A-Weighted Sound Power Level	L_{WA}
3. Maximum A-Weighted Sound Level	L_{max}
4. Peak A-Weighted Sound Level	L_{Apk}
5. Level Exceeded x% of the Time	L_x
6. Equivalent Sound Level	L_{eq}
7. Equivalent Sound Level over Time (T) (1)	$L_{eq(T)}$
8. Day Sound Level	L_d
9. Night Sound Level	L_n
10. Day-Night Sound Level	L_{dn}
11. Yearly Day-Night Sound Level	$L_{dn(Y)}$
12. Sound Exposure Level	L_{SE}

(1) Unless otherwise specified, time is in hours (e.g. the hourly equivalent level is $L_{eq(1)}$). Time may be specified in non-quantitative terms (e.g., could be specified a $L_{eq(WASH)}$ to mean the washing cycle noise for a washing machine).

SOURCE: EPA ACOUSTIC TERMINOLOGY GUIDE, BNA 8-14-78, NOISE REGULATION REPORTER.

APPENDIX B (CONTINUED)

TABLE II

RECOMMENDED DESCRIPTOR LIST

TERM	A-WEIGHTING	ALTERNATIVE(1) A-WEIGHTING	OTHER(2) WEIGHTING	UNWEIGHTED
1. Sound (Pressure) (3) Level	L_A	L_{pA}	L_B, L_{pB}	L_p
2. Sound Power Level	L_{WA}		L_{WB}	L_W
3. Max. Sound Level	L_{max}	L_{Amax}	L_{Bmax}	L_{pmax}
4. Peak Sound (Pressure) Level	L_{Apk}		L_{Bpk}	L_{pk}
5. Level Exceeded x% of the time	L_x	L_{Ax}	L_{Bx}	L_{px}
6. Equivalent Sound Level	L_{eq}	L_{Aeq}	L_{Beq}	L_{peq}
7. Equivalent Sound Level (4) Over Time(T)	$L_{eq(T)}$	$L_{Aeq(T)}$	$L_{Beq(T)}$	$L_{peq(T)}$
8. Day Sound Level	L_d	L_{Ad}	L_{Bd}	L_{pd}
9. Night Sound Level	L_n	L_{An}	L_{Bn}	L_{pn}
10. Day-Night Sound Level	L_{dn}	L_{Adn}	L_{Bdn}	L_{pdn}
11. Yearly Day-Night Sound Level	$L_{dn(Y)}$	$L_{Adn(Y)}$	$L_{Bdn(Y)}$	$L_{pdn(Y)}$
12. Sound Exposure Level	L_S	L_{SA}	L_{SB}	L_{Sp}
13. Energy Average value over (non-time domain) set of observations	$L_{eq(e)}$	$L_{Aeq(e)}$	$L_{Beq(e)}$	$L_{peq(e)}$
14. Level exceeded x% of the total set of (non-time domain) observations	$L_{x(e)}$	$L_{Ax(e)}$	$L_{Bx(e)}$	$L_{px(e)}$
15. Average L_x value	L_x	L_{Ax}	L_{Bx}	L_{px}

(1) "Alternative" symbols may be used to assure clarity or consistency.

(2) Only B-weighting shown. Applies also to C,D,E,.....weighting.

(3) The term "pressure" is used only for the unweighted level.

(4) Unless otherwise specified, time is in hours (e.g., the hourly equivalent level is Leq(1). Time may be specified in non-quantitative terms (e.g., could be specified as Leq(WASH) to mean the washing cycle noise for a washing machine.

APPENDIX *H*

AIR QUALITY IMPACT REPORT
(by J.W. Morrow)

AIR QUALITY IMPACT REPORT (AQIR)

UNIVERSITY OF HAWAII AT HILO
UNIVERSITY PARK

10 March 1997

PREPARED FOR:

Engineering Concepts, Inc.

and

Department of Accounting and General Services
State of Hawaii

PREPARED BY:

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1. INTRODUCTION

The State of Hawaii is proposing to develop the University Park on lands adjacent to and west of the existing University of Hawaii at Hilo (UH Hilo) campus (Figure 1). This 116-acre expansion of the UH Hilo campus will be comprised of the following major components:

- multipurpose center with 8,000 seats and 2,000 parking stalls
- new residence halls with 750 beds and 375 parking stalls
- expanded facilities for 3,067 new students, 558 new faculty/staff personnel and 1,159 parking stalls
- expansion of research and technology park with 684 new employees

The purpose of this report is to assess the impact of the proposed development on air quality on a local and regional scale. The overall project can be considered an "indirect source" of air pollution as defined in the Federal Clean Air Act [1] since its primary association with air quality is its inherent attraction for mobile sources, i.e., motor vehicles. Much of the focus of this analysis, therefore, is on the traffic-related impacts on air quality. These impacts were evaluated for existing (1996) and future (2010) conditions with and without the project.

During construction of the various facilities air pollutant emissions will be generated onsite and offsite due to vehicular movement, grading, concrete and asphalt batching, and general dust-generating construction activities. These impacts have also been addressed.

2. AIR QUALITY STANDARDS

A summary of State of Hawaii and national ambient air quality standards is presented in Table 1 [2, 3]. Note that Hawaii's standards are not divided into primary and secondary standards as are the federal standards.

Primary standards are intended to protect public health with an adequate margin of safety while secondary standards are intended to protect public welfare through the prevention of damage to soils, water, vegetation, man-made materials, animals, wildlife, visibility, climate, and economic values [4].

Some of Hawaii's standards (CO, NO_2, and O_3) are clearly more stringent than their federal counterparts but, like their federal counterparts, may be exceeded once per year. It should also be noted that in November 1993, the Governor signed amendments to Chapter 59, Ambient Air Quality Standards [3], adopting the federal standard for particulate matter equal to or less than 10 microns in diameter (PM_{10}). Since measurement data in Hawaii indicate that PM_{10} comprises about 50% of total suspended particulate matter (TSP), the adoption of that federal standard with a numerical value equal to the original state TSP standard of 150 $\mu g/m^3$ represents a substantial relaxation of the standard (approximately doubling it).

In the case of the automotive pollutants [carbon monoxide (CO), oxides of nitrogen (NOx), and ozone (O_3)], there are only primary standards. Until 1983, there was also a hydrocarbons standard which was based on the precursor role hydrocarbons play in the formation of photochemical oxidants rather than any unique toxicological effect they had at ambient levels. The hydrocarbons standard was formally eliminated in January, 1983 [5].

The U.S. Environmental Protection Agency (EPA) is mandated by Congress to periodically review and re-evaluate the federal standards in light of new research findings [1]. The last such review resulted in the relaxation of the ozone standard from 160 to 235 micrograms per cubic meter ($\mu g/m^3$) [6]. The PM_{10} and ozone standards were recently reviewed, and new standards have been proposed [7,8].

Finally, the State of Hawaii also has fugitive dust regulations for particulate matter (PM) emanating from construction activities [9]. There simply can be no visible emissions from fugitive dust sources.

3. EXISTING AIR QUALITY

3.1 Department of Health Monitoring. The State Department of Health (DOH) maintains a limited network of air monitoring stations around the state to gather data on the following regulated pollutants:

- particulate matter $\leq$10 microns (PM_{10})
- sulfur dioxide (SO_2)
- nitrogen dioxide (NO_2)
- carbon monoxide (CO)
- ozone (O_3)

In the case of PM_{10} and lead, measurements are made on a 24-hour basis and collected once every six days in accordance with U.S. Environmental Protection Agency (EPA) guidelines. Carbon monoxide, SO_2, NO_2 and ozone, however, are measured on a continuous basis. It should also be noted that the majority of these pollutants are monitored only in Honolulu. Currently, no routine ambient air monitoring is conducted by the DOH in the Hilo area. Historical monitoring during the 1970's and 1980's indicated very low pollutant levels in Hilo [10] and there is little reason to believe this has changed significantly.

3.2 Other Monitoring. While air quality in the Hilo area is for the most part very good, there is a natural source which periodically degrades air quality in the area, and that is the active volcano Kilauea. This degradation occurs under southerly, i.e., "kona" wind conditions when plumes from the volcanic vents are carried toward Hilo. Morrow *et al* conducted one year of PM_{10} monitoring in the Hilo area from July 1989 through June 1990 as part of a study of volcanic air pollution [11]. Daytime and

FIGURE 1

PROJECT LOCATION

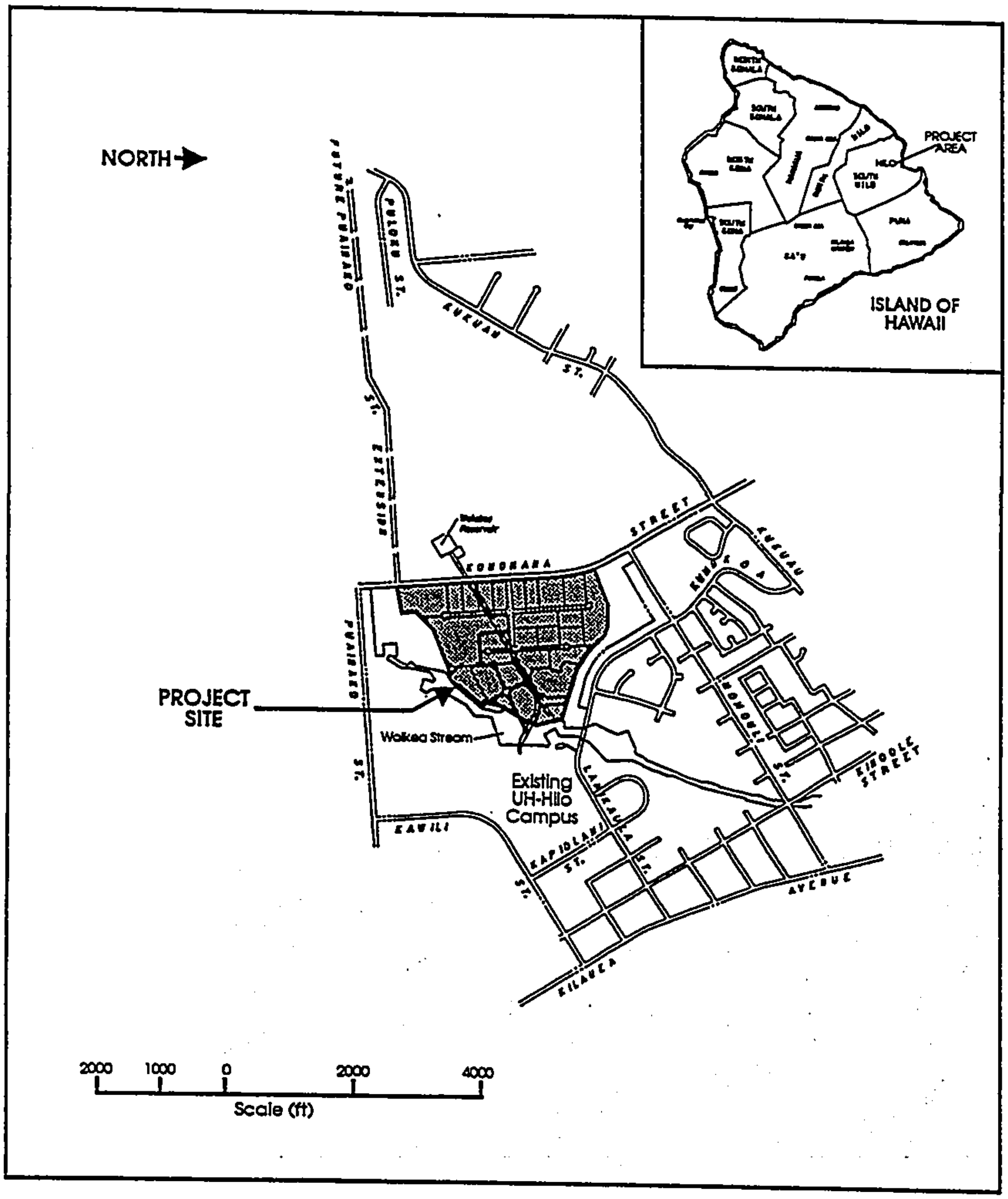
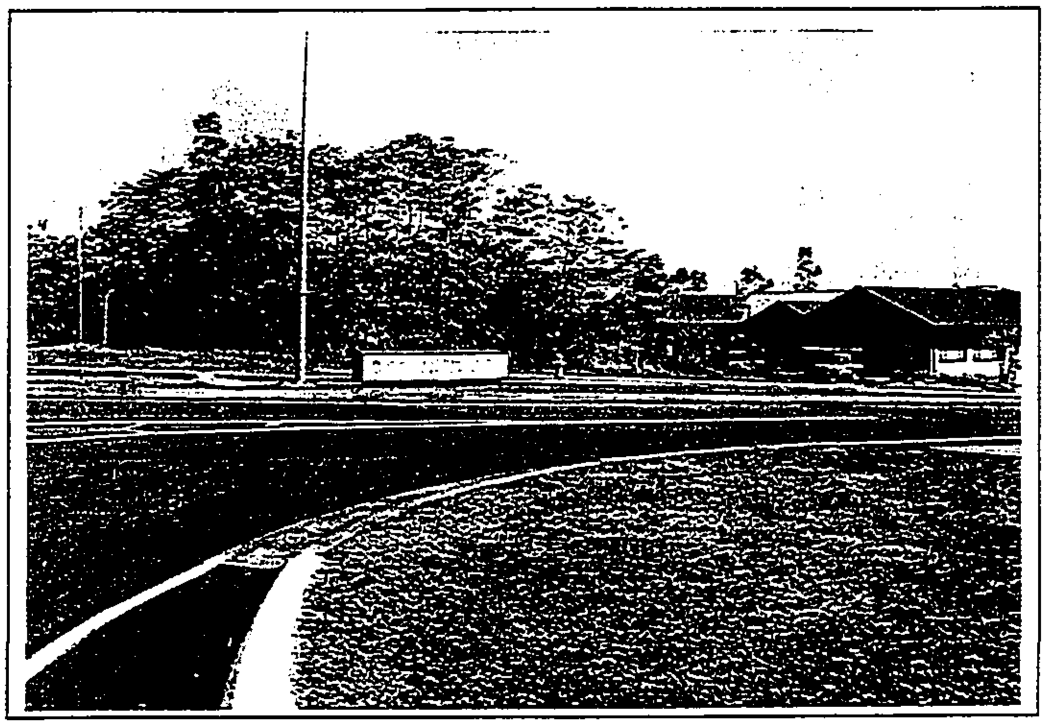
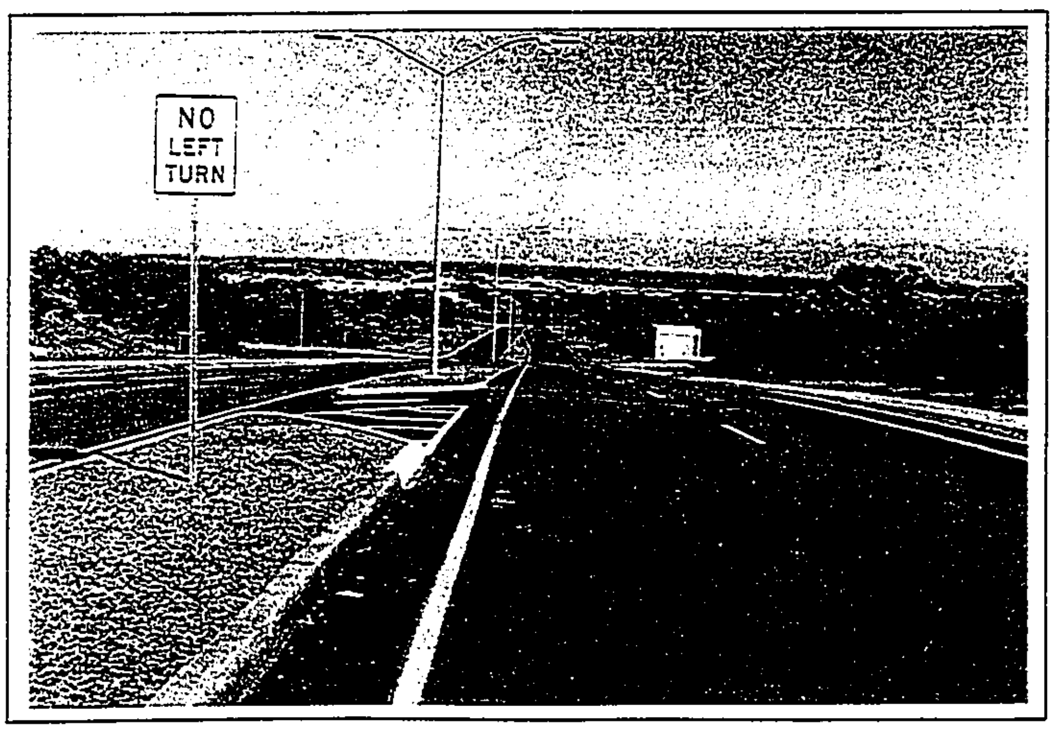


FIGURE 2

EXISTING SITE CONDITIONS
FEBRUARY 1997



Existing entrance to University Park at Nowelo and Komohana Streets (facing north)



View of project site down Nowelo Street (facing east)

TABLE 1

SUMMARY OF STATE OF HAWAII AND FEDERAL AMBIENT AIR QUALITY STANDARDS

POLLUTANT	SAMPLING PERIOD	NAAQS PRIMARY	NAAQS SECONDARY	STATE STANDARDS
PM_{10}	Annual	50	50	50
	24-hr	150	150	150
SO_2	Annual	80	—	80
	24-hr	365	—	365
	3-hr	—	1,300	1,300
NO_2	Annual	100	—	70
CO	8-hr	10	—	5
	1-hr	40	—	10
O_3	1-hr	235	—	100
H_2S	1-hr	—	—	35
Pb	Calendar Quarter	1.5	—	1.5

KEY:
- PM_{10} - particulate matter < 10 microns
- SO_2 - sulfur dioxide
- NO_2 - nitrogen dioxide
- CO - carbon monoxide
- O_3 - ozone
- H_2S - hydrogen sulfide
- Pb - lead

All concentrations in micrograms per cubic meter ($\mu g/m^3$) except CO which is in milligrams per cubic meter (mg/m^3).

nighttime samples were collected every third day and analyzed for 37 elements and several ionic species. The results indicated PM_{10} concentrations averaging 10.7 μg/m^3 and ranging as high as 34 μg/m^3. The influence of volcanic emissions were evident in the data set as sulfate levels which normally ranged 1- 2μg/m^3 under normal NE trade wind conditions, rose to 8 - 13 μg/m^3 during southerly winds.

3.3 Onsite Carbon Monoxide Sampling. In conjunction with this study, air sampling was conducted on 5 - 7 February 1997, in the vicinity of the Puainako - Komohana and Lanikaula - Kinoole intersections. These sites were selected based on the results of the traffic impact study prepared for this project [12] which indicated higher traffic volumes and potentially significant impacts at these intersections. In each case, the sampling site was established within 10 meters of the traffic lanes. A continuous carbon monoxide (CO) instrument was set up and operated during the a.m. and p.m. peak traffic hours. An anemometer and vane were installed and operated to record onsite surface wind conditions during the sampling. A simultaneous manual count of traffic was also performed. The variability of each of the parameters measured during the peak hours is clearly seen in Figures 3 - 6.

Onsite weather at the Puainako - Komohana intersection (Figure 7) on the afternoon of 5 February 1997, included light (<5 mph) variable winds with a generally easterly component and overcast skies. The sampling equipment was set up at the southwest corner of the intersection. Traffic volume at the sampling location was about 13% higher than the peak hour values reported in the traffic report [12], which is not an unusual variation. CO concentrations were of the same order of magnitude as the computer-generated estimates presented in Section 6 of this report, averaging about 1.4 mg/m^3.

During the morning of 6 February 1997, at the Puainako - Komohana intersection, skies were again overcast and winds were light westerlies 1 - 5 miles per hour (mph). Sampling instruments were set up at the same site as the previous afternoon. Traffic volume was about 6% higher than the peak a.m. level reported in the traffic report [12], but again, well within normally variability. CO concentrations were very low due to the upwind location of the sampler on the west side of Komohana Street, averaging about 0.6 mg/m^3.

At the Lanikaula - Kinoole intersection (Figure 8) on the afternoon of 6 February 1997, skies were partly cloudy and winds were light southeasterlies less than 10 mph. The sampling site was near the southwest corner of the intersection. Traffic volume was about 9% higher than indicated in the traffic impact study [12]. CO concentrations were in the 1 - 4 mg/m^3 range and averaged 1.4 mg/m^3, somewhat below the maximum predicted concentration shown in Section 6.

On the morning of 7 February 1997, the sampling equipment was set up on the northeast side of the intersection. Skies were overcast, and there were light rain showers. Winds were again westerly at about 2 - 5 mph. Peak hour traffic volume was 13% greater than the traffic study [12] count. The downwind location resulted in measurement of higher CO concentrations in the range of 2 - 8 mg/m^3 and averaging 3.2 mg/m^3 which is comparable to the computer prediction in Section 6.

FIGURE 3

P.M. PEAK HOUR CONDITIONS
PUAINAKO - KOMOHANA INTERSECTION
5 FEBRUARY 1997

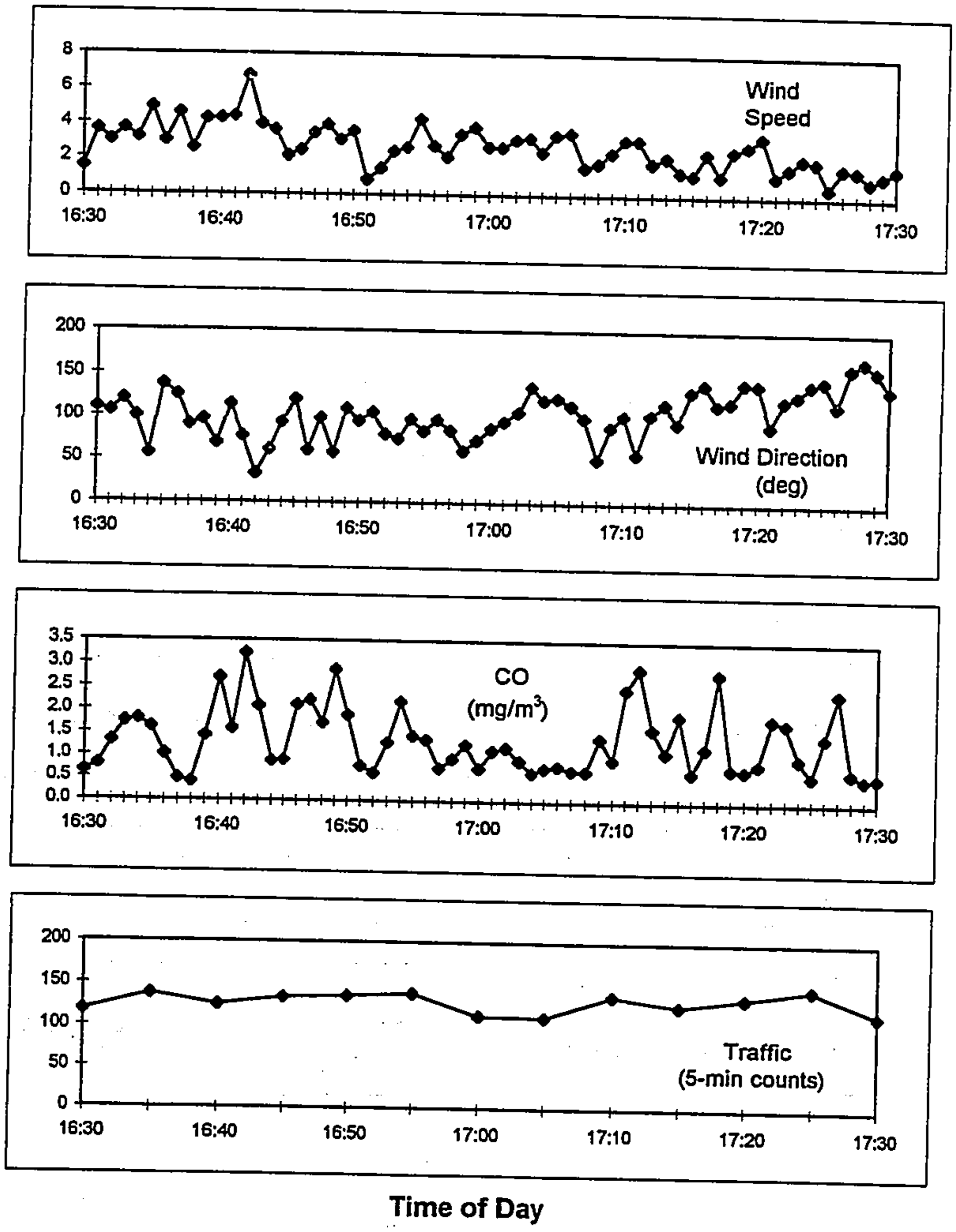


FIGURE 4

A.M. PEAK HOUR CONDITIONS
PUAINAKO - KOMOHANA INTERSECTION
6 FEBRUARY 1997

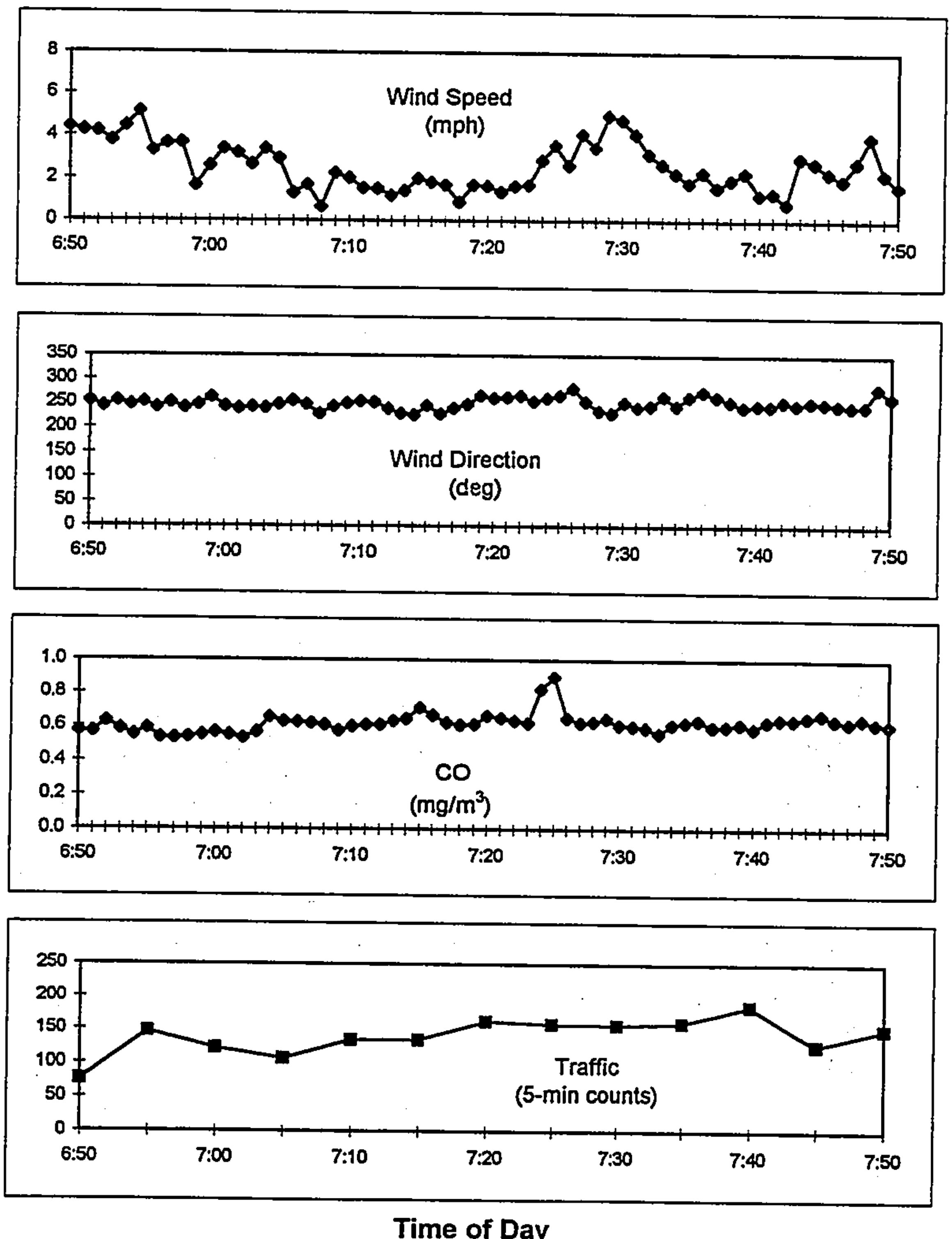


FIGURE 5

P.M. PEAK HOUR CONDITIONS
LANIKAULA - KINOOLE INTERSECTION
6 FEBRUARY 1997

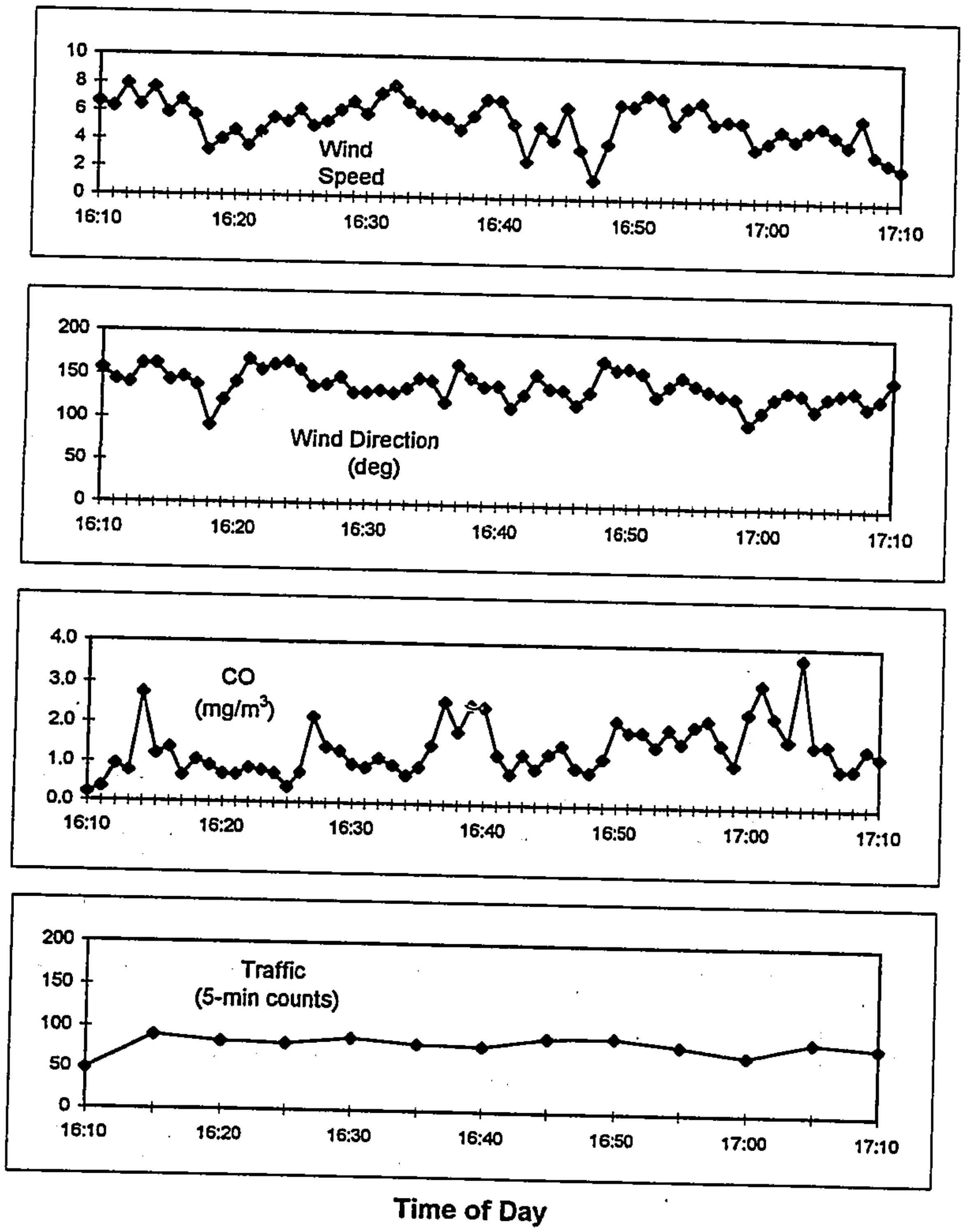


FIGURE 6

A.M. PEAK HOUR CONDITIONS
LANIKAULA - KINOOLE INTERSECTION
7 FEBRUARY 1997

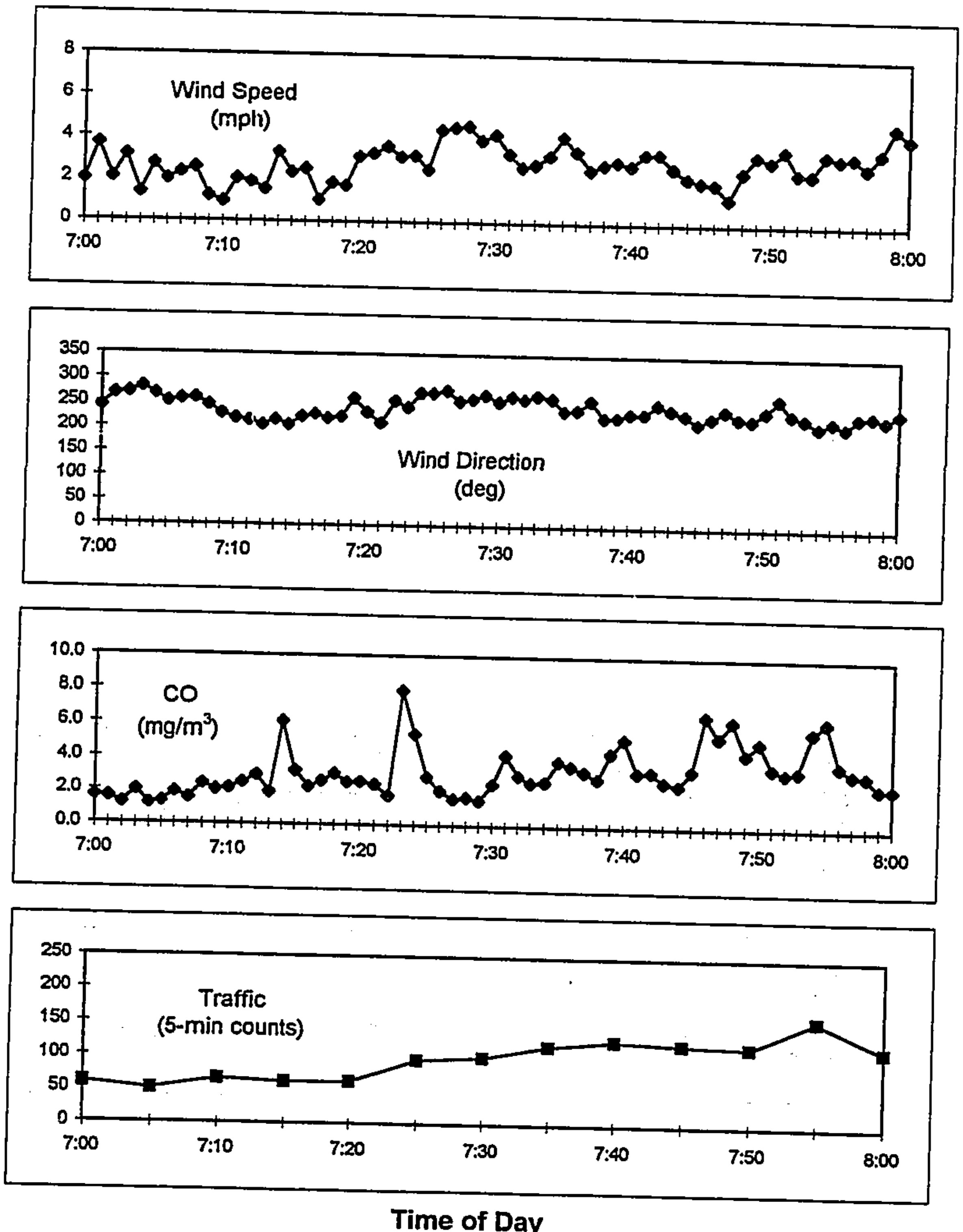
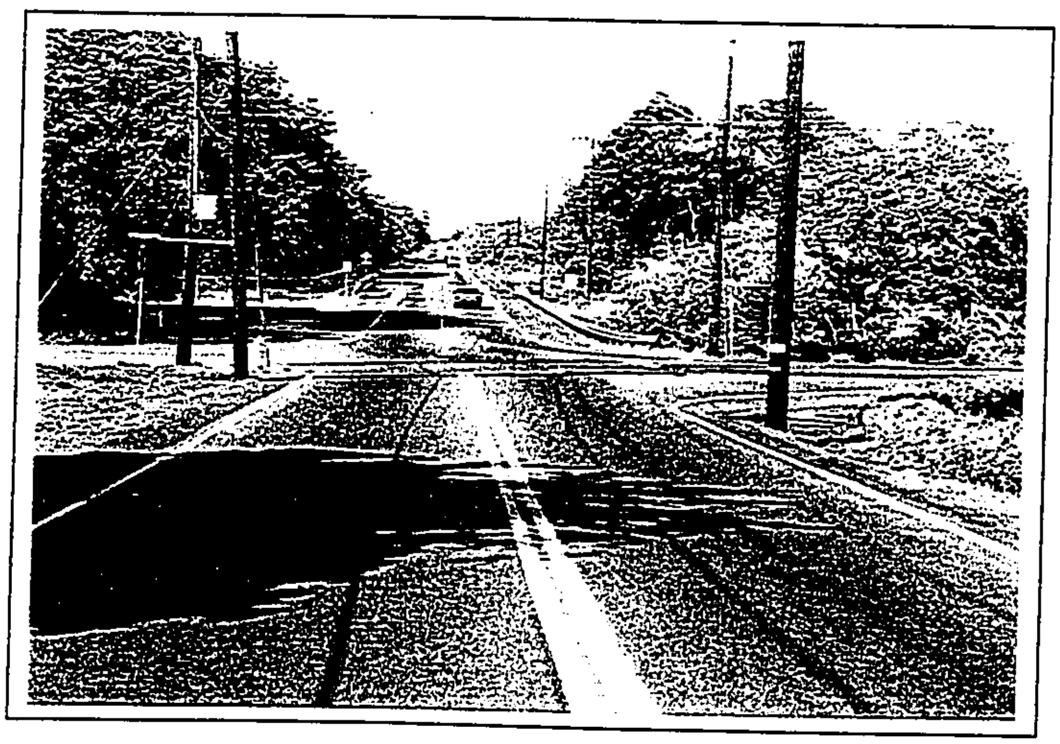


FIGURE 7

PUAINAKO - KOMOHANA INTERSECTION
FEBRUARY 1997

Puainako Street
(facing east)

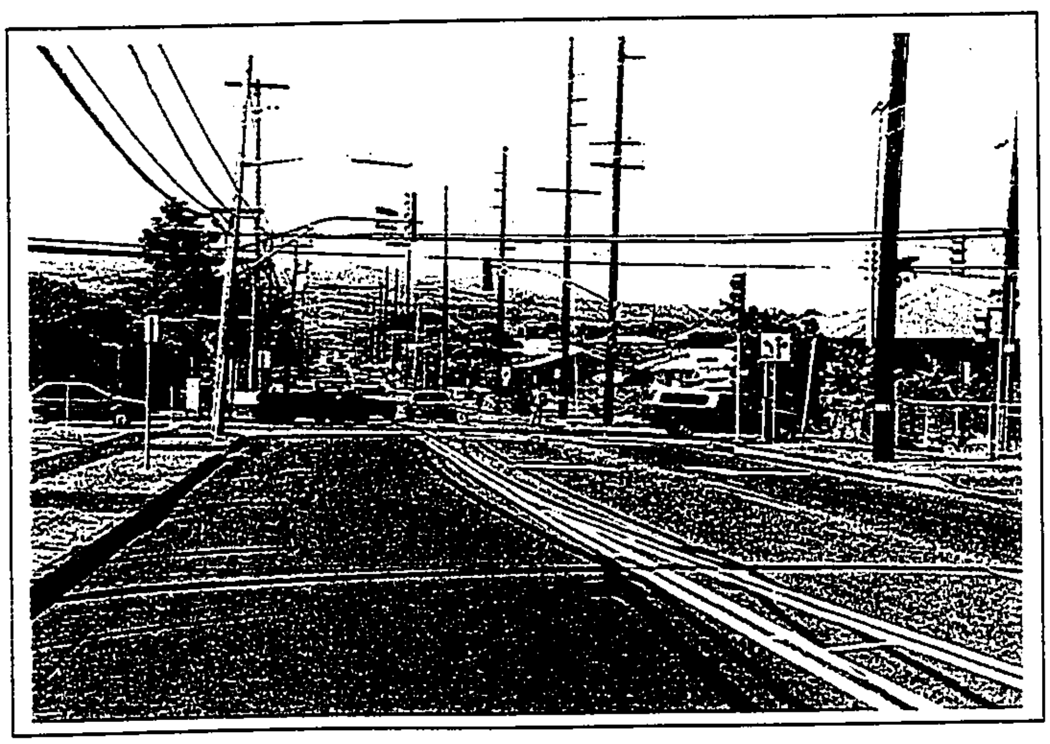


Komohana Street
(facing north)

FIGURE 8

LANIKAULA - KINOOLE INTERSECTION
FEBRUARY 1997

Lanikaula Street
(facing northeast)



Kinoole Street
(facing northwest)

4. CLIMATE AND METEOROLOGY

4.1 Temperature and Rainfall. Temperatures in Hilo are typical of most places in Hawaii and vary within a relatively narrow range. Daytime values are generally in the upper 70's or low 80's (degrees Fahrenheit) while nighttime temperatures are in the 60's and 70's.

Hilo experiences high levels of rainfall with an annual mean of 141 inches. Rainfall occurs throughout the year, but most heavily during the October through April period.

Based on these temperature and precipitation conditions, and in accordance with Thornwaite's scheme for climatic classification [13], the area is considered a "wet" climate and "rainforest" geographic type.

4.2 Surface Winds. Wind data from the Hilo Airport indicate the variability in wind direction in contrast to most other locations in the Hawaiian Islands where the northeast trade winds predominate (Figure 9). It is the terrain effect of a large volcanic mountain mass behind Hilo that causes the nighttime downslope airflows from the southwest. On an annual basis, winds from the southwest quadrant prevail 40% of the time. Low speeds, i.e., less than 4.5 m/sec (10 mph) also prevail, occurring about 76% of the time (Table 2). It is these gentle winds which are more conducive to pollutant concentration buildup from groundlevel sources such as vehicular traffic on highways.

FIGURE 9 - FREQUENCY DISTRIBUTION OF WIND DIRECTION
HILO, HAWAII (1992)

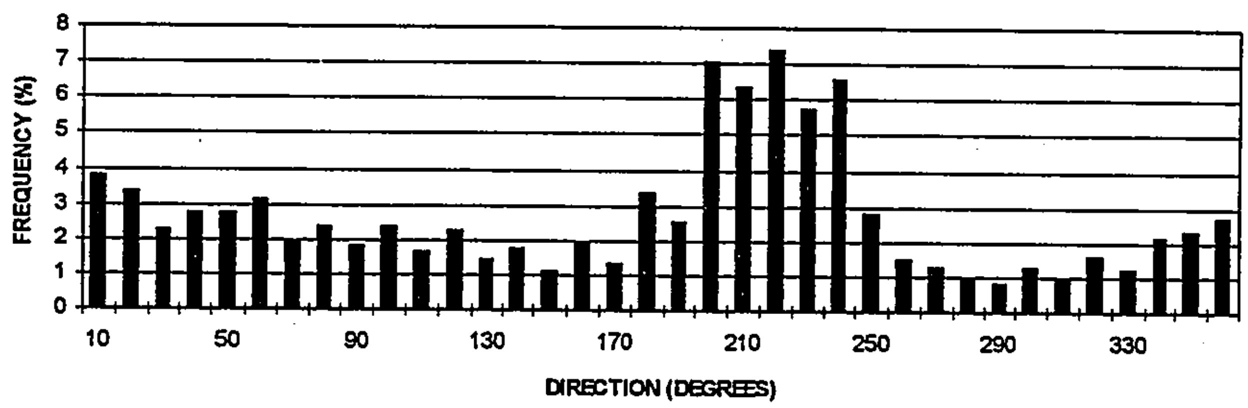


TABLE 2

FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION HILO, HAWAII 1992

Direction	< 3.1	< 4.5	Wind Speed (m/sec) < 5.8	< 7.2	< 8.5	> OR = 8.5	All Speeds
10	0.76	0.81	1.38	0.61	0.23	0.02	3.81
20	0.79	0.75	1.22	0.39	0.19	0.02	3.36
30	0.61	0.52	0.80	0.27	0.08	0.00	2.29
40	0.71	0.79	0.87	0.27	0.14	0.01	2.78
50	0.60	0.59	1.06	0.42	0.06	0.00	2.73
60	0.79	1.13	0.92	0.24	0.08	0.00	3.15
70	0.44	0.77	0.58	0.11	0.00	0.00	1.91
80	0.71	0.51	0.84	0.26	0.07	0.00	2.39
90	0.43	0.38	0.65	0.28	0.08	0.00	1.82
100	0.77	0.71	0.67	0.17	0.03	0.00	2.36
110	0.76	0.28	0.46	0.15	0.02	0.00	1.67
120	1.17	0.44	0.55	0.10	0.00	0.00	2.27
130	0.89	0.32	0.15	0.05	0.01	0.00	1.41
140	1.13	0.36	0.18	0.03	0.05	0.01	1.76
150	0.88	0.08	0.09	0.00	0.03	0.00	1.08
160	1.63	0.19	0.11	0.00	0.01	0.00	1.95
170	1.17	0.11	0.02	0.01	0.01	0.00	1.33
180	3.13	0.17	0.03	0.01	0.01	0.00	3.36
190	2.38	0.10	0.03	0.00	0.00	0.00	2.52
200	6.55	0.48	0.05	0.01	0.00	0.00	7.08
210	5.73	0.59	0.00	0.00	0.00	0.00	6.32
220	6.61	0.71	0.05	0.02	0.00	0.00	7.39
230	4.70	0.92	0.13	0.01	0.00	0.00	5.76
240	4.69	1.64	0.23	0.03	0.00	0.00	6.59
250	1.78	0.74	0.27	0.00	0.00	0.00	2.79
260	0.91	0.44	0.10	0.01	0.00	0.00	1.47
270	0.69	0.46	0.09	0.03	0.01	0.00	1.29
280	0.63	0.28	0.08	0.01	0.00	0.00	1.00
290	0.55	0.23	0.06	0.00	0.00	0.00	0.83
300	0.75	0.43	0.07	0.00	0.00	0.00	1.25
310	0.43	0.36	0.18	0.01	0.00	0.02	1.01
320	0.63	0.49	0.38	0.05	0.03	0.01	1.58
330	0.47	0.38	0.28	0.05	0.05	0.02	1.24
340	0.56	0.67	0.51	0.28	0.13	0.02	2.17
350	0.60	0.59	0.66	0.30	0.16	0.02	2.33
360	0.54	0.72	0.75	0.44	0.22	0.06	2.72
All Directions:	56.56	19.16	14.49	4.66	1.70	0.23	96.79

Percentage of calms = 3.21

5. SHORT-TERM IMPACTS

5.1 Onsite Impacts. The principal source of short-term air quality impact will be construction activity. Construction vehicle activity will increase automotive pollutant concentrations along the existing roadways as well as on the project site itself. The additional construction vehicle traffic should not exceed street capacities although the presence of large trucks can reduce a roadway's capacity as well as lower average travel speeds.

The site preparation and earth moving will create particulate emissions as will building and onsite road construction. Construction vehicles movement on unpaved on-site roads will also generate particulate emissions. EPA studies on fugitive dust emissions from construction sites indicate that about 1.2 tons/acre per month of activity may be expected under conditions of medium activity, moderate soil silt content (30%), and a precipitation/ evaporation (P/E) index of 50 [13,14].

While some onsite soils are silty clay loams with a substantially higher silt content [15] than the "moderate" silt content cited above, the wet local climate (P/E Index 213), would more than offset this, thus suggesting much lower fugitive dust emissions than estimated by the EPA. The predominance of low wind speeds also suggests reduced fugitive dust potential.

5.2 Offsite Impacts. In addition to the onsite impacts attributable to construction activity, there will also be offsite impacts due to the operation of concrete and asphalt batching plants needed for construction. Such plants routinely emit particulate matter and other gaseous pollutants. It is too early, however, to identify the specific facilities that will be providing these materials and thus the discussion of air quality impacts is necessarily generic. The batch plants which will be producing the concrete for foundations, curbing, etc. and the asphalt for roadways must be permitted by the Department of Health Clean Air Branch pursuant to state regulations [9]. In order to obtain these permits they must demonstrate their ability to continuously comply with both emission [9] and ambient air quality [3] standards. Under the recently promulgated federal Title V operating permit requirements [16], now incorporated in Hawaii's rules [7], air pollution sources must regularly attest to their compliance with all applicable requirements.

6. MOBILE SOURCE IMPACTS

6.1 Mobile Source Activity. The traffic study cited earlier [20] served as the basis for this mobile source impact analysis. Peak-hour traffic volumes were extracted from that plan and used to estimate air quality impacts for existing conditions and future (2010) with and without the project at the two intersections with the greatest impacts, i.e., Puainako at Komohana and Lanikaula at Kinoole Streets.

6.2 Emission Factors. Automotive emission factors for carbon monoxide (CO) were generated for calendar years 1996 and 2010 using the Mobile Source Emissions Model (MOBILE-5A) [17]. To localize the emission factors as much as possible, the March 1992 age distribution for registered vehicles in the City & County of Honolulu [18] was input in lieu of national statistics. That same age distribution was the basis for the distribution of vehicle miles traveled as well.

6.3 Modeling Methodology. Due to the present state-of-the-art in air quality modeling, analyses such as this generally focus on estimating concentrations of non-reactive pollutants. For projects involving mobile sources as the principal source, carbon monoxide is normally selected for modeling because it has a relatively long half-life in the atmosphere (ca. 1 month)[19], and it comprises the largest fraction of automotive emissions.

Because of the rural nature of the area, a stable atmosphere (Category "F") [20] was assumed for the morning and a neutral atmosphere (Category "D") for afternoon peak hours. A 1 meter per second (m/sec) wind speed was also assumed as worst case meteorological conditions.

The EPA guideline model CAL3QHC [21,22] was employed to estimate near-intersection carbon monoxide concentrations. An array of 48 receptor sites at distances of 10 meters from the road edge were input to the model. A background CO concentration of 0.1 milligram per cubic meter (mg/m^3) was assumed, again due to the rural nature of the area.

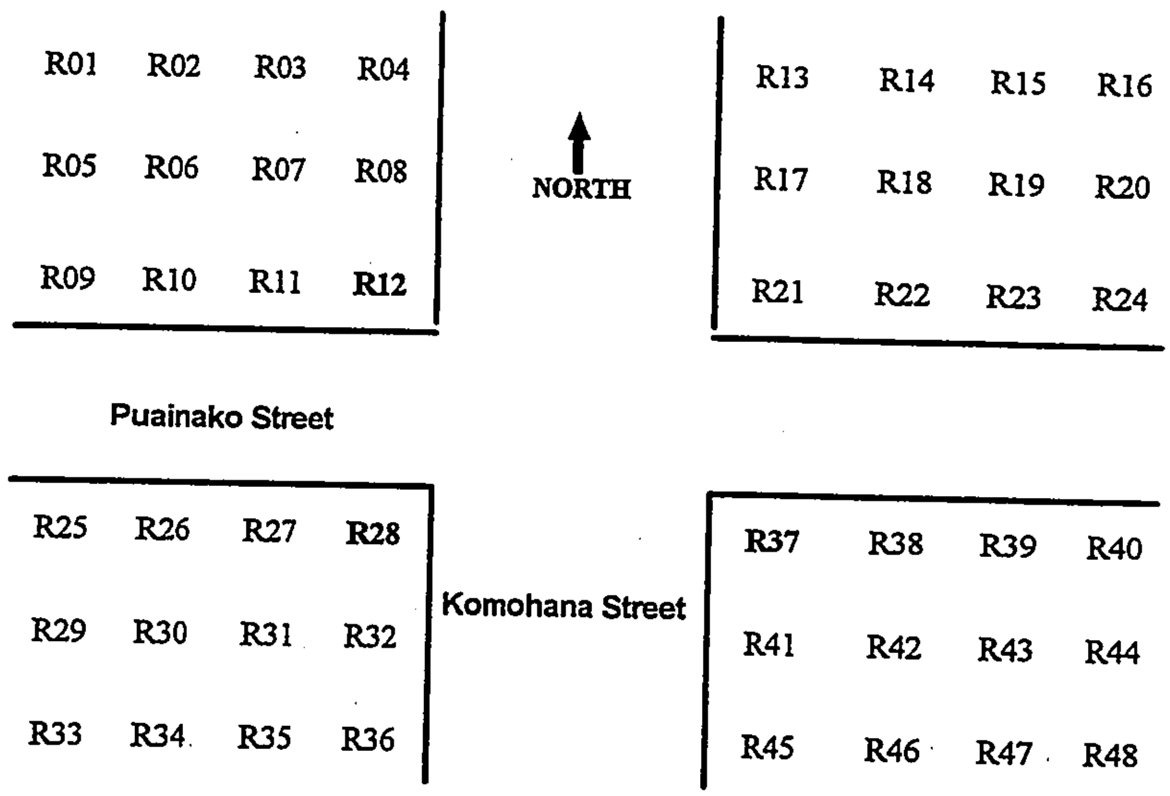
The model uses an iterative process to compute CO concentration estimates for all wind directions in 10 degree increments. The net result is to identify the wind direction producing the maximum CO concentration at each receptor location.

6.4 Results: 1-Hour Concentrations. The results of this modeling are presented in Figures 10 and 11. Each figure depicts the locations of the 48 receptor sites around the respective intersections. Maximum estimated concentrations in milligrams per cubic meter (mg/m^3) for each of the evaluated scenarios are also presented along with the particular receptor location at which they were predicted. No exceedances of State or Federal 1-hour CO standards were predicted.

6.5 Results: 8-Hour Concentrations. Estimates of 8-hour concentrations can be derived by applying a "persistence" factor to the 1-hour concentrations. This "persistence" factor accounts for the fact that the worst case 1-hour meteorology and traffic volumes do not persist for 8 hours. EPA recommends calculation of a persistence factor based on actual 1-hour and 8-hour CO measurements. This was done for a recent Hawaii project [23] and yielded an average persistence factor of 0.5. Applying this factor to the maximum 1-hour estimates again indicates compliance with both State and Federal 8-hour standards.

FIGURE 10

ESTIMATES OF MAXIMUM 1-HOUR CARBON MONOXIDE CONCENTRATIONS
Puainako Street at Komohana Street
Peak Traffic Hours
1996 - 2010



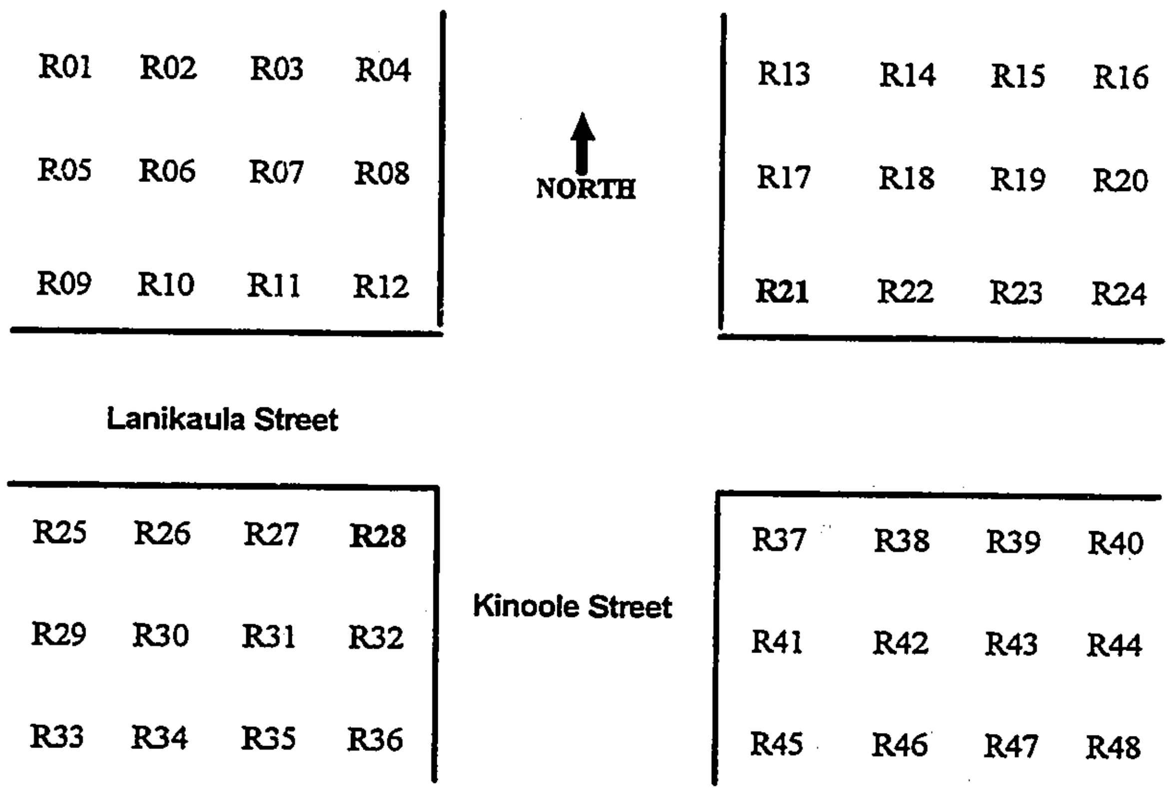
Receptor Spacing
= 10 meters

Estimated Maximum Concentrations
(mg/m^3)

Period	Existing	2010 w/o Project	2010 with Project
AM	2.9 (R37)	5.5 (R28)	6.5 (R28)
PM	1.6 (R37)	3.3 (R12)	3.3 (R28)

FIGURE 11

ESTIMATES OF MAXIMUM 1-HOUR CARBON MONOXIDE CONCENTRATIONS
Lanikaula Street at Kinoole Street
Peak Traffic Hours
1996 - 2010



Receptor Spacing
= 10 meters

Estimated Maximum Concentrations
(mg/m³)

Period	Existing	2010 w/o Project	2010 with Project
AM	2.8 (R21)	4.2 (R21)	4.5 (R21)
PM	2.2 (R28)	4.2 (R28)	4.3 (R28)

7. DISCUSSION, CONCLUSIONS AND MITIGATION

7.1 Short-Term Impacts. Although the potential for fugitive dust seems quite low due to the wet climate and low wind speeds, adequate dust control should not be ignored, particularly if dry periods occur during the construction phases. Dust control can be accomplished through frequent watering of unpaved roads and areas of exposed soil. The EPA estimates that twice daily watering can reduce fugitive dust emissions by as much as 50% [14]. Accelerated landscaping of completed areas will also help. Due to the proximity of existing residences and other occupied structures, dust control should be implemented as required based on weather conditions.

The offsite impacts associated with preparation of construction materials (asphalt and concrete batching) will be controlled by the existing regulatory requirements for air pollution sources which will ensure that they remain in compliance with health and environmental standards.

7.2 Mobile Source Impacts. As noted in Section 6, no exceedances of State or Federal carbon monoxide standards are predicted for 2010. Predicted concentrations increase with or without the project due to increased traffic volumes, reduced average speed, and queuing at signalized intersections.

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APPENDIX *I*

TRAFFIC IMPACT ASSESSMENT
(by Pacific Planning & Engineering, Inc.)

TRAFFIC IMPACT ASSESSMENT REPORT

FOR

UNIVERSITY PARK
UNIVERSITY OF HAWAII AT HILO

April 1997

Hilo, Hawaii

Prepared for:

University of Hawaii at Hilo

Prepared By:

Pacific Planning & Engineering, Inc.
1221 Kapiolani Boulevard, Suite PH 60
Honolulu, Hawaii 96814

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FOREWORD

The traffic forecasts shown within this report's figures and tables are the direct result of Pacific Planning & Engineering, Inc.'s proprietary forecasting and analytical tools. For report editing and review purposes, some or all of the forecast values have been rounded to the nearest five vehicles from our mathematical results, although we do not imply this level of accuracy can exist in any forecast method. The rounded values, however, reasonably quantify the forecasted traffic volumes for the purposes of this study.

Analytical methods are based on the 1994 edition of the Highway Capacity Manual.

EXECUTIVE SUMMARY

Pacific Planning & Engineering, Inc. (PP&E) was engaged to identify and assess potential future traffic impacts that would be caused by the proposed expansion of facilities at the University of Hawaii at Hilo in Hilo, Hawaii.

Project Description

The University of Hawaii at Hilo is planning to expand the existing campus and provide a University Park. The development is situated mauka of the existing campus and will consist of:

- Expansion of facilities to accommodate 3,067 new students and 558 new faculty/staff personnel along with 1,159 new parking stalls
- New residence halls to accommodate 750 beds with 375 parking stalls
- Multi-Purpose Center with 8,000 seats and 2000 parking stalls
- Expansion of the Research and Technology Park with 684 new employees.

The project is located in Hilo. Figure 1 on page 8 depicts the general location. Access to the new facilities will be mainly via Nowelo Street off Komohana Street and an existing access off Lanikaula Street The major access would be from Nowelo Street off Komohana Street.

An internal road connecting the upper and lower sections of the campus will be built. This road will extend Nowelo Street and provide connection to Lanikaula Street.

Methodology

Traffic analysis of 2010 traffic forecasts was conducted for the following intersections to determine the relative impact of the proposed project:

- Komohana Street with Puainako Street
- Komohana Street with Nowelo Street
- Lanikaula Street with Access 6
- Kinoole Street with Lanikaula Street

These intersections represent the areas where project traffic would have the greatest impact in terms of concentration, other traffic streams, and major roadways. Photos of these intersections are shown as Figures ES-1 through ES-4.

Future traffic was forecasted at the study intersections based on the approved planning values contained in the Long Range Highway Plan. The major objective was to convert the Plan's stated values for average daily traffic assignments to weekday peak hour intersection turning movement volumes. These turning movement volumes are essential for the Highway Capacity Manual analyses. This was accomplished by the following method:

- reviewing the Island of Hawaii Long Range Highway Plan,
- adapting various data from that report such as daily average daily traffic forecasts as a basis to obtain weekday peak hour traffic volumes,
- traffic generated by the project uses.

This study assesses the impact on the study intersections by determining the level-of-service (LOS) for existing, 2010 forecast without project, and 2010 forecast with project scenarios.

The University Park Project completion schedule is mainly a function of available funding. If all of the project were complete by the year 2010, the impacts described in the following sections would fairly represent the traffic needs of the project.

Figure ES-1. Komohana Street with Puainako Street

Figure ES-2. Komohana Street with Nowelo Street

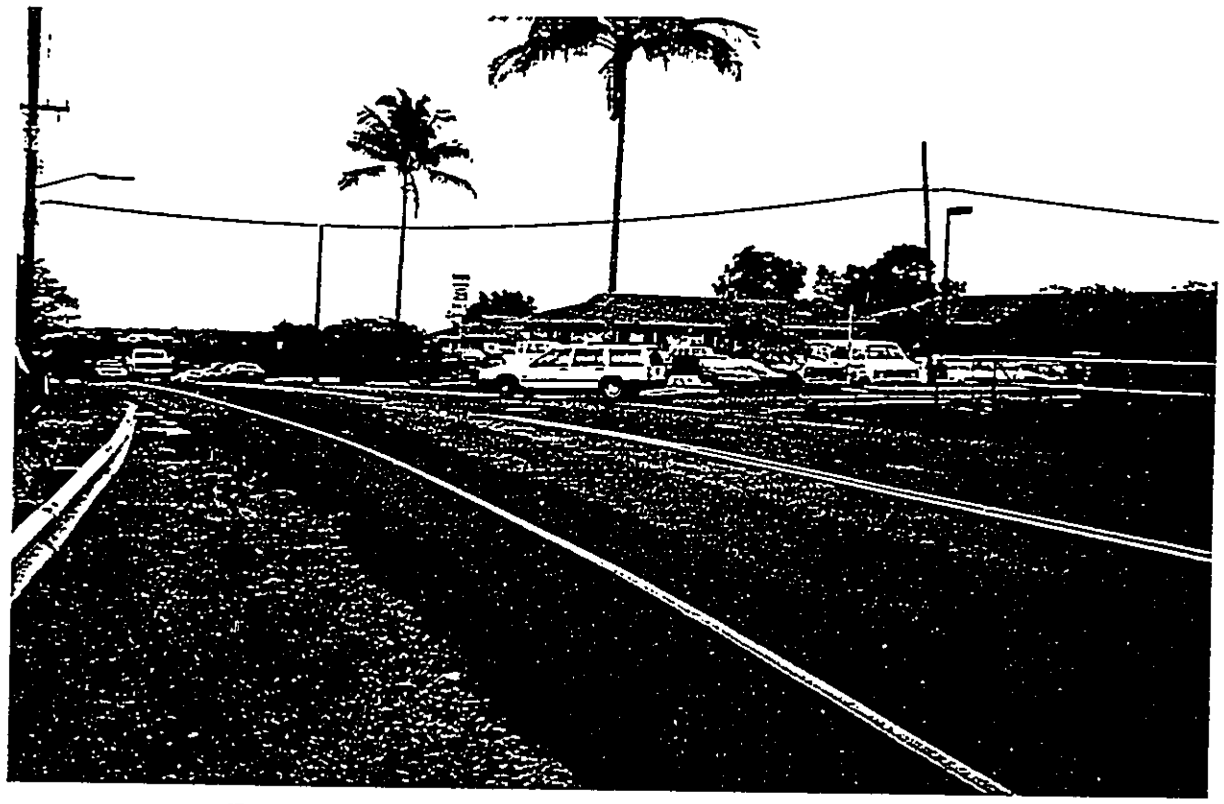


Figure ES-3. Lanikaula Street with Access 6

Figure ES-4. Kinoole Street with Lanikaula Street

Conclusions and Recommendations

The University Park project at the University of Hawaii at Hilo will have some impact on traffic flow at several of the study intersections based on the comparison of level-of-service (LOS) and delay results between the 2010 traffic conditions during the weekday peak hours without and with the project.

Even without the project, the increase in traffic volumes require certain roadway improvements. Based on the Island of Hawaii Long Range Highway Plan, Komohana Street is planned to be widened from two to four lanes with dedicated turn lanes at major intersections and traffic signalization. The Plan also recommends widening Puainako Street and Kinoole Street from two to four lanes. Figure 9 shows the laneage requirements for year 2010 traffic volumes without the project.

With the project, the analysis results show several movements will have decreases in LOS. The intersections with the largest impact are Komohana Street with Puainako Street and Kinoole Street with Lanikaula Street during the morning peak hours. However, although the LOS drops with the project, the intersection would still operate satisfactorily at LOS D.

For the access point at Access 6, a left-turn storage lane for motorists entering the campus would provide smoother traffic flow. No additional improvements are necessary for the intersection of Komohana Street with Nowelo Street.

The Multi-Purpose center may generate large traffic volumes during special events. However, it is not expected to occur on a frequent basis, and less frequently during peak hours. Depending on the event, it may be necessary to provide additional measures (coning, traffic control personnel, etc.) such as currently used for events at the Special Events Arena on the Manoa campus.

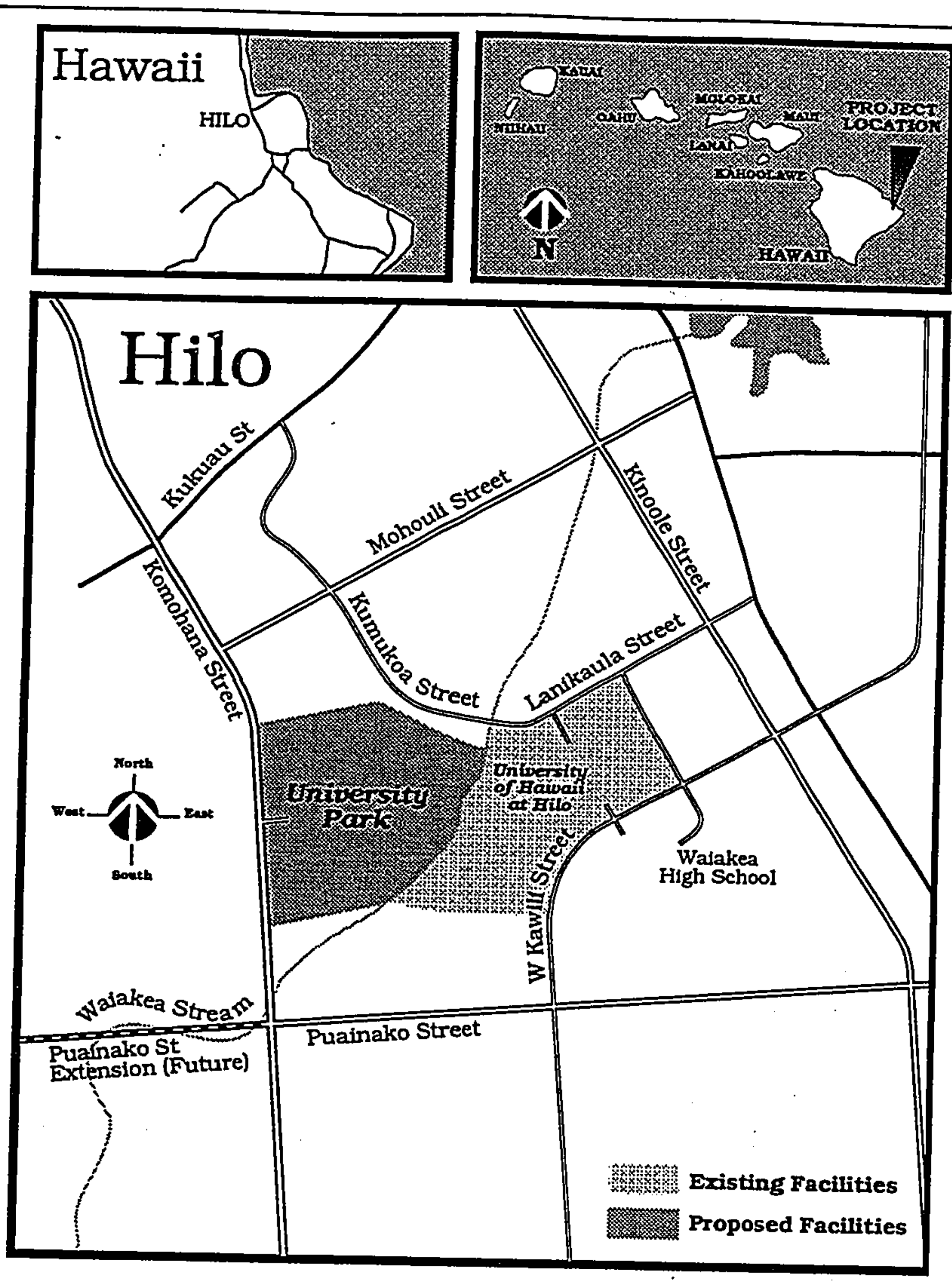
PROJECT DESCRIPTION

The University of Hawaii at Hilo is planning to expand the existing campus and provide a University Park. The development is situated mauka of the existing campus and will consist of:

- Expansion of facilities to accommodate 3,067 new students and 558 new faculty/staff personnel along with 1,159 new parking stalls
- New residence halls to accommodate 750 beds with 375 parking stalls
- Multi-Purpose Center with 8,000 seats and 2000 parking stalls
- Expansion of the Research and Technology Park with 684 new employees.

The project is located in Hilo as shown in Figure 1. Access to the new facilities will be mainly via Komohana Street and Lanikaula Street The major access would be from Nowelo Street off Komohana Street.

An internal road connecting the upper and lower sections of the campus will be built. This road will extend Nowelo Street and provide connection to Lanikaula Street.



University of Hawaii at Hilo - University Park

PACIFIC PLANNING & ENGINEERING, INC	**Project Location Map**	**Figure 1**

EXISTING CONDITIONS

An inventory of existing conditions was conducted to establish the current traffic conditions in the area and to provide a basis for estimating the potential traffic impact of the proposed project. The review included the land uses in the area, roadway facilities, and existing traffic conditions.

Land Uses

The land uses immediately surrounding and near to the project consist mainly of adjacent residential areas. The Waiakea Schools (elementary, intermediate, high) are situated south of the campus.

Roadway Facilities

Komohana Street serves as a north-south collector roadway serving the Hilo area. It consists of one through lane in each direction with turn lanes at selected intersections. Several intersections are signalized. The posted speed limit varies from 25 to 45 miles per hour (mph).

Kinoole Street is a two lane collector roadway that essentially parallels Komohana Street to the east. Various intersections are signalized and the posted speed limit is 35 mph.

Puainako Street is a two lane road that provides east-west circulation through Hilo. It terminates at Komohana Street to the west and Kanoelehua Street to the east. The posted speed limit is 25 mph.

Lanikaula Street is a two lane road which provides access to the University opposite Kawili Street. The posted speed limit is 25 mph.

Figure 2 shows the existing laneage for the study intersections.

Traffic Conditions

Traffic counts were taken at the following study intersections:

- Komohana Street with Puainako Street
- Komohana Street with Nowelo Street
- Lanikaula Street with Access 6
- Kinoole Street with Lanikaula Street

State Department of Transportation 24-hour count data indicate that the peak traffic periods in the vicinity occur from 6:00 to 8:00 a.m. in the morning and 4:00 to 6:00 p.m. in the afternoon. The counts were taken on April 1-2, 1996 during the peak periods. These counts were used as the baseline condition to which future estimated traffic volumes were added.

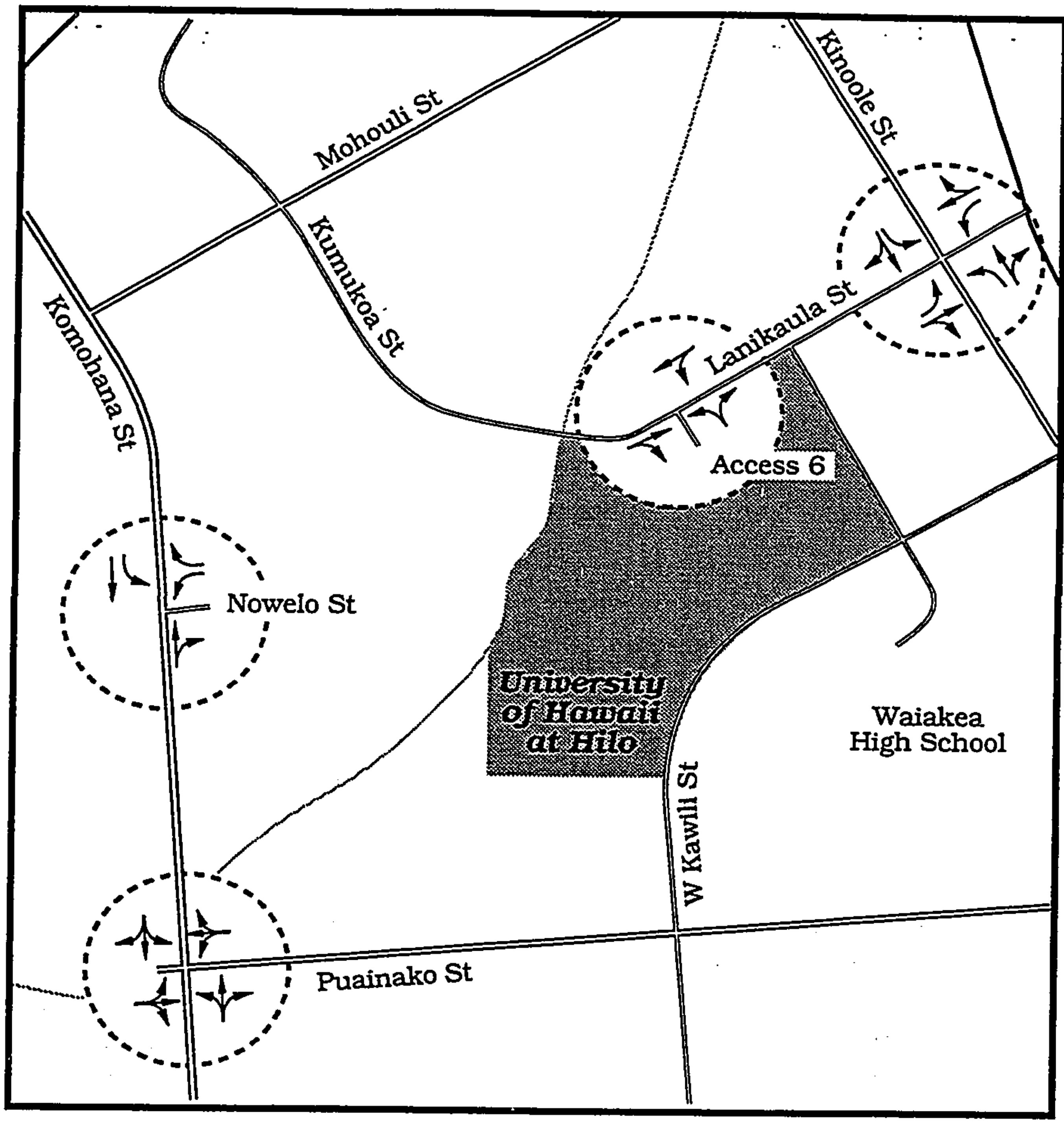
Manual counts were taken of passenger cars, trucks and buses by turning movements and approaches. During the morning and afternoon study periods, the weather was overcast with showers and the roadway pavement was wet. Figures 3 and 4 show the present traffic volumes at the study intersection. The manual traffic count data for the study periods is summarized in Appendix A.

The following observations were made at the time of the survey:

- During the morning peak hour, through traffic on Komohana Street flowed without difficulty through the study intersection. However, motorists turning left from Puainako Street experienced long delays due to a steady stream of vehicles northbound on Komohana Street. During the afternoon peak hour, traffic appeared to flow much better.

- At the other intersections, traffic flowed smoothly during both peak hours.

Figures 3 and 4 show the existing traffic volumes during the peak hours.



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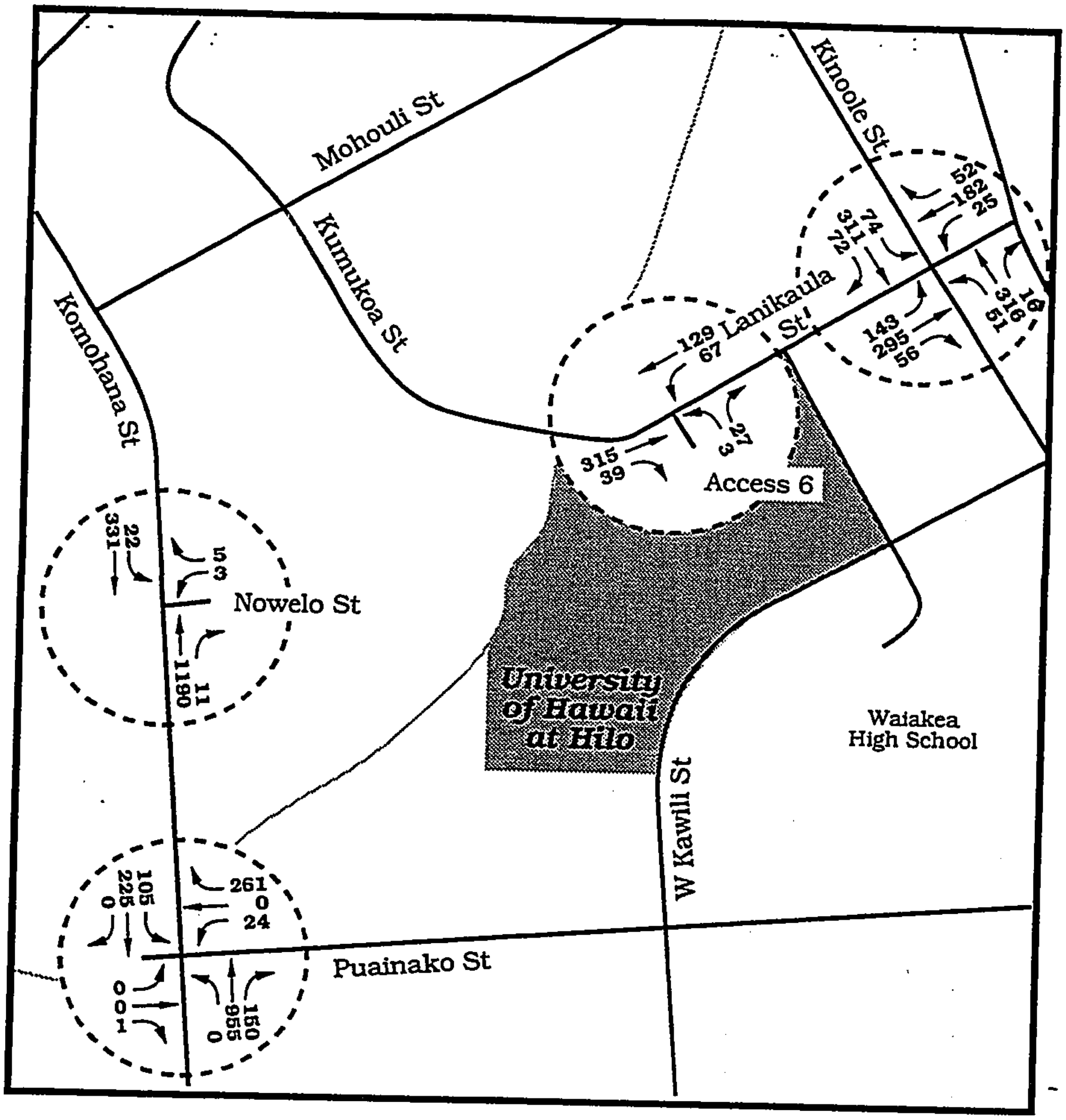
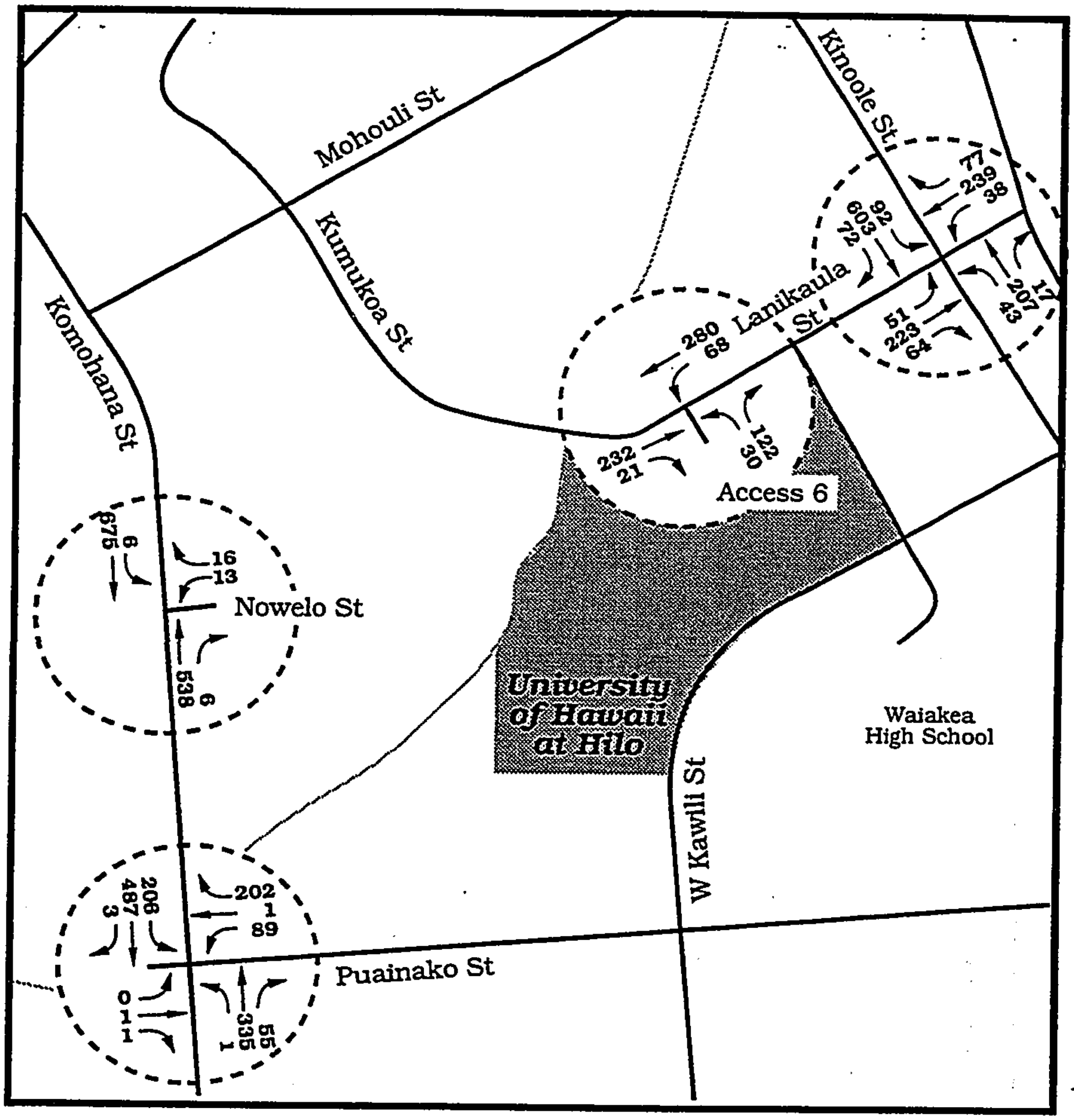
Existing Study Intersections & Laneages

Figure 2



PACIFIC PLANNING ENGINEERING, INC	Existing Weekday Morning Peak Hour Traffic Volumes	Figure 3



PACIFIC PLANNING & ENGINEERING, INC

Existing Weekday Afternoon Peak Hour Traffic Volumes

Figure 4

FUTURE CONDITIONS

A survey was conducted for any approved planned developments in the immediate area for inclusion in the total future traffic conditions at the study intersection.

Land Uses

Because of the long-term nature of the study year, the Island of Hawaii Long Range Highway Plan published in 1991 is the basis for estimating future land uses based on population and employment data for the year 2010.

Roadway Facilities

Because of the long-term nature of the study year, the Island of Hawaii Long Range Highway Plan was used to determine future roadway improvements. The Plan describes roadway improvements for the year 2010 and is summarized below:

- Komohana Street: Widen Komohana Street from Ainaola Drive to Puainako Street to provide a two-way left turn lane. Widen Komohana Street from two lanes to four lanes from Puainako Street to Waianuenue Avenue. Provide dedicated turn lanes at major intersections.
- Puainako Street: Extend Puainako Street mauka of Komohana Street to connect with Kaumana Drive. Widen Puainako Street from two lanes to four lanes from Komohana Street to Kinoole Street.
- Kinoole Street: widen Kinoole Street from two to four lanes from Ponahawai Street to Olona Street.

PROJECTED TRAFFIC CONDITIONS

Future traffic was forecasted for the year 2010 for traffic conditions without and with the University project at the study intersections.

Future Traffic Without Project

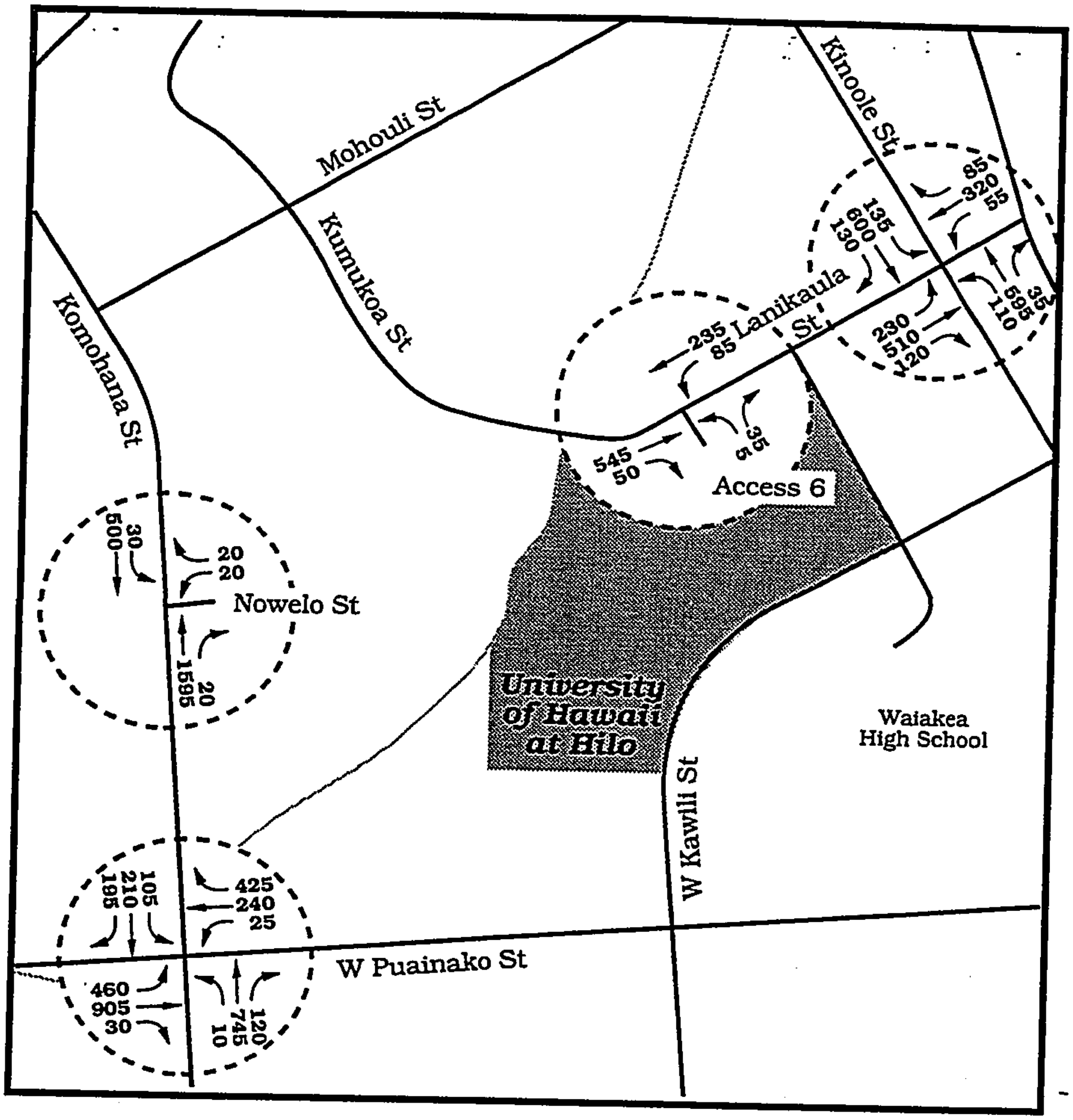
Future traffic without the proposed project was forecasted by reviewing the Island of Hawaii Long Range Highway Plan (May 1991). The plan provides a forecast of Average Daily Traffic (ADT) volumes for the year 2010 on critical roadways within the Hilo area.

The ADT volumes were reduced to morning and afternoon peak hour traffic volumes using k (peak hour percentages) and d (directional percentages) factors from DOT data and existing counts. Turning movements were estimated based on existing data as well as year 2010 forecasts of population and employment. The resultant values for the 2010 weekday morning and afternoon peak hour traffic volumes without project traffic are shown in Figures 5 and 6.

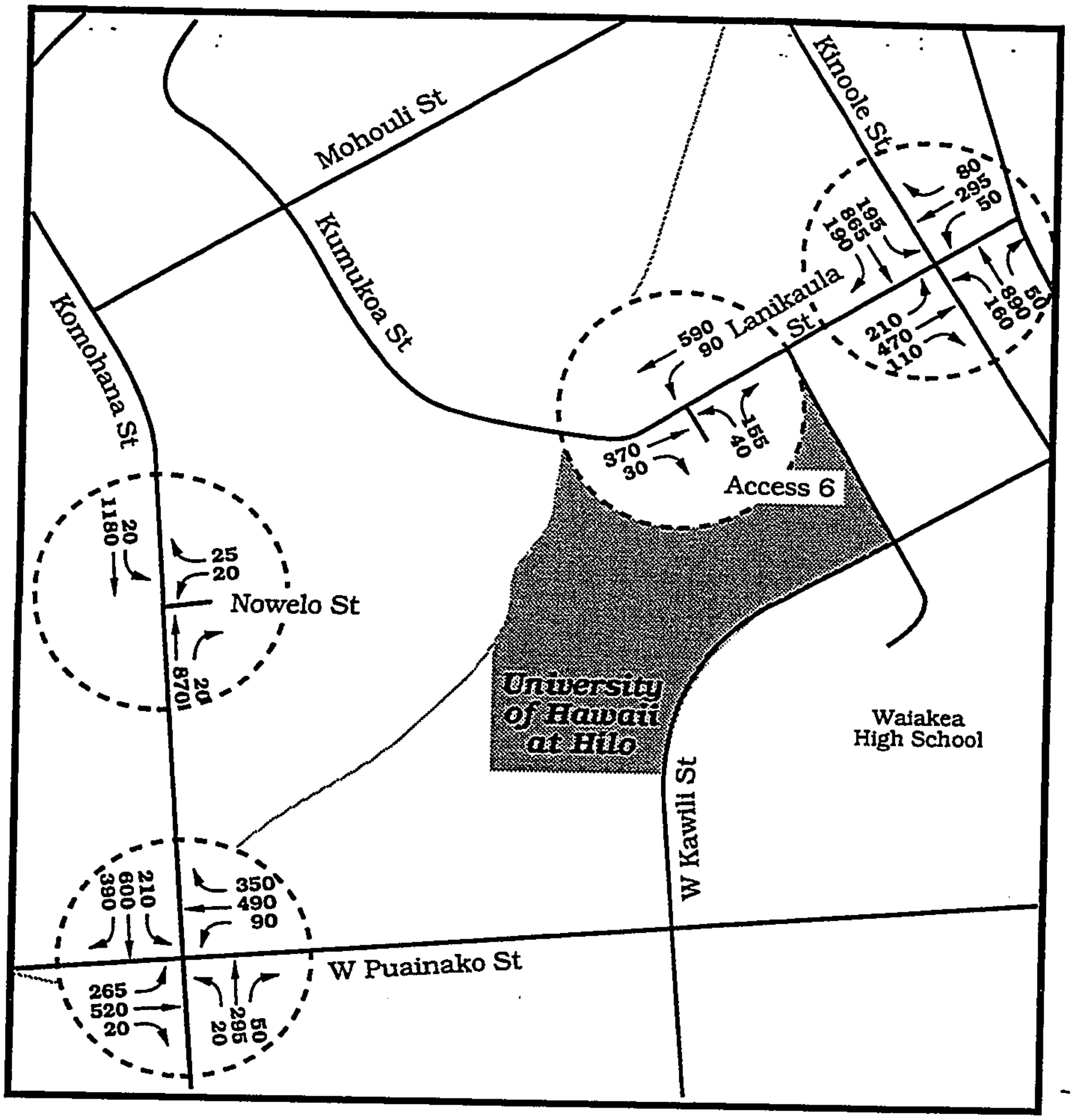
Future Traffic With Project

Future traffic with the project was forecasted by adding traffic generated by the proposed project to the forecasted traffic without the project. Future traffic with the project traffic was forecasted for the 2010 weekday morning and afternoon peak hours.

The standard three step procedure of trip generation, trip distribution, and traffic assignment was used to estimate peak hour traffic from the proposed project.



PACIFIC PLANNING ENGINEERING, INC	2010 Weekday Morning Peak Hour Traffic Volumes Without Project	Figure 5



PACIFIC PLANNING ENGINEERING, INC

2010 Weekday Afternoon Peak Hour Traffic Volumes Without Project

Figure 6

Vehicle trips generated by the project were estimated using the project land uses, the ITE Trip Generation Report[1], and trip rates derived using data from another similar land use. Trips generated by the Multi-Purpose Center were not included in the forecasts since events that would generate external trips would not occur on a day to day basis. Planned uses primarily are targeted for users already on campus. However, special traffic control actions may be required as noted elsewhere. This report focuses on daily average peak hour traffic. Table 1 shows the estimated number of project trips.

Table 1 - Trip Generation for UH Hilo Expansion

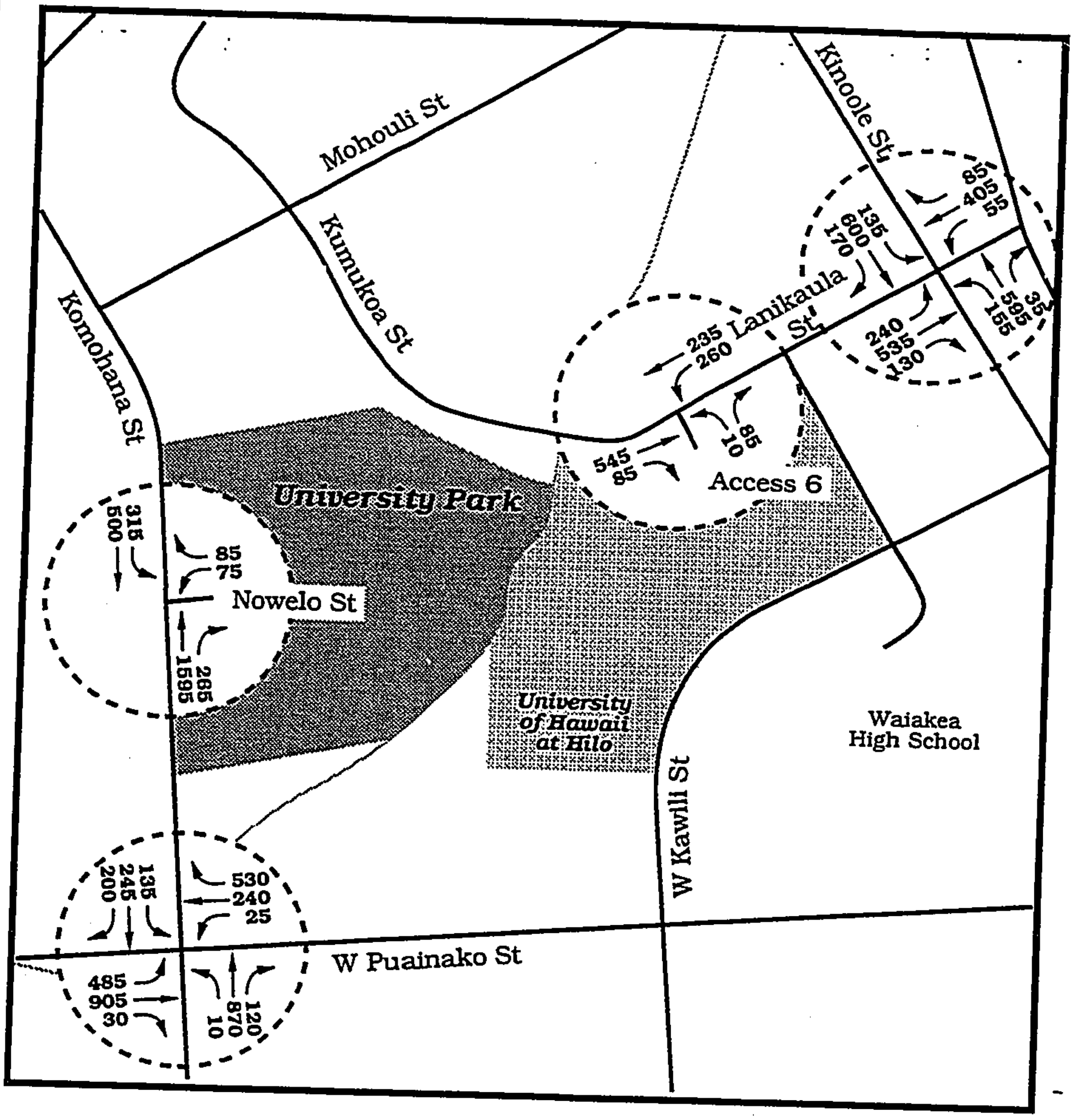
Land Use	Parameter	Morning Peak Hour		Afternoon Peak Hour	
		Enter	Exit	Enter	Exit
Campus Expansion	3067 Students	478	105	205	501
Research & Tech Park	684 Employees	244	50	42	238
Total		722	155	247	739

The trip distribution step estimates the distribution of vehicle trips to their predicted destinations and origins. Trips were distributed based on the estimated forecasted population of the Hilo District from the Island of Hawaii Long Range Highway Plan.

The traffic assignment step assigns vehicle trips to specific routes on the roadway network that will take the driver from origin to destination. All trips were assigned to the various roadways surrounding the study intersections based on likely travel paths.

The resulting traffic volume forecasts are shown in Figures 7 and 8.

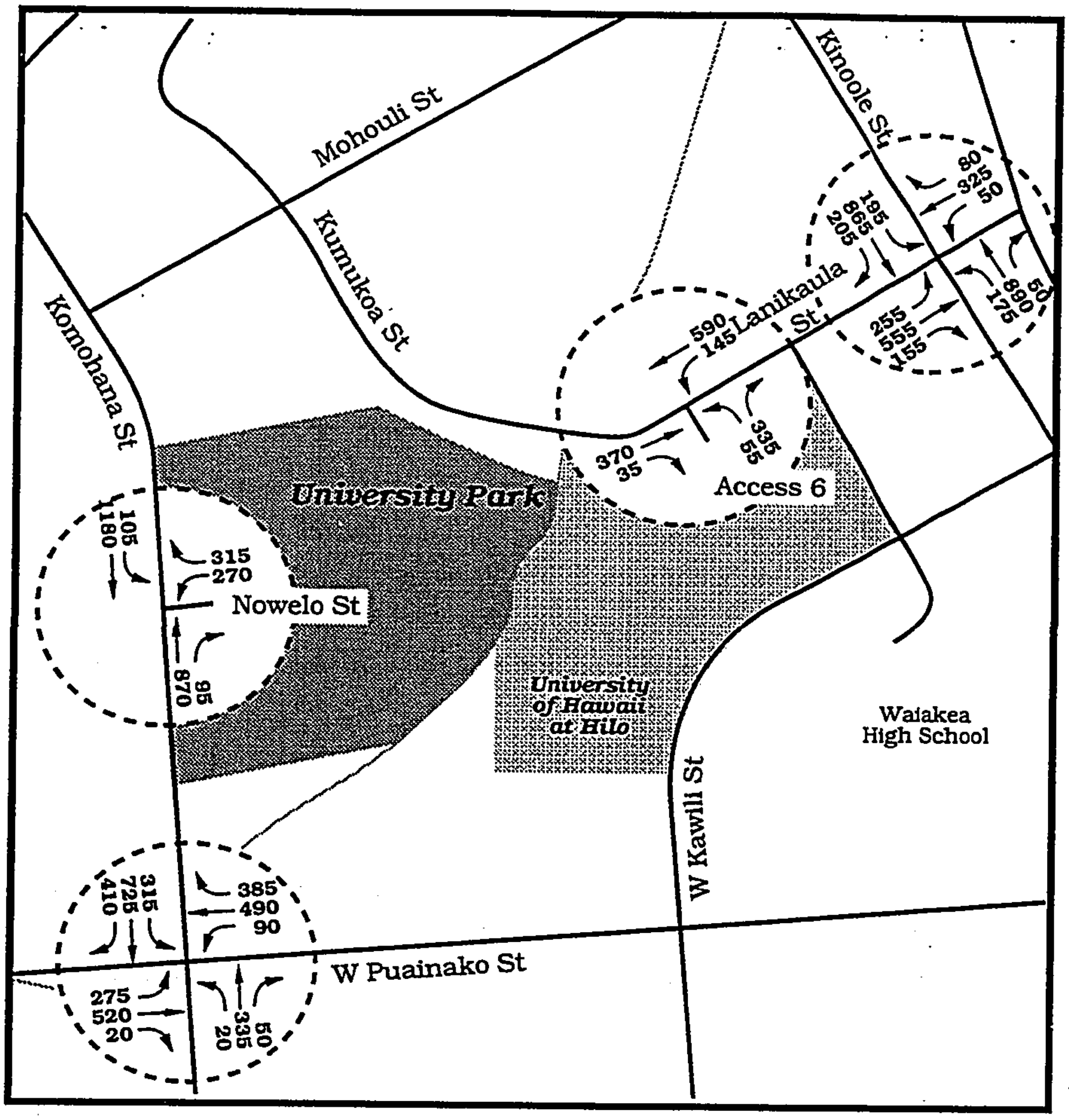
[1] Trip Generation Report, by the Institute of Transportation Engineers, Fifth Edition, 1991.



PACIFIC PLANNING & ENGINEERING, INC

2010 Weekday Morning Peak Hour Traffic Volumes With Project

Figure 7



PACIFIC PLANNING & ENGINEERING, INC	2010 Weekday Afternoon Peak Hour Traffic Volumes With Project	Figure 8

TRAFFIC ANALYSIS

Analyses were conducted on the following study intersections to determine the relative impact of the proposed improvement project on the local roadway system and to determine improvements to mitigate the impact of the project:

- Komohana Street with Puainako Street
- Komohana Street with Nowelo Street
- Lanikaula Street with Access 6
- Kinoole Street with Lanikaula Street

Analysis Methods

The study intersections were analyzed using methods outlined in the Highway Capacity Manual (HCM), Special Report 209, 1994. Appendix B provides detailed definitions of the "level-of-service" (LOS) used in this study. (The reader should note that certain significant changes released in early 1995 have been made to the HCM. These changes are incorporated in our analysis.)

Signalized Intersection Analysis is based on average stopped delay per vehicle to measure traffic operating conditions. The methodology for operational analysis measures traffic operations using the LOS rating, which ranges from A to F. The LOS for the traffic movements at a signalized intersection is classified into six categories ranging from less than 5 seconds of average delay per vehicle (LOS A) to over 60 seconds of average delay per vehicle (LOS F).

Unsignalized Intersection Analysis is determined by total delay which is defined as the total elapsed time from when a vehicle stops at the end of a queue until the vehicle departs from the stop line. This includes the time required for the vehicle to travel from the last-in-queue position. LOS for unsignalized intersections is also classified into six categories ranging from less than 5 seconds of average total delay per vehicle (LOS A) to over 45 seconds of average total delay per vehicle (LOS F).

The Island of Hawaii Long Range Highway Plan recommends certain roadway improvements. The Plan calls for widening Komohana Street to four lanes with dedicated turn lanes at major intersections, widening Kinoole Street to four lanes and widening Puainako Street to four lanes. The laneage requirements at the study intersections for the "without project" case were based on the Plan's guidance as well as on capacity conditions. Figure 9 shows the laneage requirements for the "without project" case.

These laneages were also used in the analysis for the "with project" case to determine the relative impact of the project.

Analysis Results

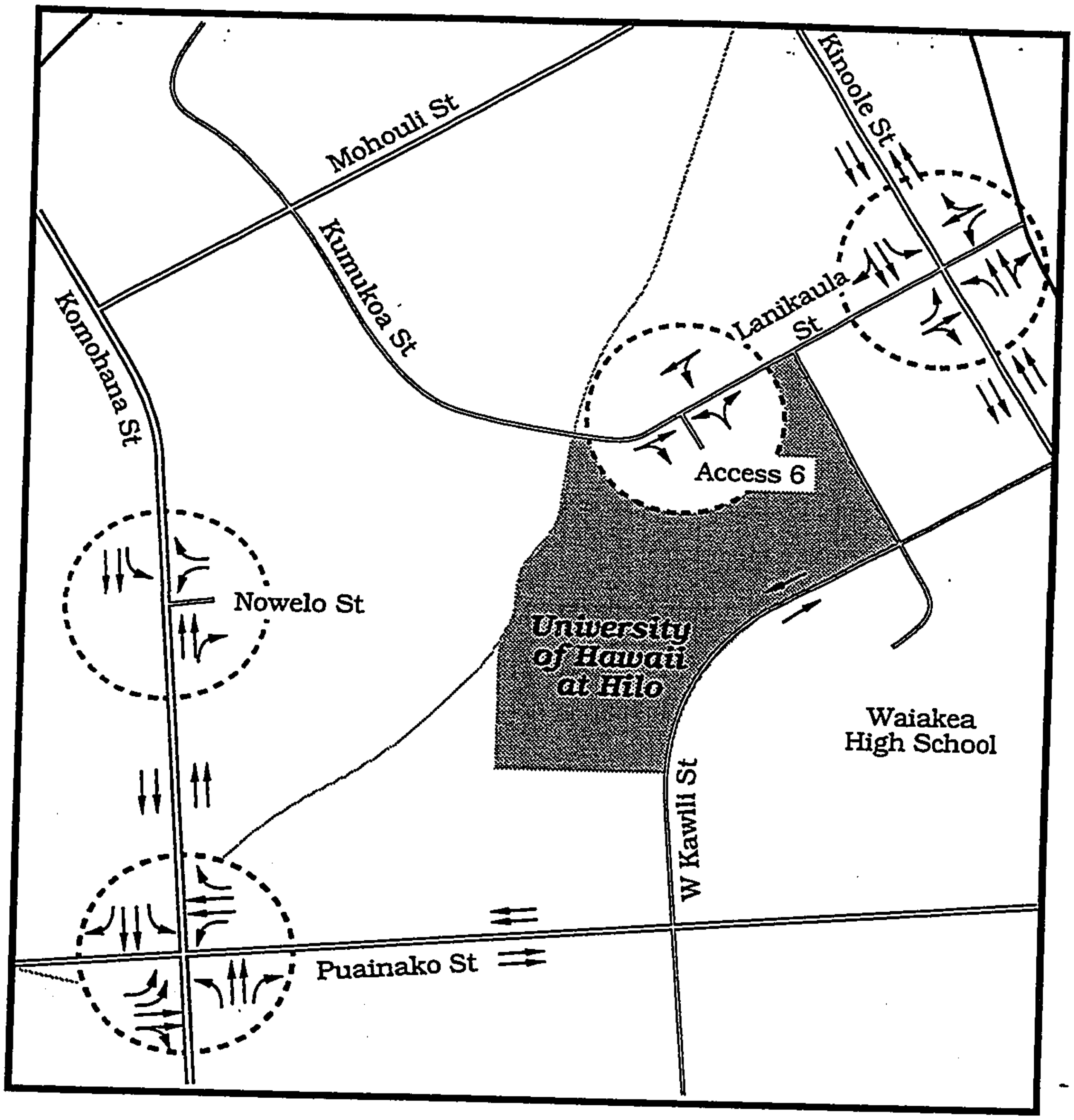
The results of the analysis for the study intersections are shown in Tables 2 through 8 with certain highlights described.

Kinoole Street with Lanikaula Street (Table 2)

- Presently, all movements operate at LOS B during both the morning and afternoon peak hours.

For the year 2010, Kinoole Street is planned to be widened to four lanes from two lanes.

- Without the project, during the morning peak hour, several movements drop in LOS from "B" to "C" or "D". During the afternoon peak hour, all movements drop to LOS C or "D".



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Year 2010 Laneages Without Project

Figure 9

- With the project, during the morning peak hour, all movements operate at LOS C or "D" conditions with the overall intersection operating at LOS D. During the afternoon peak hour, the LOS for all movements remain the same except for increases in delay.

Table 2 - Kinoole Street with Lanikaula Street - Signalized Analysis			
Intersection / Movement	**LOS (delay-seconds/vehicle)**		
	Existing	**2010 Without Project**	**2010* With Project**
Morning Peak Hour			
Northbound TH on Kinoole St	B (7)	B (12)	C (23)
Northbound LT on Kinoole St	B (6)	C (19)	D (39)
Southbound TH on Kinoole St	B (8)	B (13)	D (37)
Southbound LT on Kinoole St	B (6)	D (34)	C (22)
Eastbound TH on Lanikaula St	B (11)	C (19)	C (24)
Eastbound LT on Lanikaula St	B (7)	B (10)	D (38)
Westbound TH on Lanikaula St	B (6)	B (6)	D (32)
Westbound LT on Lanikaula St	B (6)	B (5)	C (21)
Overall Intersection	B (8)	B (14)	D (30)
Afternoon Peak Hour			
Northbound TH on Kinoole St	B (7)	C (20)	C (21)
Northbound LT on Kinoole St	B (7)	D (39)	D (39)
Southbound TH on Kinoole St	B (12)	D (37)	D (39)
Southbound LT on Kinoole St	B (6)	D (39)	D (39)
Eastbound TH on Lanikaula St	B (10)	C (22)	C (22)
Eastbound LT on Lanikaula St	B (8)	D (39)	D (39)
Eastbound RT on Lanikaula St	n/a	C (16)	C (15)
Westbound TH on Lanikaula St	B (9)	D (24)	D (25)
Westbound LT on Lanikaula St	B (7)	C (21)	C (23)
Westbound RT on Lanikaula St	n/a	C (20)	C (21)
Overall Intersection	B (10)	D (29)	D (29)

* Analyzed with longer cycle lengths and protected-permitted left-turn phasing

Komohana Street with Nowelo Street (Tables 3 and 4)

- Presently, motorists attempting to turn left onto Komohana Street from Nowelo Street experience LOS D conditions during the morning peak hour and LOS C conditions during the afternoon peak hour.

For the year 2010, Komohana Street is planned to be widened to four lanes with signalization at the intersection.

- Without the project, the intersection would operate at LOS A for both the morning and afternoon peak hour.

- With the project, the intersection would operate at LOS B for both the morning and afternoon peak hour.

Table 3 - Komohana Street with Nowelo Street -Unsignalized Analysis

Intersection / Movement	LOS (delay-seconds/vehicle)		
	Existing	2010 Without Project	2010 With Project
Morning Peak Hour			
Southbound LT from Komohana St	B (8)	n/a	n/a
Westbound LT from Nowelo St	D (27)	n/a	n/a
Westbound RT from Nowelo St	C (11)	n/a	n/a
Afternoon Peak Hour			
Southbound LT from Komohana St	A (4)	n/a	n/a
Westbound LT from Nowelo St	C (17)	n/a	n/a
Westbound RT from Nowelo St	A (5)	n/a	n/a

Table 4 - Komohana Street with Nowelo Street - Signalized Analysis			
Intersection / Movement	LOS (delay-seconds/vehicle)		
	Existing	2010 Without Project	2010 With Project
Morning Peak Hour			
Northbound TH on Komohana St	n/a	A (2)	B (10)
Southbound TH on Komohana St	n/a	A (1)	A (2)
Southbound LT on Komohana St	n/a	A (1)	B (10)
Westbound LT on Nowelo St	n/a	D (39)	D (39)
Westbound RT on Nowelo St	n/a	D (39)	D (39)
Overall Intersection	n/a	A (2)	B (10)
Afternoon Peak Hour			
Northbound TH on Komohana St	n/a	A (2)	B (6)
Southbound TH on Komohana St	n/a	A (2)	B (7)
Southbound LT on Komohana St	n/a	A (1)	B (9)
Westbound LT on Nowelo St	n/a	D (37)	D (37)
Westbound RT on Nowelo St	n/a	D (37)	D (32)
Overall Intersection	n/a	A (3)	B (11)

Lanikaula Street with Access 6 (Table 5)

- Presently, all movements operate at LOS A during the morning peak hour. During the afternoon peak hour, exiting motorists experience LOS B conditions.

- Without the project, all movements will continue to operate at essentially the same LOS as the existing conditions.

- With the project, motorists exiting the driveway experience a drop in LOS from "B" to "C" during the afternoon peak hour. During the morning peak hour, motorists making left-turns into the driveway experience a drop in LOS from "A" to "B".

Table 6 - Lanikaula Street with Access 6 - Unsignalized Analysis			
Intersection / Movement	LOS (delay-seconds/vehicle)		
	Existing	2010 Without Project	2010 With Project
Morning Peak Hour			
Westbound LT from Lanikaula St	A (3)	A (4)	B (5)
Northbound LT/RT from Access 6	A (4)	B (5)	B (8)
Afternoon Peak Hour			
Westbound LT from Lanikaula St	A (3)	A (4)	A (4)
Northbound LT/RT from Access 6	B (5)	B (10)	C (16)

Komohana Street with Puainako Street (Tables 7 and 8)

- Presently, motorists turning from Puainako Street onto Komohana Street experience LOS D or E conditions during the study peak hours.

Table 7 - Komohana Street with Puainako Street - Unsignalized Analysis			
Intersection / Movement	LOS (delay-seconds/vehicle)		
	Existing	2010 Without Project	2010 With Project
Morning Peak Hour			
Southbound LT from Komohana St	B (10)	n/a	n/a
Westbound LT/TH/RT from Puainako St	E (44)	n/a	n/a
Afternoon Peak Hour			
Southbound LT from Komohana St	A (4)	n/a	n/a
Westbound LT/TH/RT from Puainako St	D (23)	n/a	n/a

For the year 2010, Komohana Street is planned to be widened to four lanes with dedicated turn lanes and signalization at the intersection.

- Without the project, the intersection would operate at LOS D for both the morning and afternoon peak hours.

- With the project, the intersection would operate at LOS D for both the morning and afternoon peak hours, but with increases in delay.

Table 8 - Komohana Street with Puainako Street - Signalized Analysis			
Movement	LOS (delay-seconds/vehicle)		
	Existing	2010 Without Project	2010 With Project
Morning Peak Hour			
Northbound TH on Komohana St	n/a	D (34)	D (39)
Northbound LT on Komohana St	n/a	D (39)	D (39)
Northbound RT on Komohana St	n/a	D (27)	D (26)
Southbound TH on Komohana St	n/a	C (23)	C (23)
Southbound LT on Komohana St	n/a	D (38)	D (39)
Southbound RT on Komohana St	n/a	C (23)	C (23)
Eastbound TH on Puainako St	n/a	C (21)	C (21)
Eastbound LT on Puainako St	n/a	D (35)	D (39)
Westbound TH on Puainako St	n/a	C (24)	C (23)
Westbound LT on Puainako St	n/a	D (39)	D (39)
Westbound RT on Puainako St	n/a	D (32)	D (39)
Overall Intersection	n/a	D (28)	D (32)
Afternoon Peak Hour			
Northbound TH on Komohana St	n/a	D (32)	D (32)
Northbound LT on Komohana St	n/a	D (39)	D (39)
Northbound RT on Komohana St	n/a	D (29)	D (29)
Southbound TH on Komohana St	n/a	C (24)	C (24)
Southbound LT on Komohana St	n/a	D (34)	D (39)
Southbound RT on Komohana St	n/a	C (24)	C (24)
Eastbound TH on Lanikaula St	n/a	C (22)	C (24)
Eastbound LT on Lanikaula St	n/a	D (35)	D (35)
Westbound TH on Lanikaula St	n/a	D (26)	D (27)
Westbound LT on Lanikaula St	n/a	D (39)	D (39)
Westbound RT on Puainako St	n/a	C (24)	D (26)
Overall Intersection	n/a	D (27)	D (28)

MITIGATION

Based on the analysis results, the proposed roadways shown on Figure 9 for the "without project" case should be sufficient to accommodate the University project with the following additional recommendation for smoother traffic flow:

- At the intersection of Lanikaula Street with Access 6, a left-turn storage lane on Lanikaula Street is recommended.

CONCLUSIONS AND RECOMMENDATIONS

The University Park project at the University of Hawaii at Hilo will have some impact on traffic flow at several of the study intersections based on the comparison of level-of-service (LOS) and delay results between the 2010 traffic conditions during the weekday peak hours without and with the project.

Even without the project, the increase in traffic volumes require certain roadway improvements. Based on the Island of Hawaii Long Range Highway Plan, Komohana Street is planned to be widened from two to four lanes with dedicated turn lanes at major intersections and traffic signalization. The Plan also recommends widening Puainako Street and Kinoole Street from two to four lanes. Figure 9 shows the laneage requirements for year 2010 traffic volumes without the project.

With the project, the analysis results show several movements will have decreases in LOS. The intersections with the largest impact are Komohana Street with Puainako Street and Kinoole Street with Lanikaula Street during the morning peak hours. However, although the LOS drops with the project, the intersection would still operate satisfactorily at LOS D.

For the access point at Access 6, a left-turn storage lane for motorists entering the campus would provide smoother traffic flow. No additional improvements are necessary for the intersection of Komohana Street with Nowelo Street.

The Multi-Purpose center may generate large traffic volumes during special events. However, it is not expected to occur on a frequent basis, and less frequently during peak hours. Depending on the event, it may be necessary to provide additional measures (coning, traffic control personnel, etc.) such as currently used for events at the Special Events Arena on the Manoa campus.

APPENDIX A

TRAFFIC COUNT DATA

Project : 26.0 UHHilo
Date: 4/2/96

	Direction	North-South Road	Direction
	NORTHBOUND	KOMOHANA	SOUTHBOUND

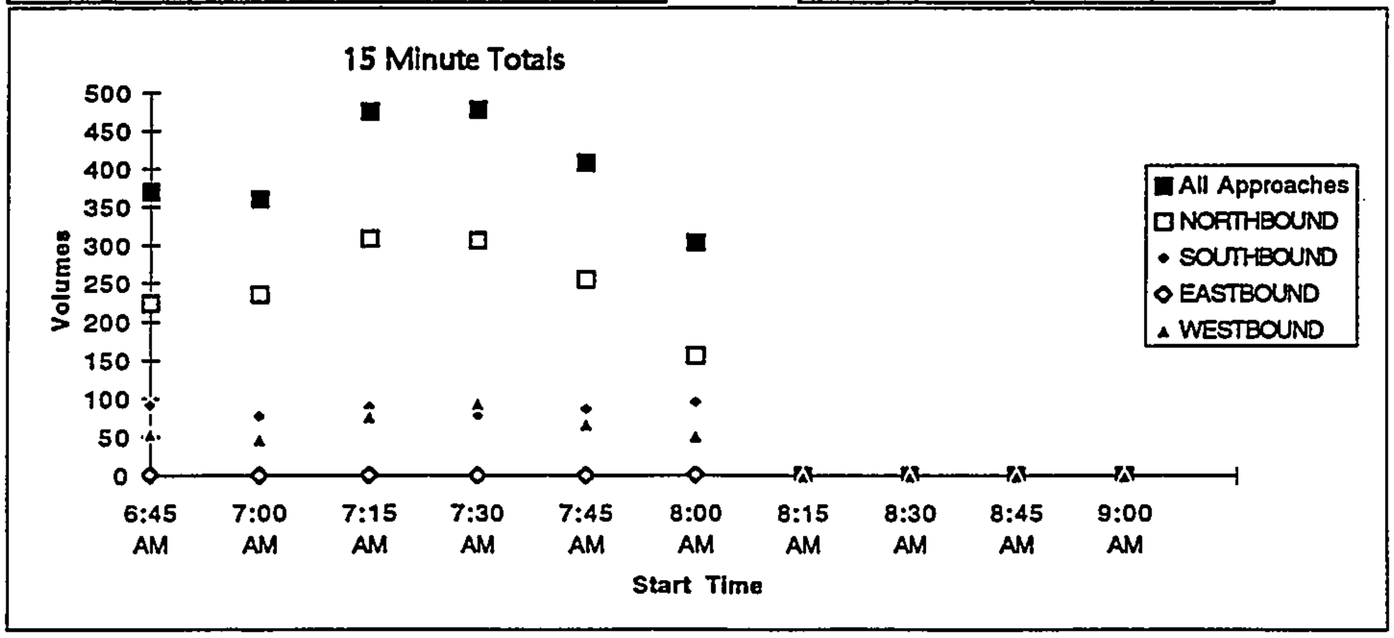
Start Time	NB-LT	NB-TH	NB-RT	T/B		SB-LT	SB-TH	SB-RT	T/B	
6:45 AM	0	187	37	0		33	58	0	0	
7:00 AM	0	200	36	3		35	42	0	0	
7:15 AM	0	266	42	1		25	64	0	0	
7:30 AM	0	260	46	0		25	53	0	0	
7:45 AM	0	229	26	4		20	66	0	0	
8:00 AM	0	142	14	0		29	66	0	0	

PEAK HOUR	NB-LT	NB-TH	NB-RT			SB-LT	SB-TH	SB-RT		
7:00 AM	0	955	150	8	0	105	225	0	0	0
8:00 AM	TOTAL	1105		0.72%		TOTAL	330		0.00%	

	Direction	East-West Road	Direction
	EASTBOUND	PUAINAKO	WESTBOUND

Start Time	EB-LT	EB-TH	EB-RT	T/B		WB-LT	WB-TH	WB-RT	T/B	
6:45 AM	0	1	0	0		3	0	51	0	
7:00 AM	0	0	0	0		3	0	44	1	
7:15 AM	0	0	1	0		4	0	73	0	
7:30 AM	0	0	0	0		4	0	90	0	
7:45 AM	0	0	0	0		13	0	54	0	
8:00 AM	0	1	0	0		7	1	44	0	

PEAK HOUR	EB-LT	EB-TH	EB-RT			WB-LT	WB-TH	WB-RT		
7:00 AM	0	0	1	0	0	24	0	261	1	0
8:00 AM	TOTAL	1		0.00%		TOTAL	285		0.35%	



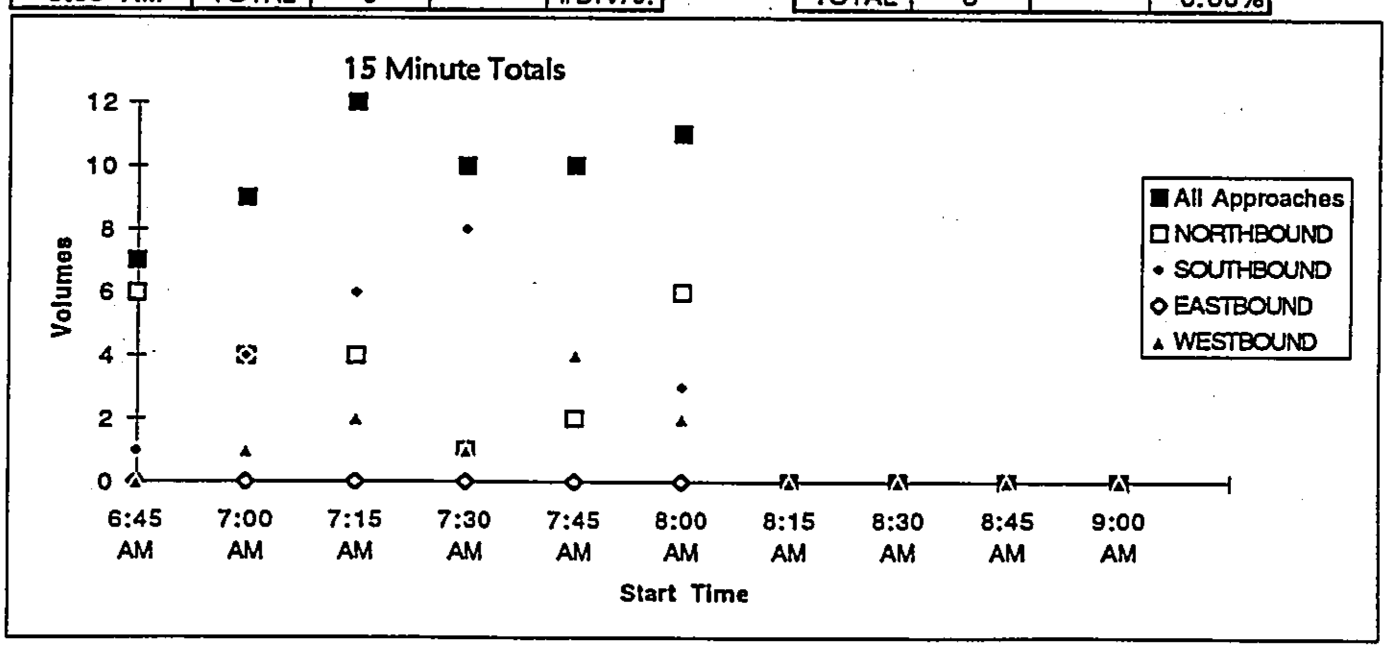
Project : 26.0 UHHilo
Date: 4/2/96

	Direction NORTHBOUND					North-South Road KOMOHANA	Direction SOUTHBOUND			
Start Time	NB-LT	NB-TH	NB-RT	T/B		SB-LT	SB-TH	SB-RT	T/B	
6:45 AM			6			1				
7:00 AM			4			4				
7:15 AM			4			6				
7:30 AM			1			8				
7:45 AM			2			4				
8:00 AM			6			3				

PEAK HOUR	NB-LT	NB-TH	NB-RT			SB-LT	SB-TH	SB-RT		
7:00 AM	0	0	11	0	0	22	0	0	0	0
8:00 AM	TOTAL	11		0.00%		TOTAL	22		0.00%	

	Direction EASTBOUND					East-West Road NAWELO	Direction WESTBOUND			
Start Time	EB-LT	EB-TH	EB-RT	T/B		WB-LT	WB-TH	WB-RT	T/B	
6:45 AM						0		0		
7:00 AM						0		1		
7:15 AM						2		0		
7:30 AM						1		0		
7:45 AM						0		4		
8:00 AM						1		1		

PEAK HOUR	EB-LT	EB-TH	EB-RT			WB-LT	WB-TH	WB-RT		
7:00 AM	0	0	0	0	0	3	0	5	0	0
8:00 AM	TOTAL	0		#DIV/0!		TOTAL	8		0.00%	



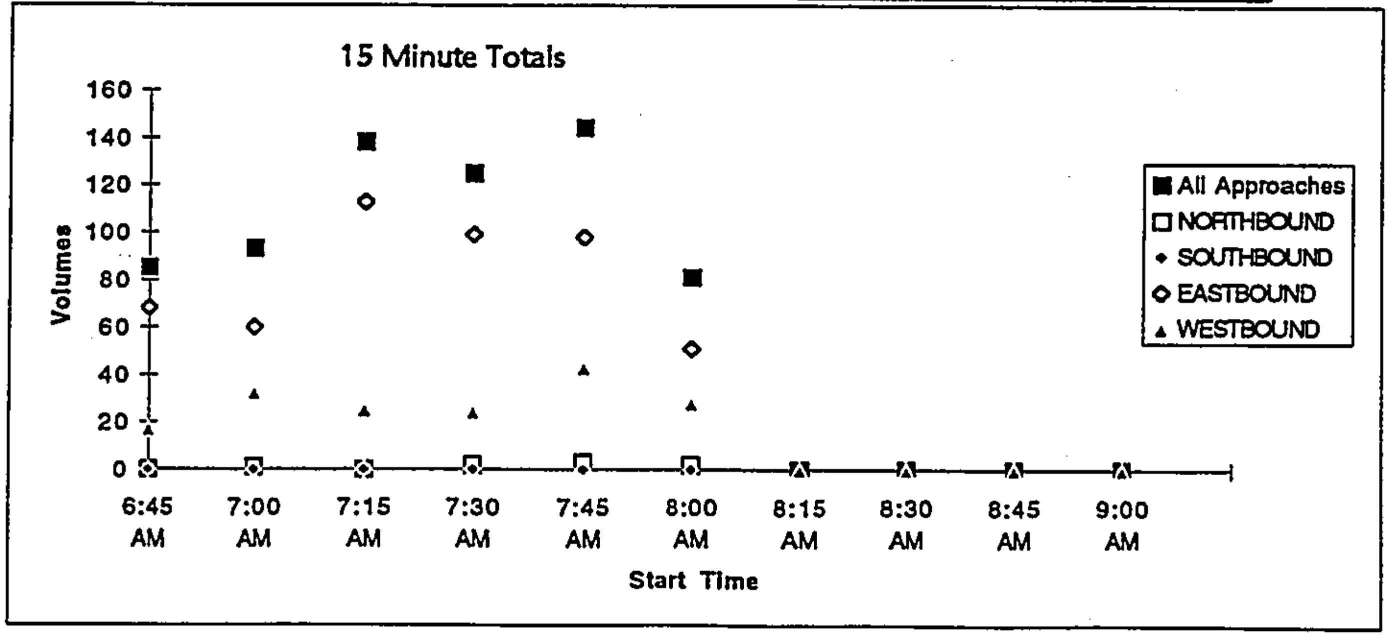
Project : 26.0 UHHilo
Date: 4/2/96

	Direction NORTHBOUND				North-South Road STUDENT HOUSING	Direction SOUTHBOUND				
Start Time	NB-LT	NB-TH	NB-RT	T/B		SB-LT	SB-TH	SB-RT	T/B	
6:45 AM	0		0	0						
7:00 AM	1		0	0						
7:15 AM	0		0	0						
7:30 AM	0		2	0						
7:45 AM	0		3	0						
8:00 AM	1		1	0						

PEAK HOUR	NB-LT	NB-TH	NB-RT			SB-LT	SB-TH	SB-RT		
7:00 AM	1	0	5	0	0	0	0	0	0	0
8:00 AM	TOTAL	6		0.00%		TOTAL	0		#DIV/0!	

	Direction EASTBOUND				East-West Road LANIKAULA	Direction WESTBOUND				
Start Time	EB-LT	EB-TH	EB-RT	T/B		WB-LT	WB-TH	WB-RT	T/B	
6:45 AM		68	0	0		0	17		0	
7:00 AM		60	0	0		1	31		1	
7:15 AM		113	0	0		1	24		1	
7:30 AM		99	0	0		2	22		0	
7:45 AM		98	0	0		1	42		0	
8:00 AM		51	0	1		2	26		2	

PEAK HOUR	EB-LT	EB-TH	EB-RT			WB-LT	WB-TH	WB-RT		
7:00 AM	0	370	0	0	0	5	119	0	2	0.
8:00 AM	TOTAL	370		0.00%		TOTAL	124		1.61%	



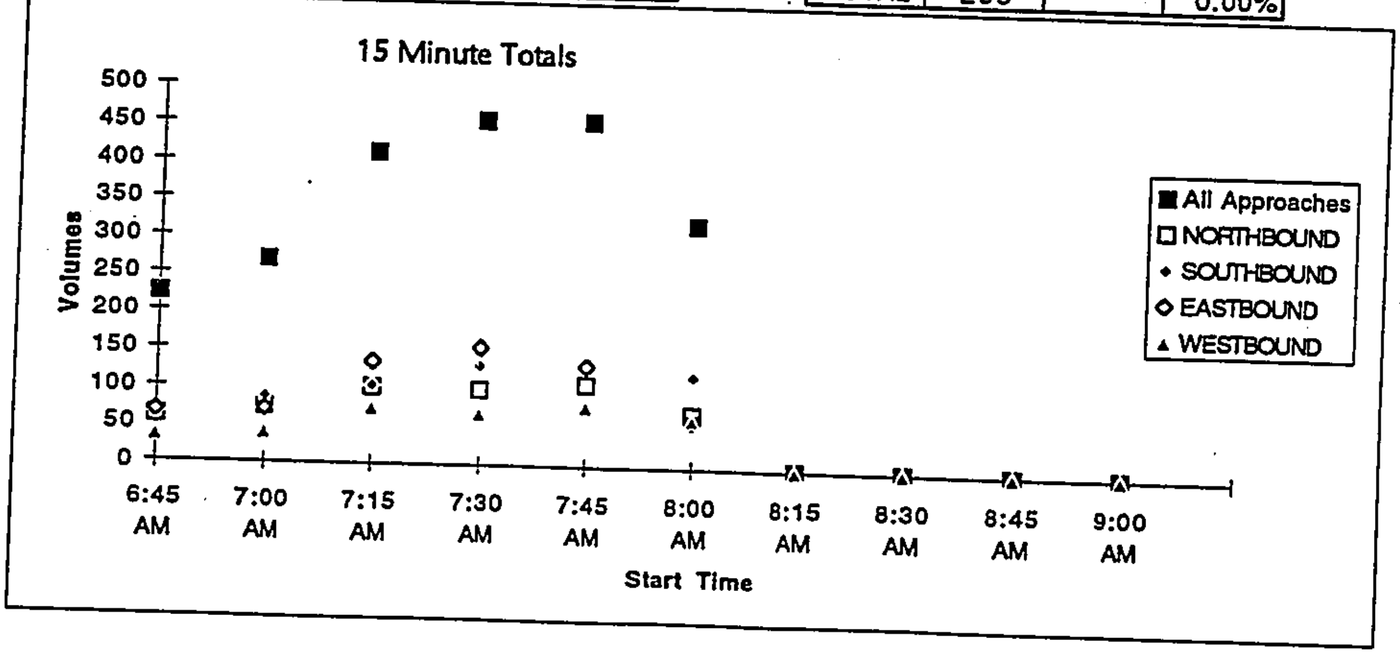
Project : 26.0 UHHilo
Date: 4/2/96

	Direction NORTHBOUND					North-South Road KINOOLE	Direction SOUTHBOUND			
Start Time	NB-LT	NB-TH	NB-RT	T/B		SB-LT	SB-TH	SB-RT	T/B	
6:45 AM	4	53	3	0		12	40	11	0	
7:00 AM	5	64	4	0		13	64	9	0	
7:15 AM	10	90	1	0		15	68	20	0	
7:30 AM	18	75	7	0		23	91	18	0	
7:45 AM	18	87	4	0		23	88	25	0	
8:00 AM	4	61	7	0		33	70	19	0	

PEAK HOUR	NB-LT	NB-TH	NB-RT			SB-LT	SB-TH	SB-RT		
7:00 AM	51	316	16	0	0	74	311	72	0	0
8:00 AM	TOTAL	383		0.00%		TOTAL	457		0.00%	

	Direction EASTBOUND					East-West Road LANIKAULA	Direction WESTBOUND			
Start Time	EB-LT	EB-TH	EB-RT	T/B		WB-LT	WB-TH	WB-RT	T/B	
6:45 AM	7	51	8	0		1	25	8	0	
7:00 AM	10	50	10	0		5	27	7	0	
7:15 AM	36	86	13	0		6	49	18	0	
7:30 AM	46	92	18	0		6	50	12	0	
7:45 AM	51	67	15	0		8	56	15	0	
8:00 AM	10	47	6	0		5	44	16	0	

PEAK HOUR	EB-LT	EB-TH	EB-RT			WB-LT	WB-TH	WB-RT		
7:00 AM	143	295	56	0	0	25	182	52	0	0
8:00 AM	TOTAL	494		0.00%		TOTAL	259		0.00%	



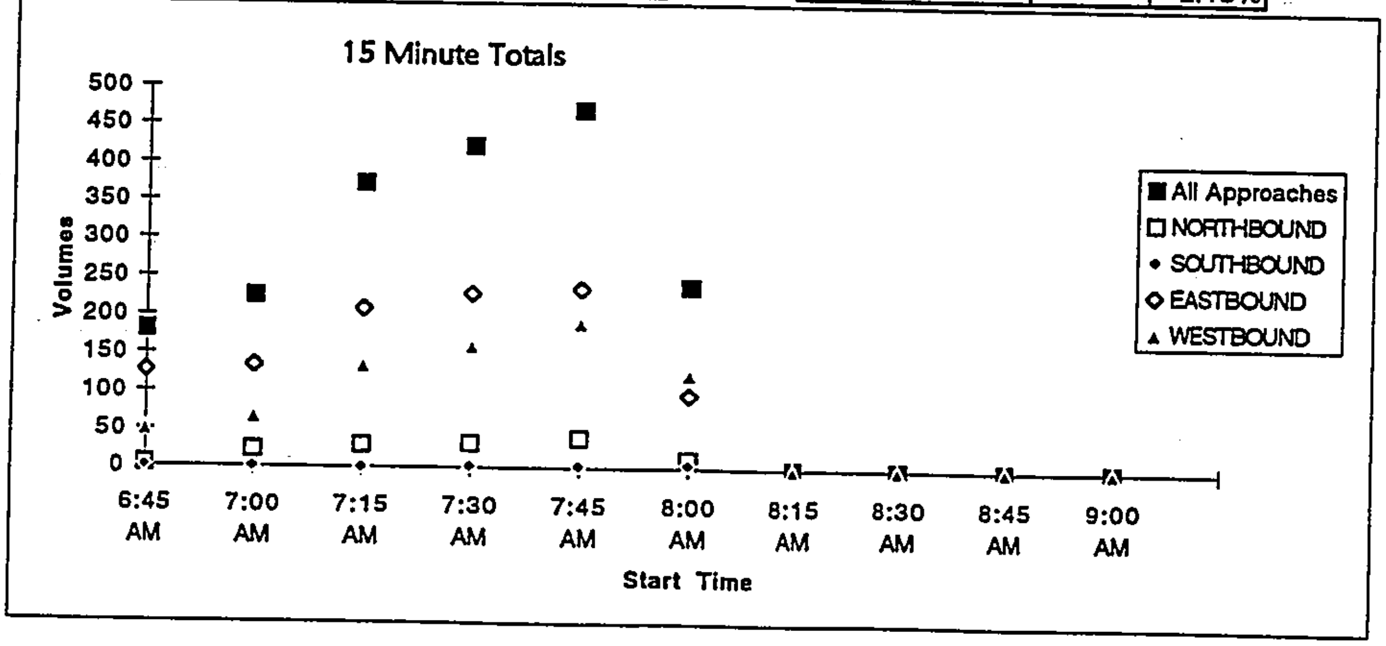
Project : **26.0 UHHilo**
Date: 4/3/96

	Direction NORTHBOUND					North-South Road DRIVEWAYS		Direction SOUTHBOUND		
Start Time	NB-LT	NB-TH	NB-RT	T/B		SB-LT	SB-TH	SB-RT	T/B	
6:45 AM	0	1	3	0		1	0	0	0	
7:00 AM	3	0	20	0		1	0	0	0	
7:15 AM	5	1	24	0		0	1	0	0	
7:30 AM	5	0	27	0		1	0	1	0	
7:45 AM	7	1	32	0		3	0	0	0	
8:00 AM	3	1	8	0		2	0	3	0	

PEAK HOUR	NB-LT	NB-TH	NB-RT			SB-LT	SB-TH	SB-RT		
7:00 AM	20	2	103	0	0	5	1	1	0	0
8:00 AM	TOTAL	125		0.00%		TOTAL	7		0.00%	

	Direction EASTBOUND					East-West Road KAWILI		Direction WESTBOUND		
Start Time	EB-LT	EB-TH	EB-RT	T/B		WB-LT	WB-TH	WB-RT	T/B	
6:45 AM	3	105	18	0		15	31	3	3	
7:00 AM	1	78	55	0		25	36	5	5	
7:15 AM	2	119	87	0		53	70	11	3	
7:30 AM	3	126	99	0		36	93	31	4	
7:45 AM	17	108	110	0		43	97	51	0	
8:00 AM	7	71	19	0		4	92	29	0	

PEAK HOUR	EB-LT	EB-TH	EB-RT			WB-LT	WB-TH	WB-RT		
7:00 AM	23	431	351	0	0	157	296	98	12	0
8:00 AM	TOTAL	805		0.00%		TOTAL	551		2.18%	



Project : 26.0 UHHilo
Date: 4/1/96

Direction NORTHBOUND — North-South Road KOMOHANA — Direction SOUTHBOUND

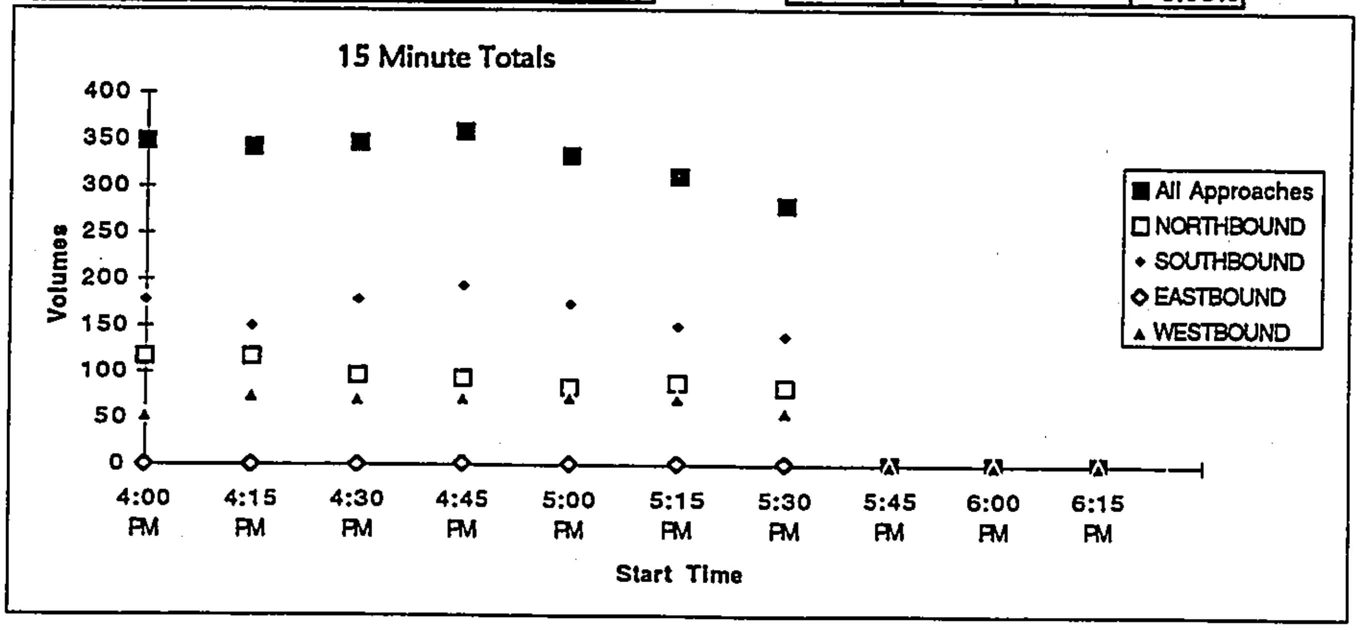
Start Time	NB-LT	NB-TH	NB-RT	T/B		SB-LT	SB-TH	SB-RT	T/B	
4:00 PM	0	103	14	0		56	122	0	0	
4:15 PM	1	99	17	0		53	97	0	0	
4:30 PM	0	87	10	0		56	122	1	0	
4:45 PM	0	81	12	0		48	143	2	0	
5:00 PM	0	68	16	0		49	125	0	0	
5:15 PM	0	75	13	0		42	107	1	0	
5:30 PM	0	71	12	0		37	102	0	0	

PEAK HOUR	NB-LT	NB-TH	NB-RT			SB-LT	SB-TH	SB-RT		
4:15 PM	1	335	55	0	0	206	487	3	0	0
5:15 PM	TOTAL	391		0.00%		TOTAL	696		0.00%	

Direction EASTBOUND — East-West Road PUAINAKO — Direction WESTBOUND

Start Time	EB-LT	EB-TH	EB-RT	T/B		WB-LT	WB-TH	WB-RT	T/B	
4:00 PM	0	0	0	0		12	0	41	0	
4:15 PM	0	0	0	0		29	0	46	0	
4:30 PM	0	0	0	0		27	0	44	0	
4:45 PM	0	1	0	0		15	1	56	0	
5:00 PM	0	0	1	0		18	0	56	0	
5:15 PM	0	1	0	0		17	0	55	0	
5:30 PM	0	0	1	0		19	0	38	0	

PEAK HOUR	EB-LT	EB-TH	EB-RT			WB-LT	WB-TH	WB-RT		
4:15 PM	0	1	1	0	0	89	1	202	0	0
5:15 PM	TOTAL	2		0.00%		TOTAL	292		0.00%	



Project : 26.0 UHHilo
Date: 4/1/96

	Direction	North-South Road	Direction
	NORTHBOUND	KOMOHANA	SOUTHBOUND

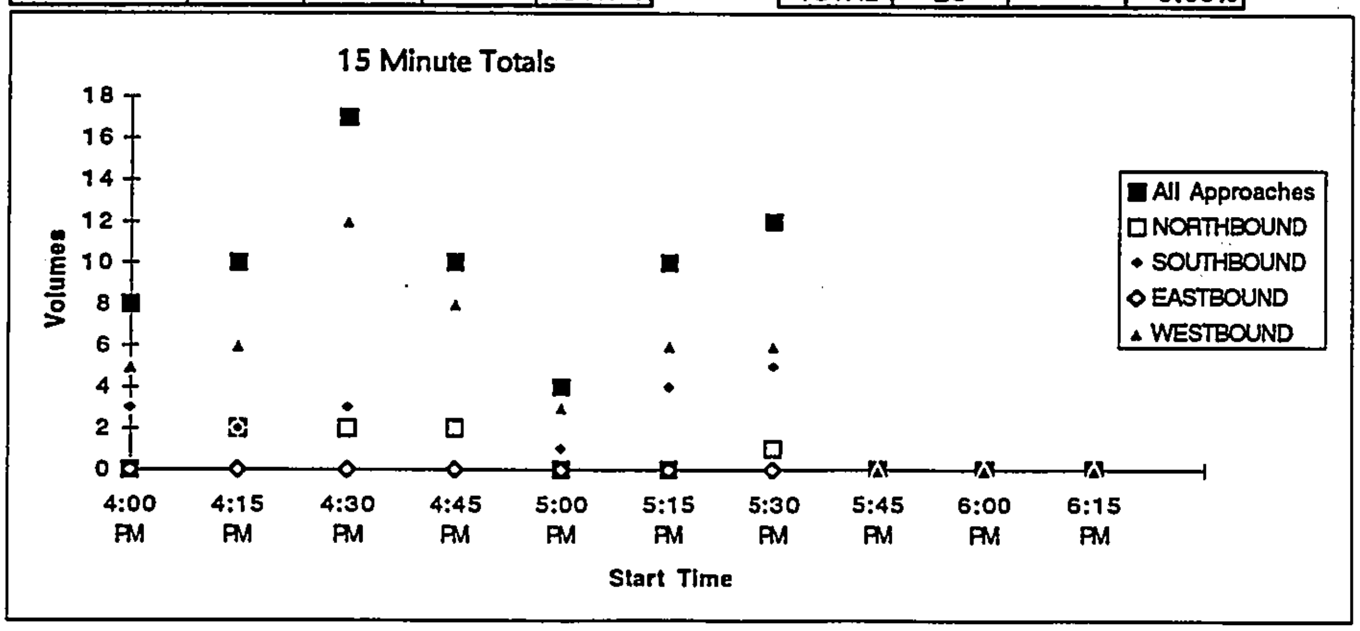
Start Time	NB-LT	NB-TH	NB-RT	T/B		SB-LT	SB-TH	SB-RT	T/B	
4:00 PM			0			3				
4:15 PM			2			2				
4:30 PM			2			3				
4:45 PM			2			0				
5:00 PM			0			1				
5:15 PM			0			4				
5:30 PM			1			5				

PEAK HOUR	NB-LT	NB-TH	NB-RT			SB-LT	SB-TH	SB-RT		
4:15 PM	0	0	6	0	0	6	0	0	0	0
5:15 PM	TOTAL	6		0.00%		TOTAL	6		0.00%	

	Direction	East-West Road	Direction
	EASTBOUND	NAWELO	WESTBOUND

Start Time	EB-LT	EB-TH	EB-RT	T/B		WB-LT	WB-TH	WB-RT	T/B	
4:00 PM						1		4		
4:15 PM						2		4		
4:30 PM						7		5		
4:45 PM						2		6		
5:00 PM						2		1		
5:15 PM						3		3		
5:30 PM						3		3		

PEAK HOUR	EB-LT	EB-TH	EB-RT			WB-LT	WB-TH	WB-RT		
4:15 PM	0	0	0	0	0	13	0	16	0	0
5:15 PM	TOTAL	0		#DIV/0!		TOTAL	29		0.00%	



Project : 26.0 UHHilo
Date: 4/1/96

Direction Northbound | North-South Road **STUDENT HOUSING** | Direction Southbound

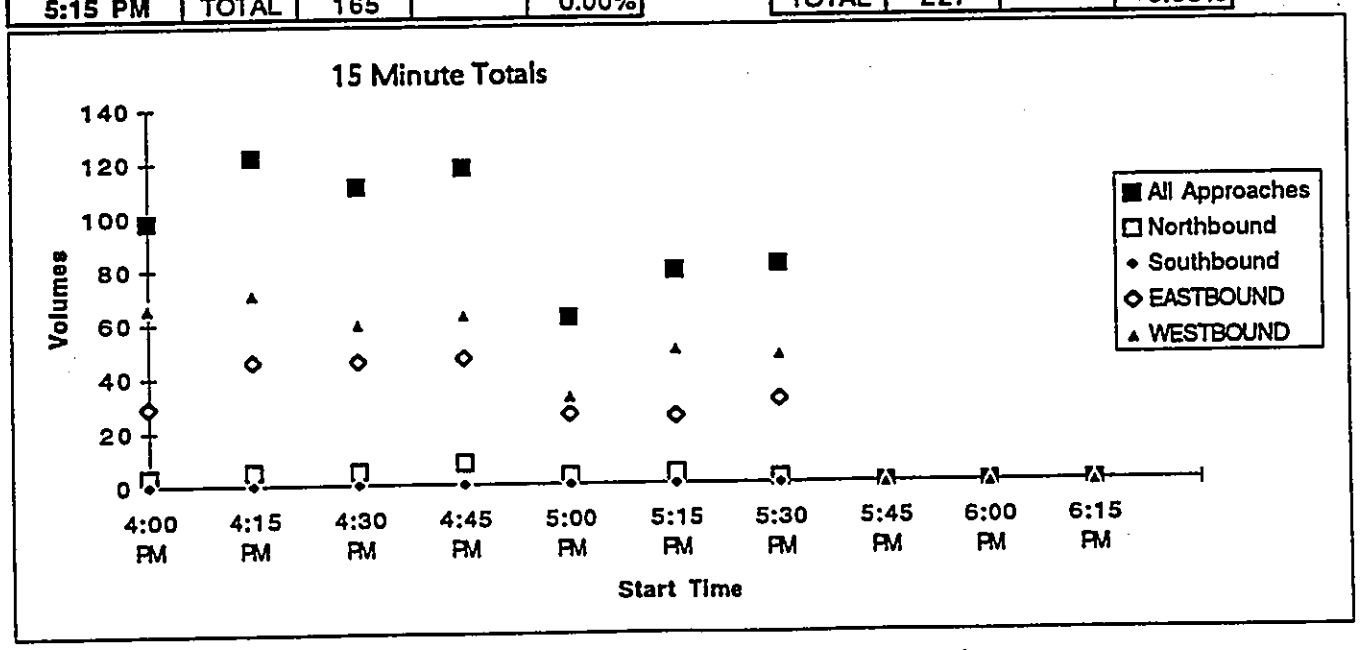
Start Time	NB-LT	NB-TH	NB-RT	T/B		SB-LT	SB-TH	SB-RT	T/B	
4:00 PM	1		2	0						
4:15 PM	1		4	0						
4:30 PM	1		4	0						
4:45 PM	0		8	0						
5:00 PM	1		2	0						
5:15 PM	0		4	0						
5:30 PM	0		2	0						

PEAK HOUR	NB-LT	NB-TH	NB-RT			SB-LT	SB-TH	SB-RT		
4:15 PM	3	0	18	0	0	0	0	0	0	0
5:15 PM	TOTAL	21		0.00%		TOTAL	0		#DIV/0!	

Direction EASTBOUND | East-West Road **LANIKAULA** | Direction WESTBOUND

Start Time	EB-LT	EB-TH	EB-RT	T/B		WB-LT	WB-TH	WB-RT	T/B	
4:00 PM		29	0	1		4	62		0	
4:15 PM		46	0	0		6	65		0	
4:30 PM		45	1	0		4	56		0	
4:45 PM		46	1	0		4	59		0	
5:00 PM		25	1	0		0	33		0	
5:15 PM		24	1	0		3	47		0	
5:30 PM		30	1	0		1	47		0	

PEAK HOUR	EB-LT	EB-TH	EB-RT			WB-LT	WB-TH	WB-RT		
4:15 PM	0	162	3	0	0	14	213	0	0	0
5:15 PM	TOTAL	165		0.00%		TOTAL	227		0.00%	



Project : 26.0 UHHilo
Date: 4/1/96

	Direction Northbound						North-South Road KINOOLE	Direction Southbound			

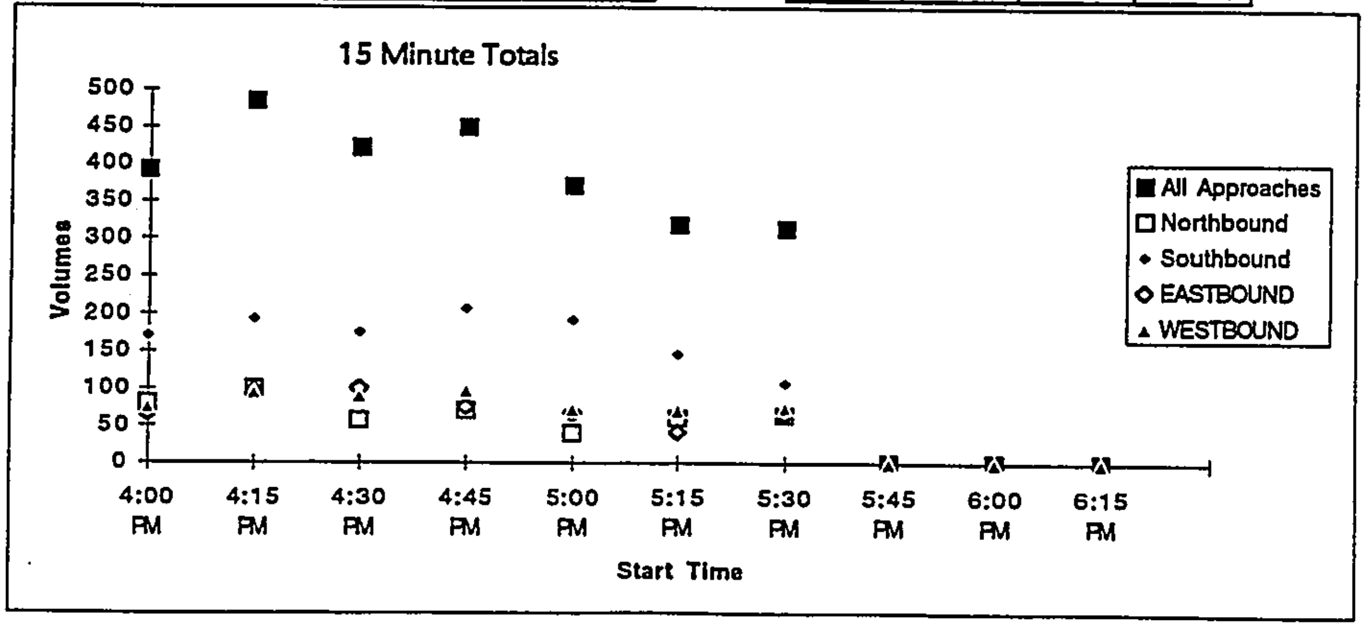
Start Time	NB-LT	NB-TH	NB-RT	T/B		SB-LT	SB-TH	SB-RT	T/B	
4:00 PM	12	63	5	0		20	129	22		
4:15 PM	25	70	5	0		29	137	27		
4:30 PM	4	48	5	0		19	137	19		
4:45 PM	13	50	7	0		26	167	14		
5:00 PM	1	39	0	0		18	162	12		
5:15 PM	13	43	4	0		12	121	14		
5:30 PM	4	57	4	0		13	82	13		

PEAK HOUR	NB-LT	NB-TH	NB-RT			SB-LT	SB-TH	SB-RT		
4:15 PM	43	207	17	0	0	92	603	72	0	0
5:15 PM	TOTAL	267		0.00%		TOTAL	767		0.00%	

Direction EASTBOUND — East-West Road LANIKAULA — Direction WESTBOUND

Start Time	EB-LT	EB-TH	EB-RT	T/B		WB-LT	WB-TH	WB-RT	T/B	
4:00 PM	11	48	7	0		11	47	17	1	
4:15 PM	12	67	17	0		7	70	18	0	
4:30 PM	18	65	17	0		13	61	16	0	
4:45 PM	13	44	18	0		10	63	24	0	
5:00 PM	8	47	12	0		8	45	19	0	
5:15 PM	9	27	5	0		11	42	18	0	
5:30 PM	11	47	8	0		5	57	13	0	

PEAK HOUR	EB-LT	EB-TH	EB-RT			WB-LT	WB-TH	WB-RT		
4:15 PM	51	223	64	0	0	38	239	77	0	0
5:15 PM	TOTAL	338		0.00%		TOTAL	354		0.00%	



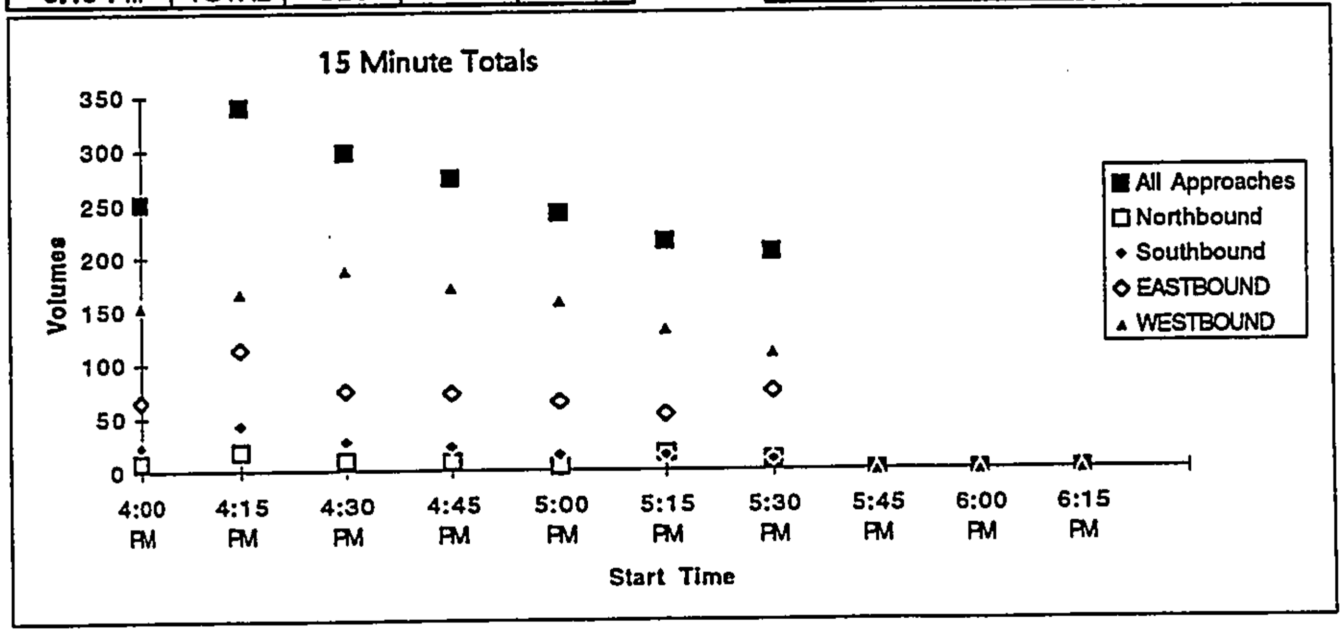
Project : 26.0 UHHilo
Date: 4/2/96

	Direction Northbound					North-South Road Driveways	Direction Southbound			
Start Time	NB-LT	NB-TH	NB-RT	T/B		SB-LT	SB-TH	SB-RT	T/B	
4:00 PM	0	1	7	0		21	0	2		
4:15 PM	5	0	13	0		34	1	7		
4:30 PM	3	1	5	0		23	0	4		
4:45 PM	4	0	4	0		20	0	2		
5:00 PM	0	0	4	0		10	1	3		
5:15 PM	5	0	11	0		10	1	3		
5:30 PM	4	0	6	0		8	0	2		

PEAK HOUR	NB-LT	NB-TH	NB-RT			SB-LT	SB-TH	SB-RT		
4:15 PM	12	1	26	0	0	87	2	16	0	0
5:15 PM	TOTAL	39		0.00%		TOTAL	105		0.00%	

	Direction EASTBOUND					East-West Road KAWILI	Direction WESTBOUND			
Start Time	EB-LT	EB-TH	EB-RT	T/B		WB-LT	WB-TH	WB-RT	T/B	
4:00 PM	2	63	0	0		5	138	12	1	
4:15 PM	2	99	12	0		10	141	16	0	
4:30 PM	4	68	2	0		11	168	9	0	
4:45 PM	2	68	2	0		8	156	8	0	
5:00 PM	0	64	0	0		10	143	6	0	
5:15 PM	1	44	7	0		11	116	5	0	
5:30 PM	4	62	7	0		5	95	10	0	

PEAK HOUR	EB-LT	EB-TH	EB-RT			WB-LT	WB-TH	WB-RT		
4:15 PM	8	299	16	0	0	39	608	39	0	0
5:15 PM	TOTAL	323		0.00%		TOTAL	686		0.00%	



APPENDIX B

LEVEL-OF-SERVICE DEFINITIONS

FOR

SIGNALIZED AND UNSIGNALIZED INTERSECTIONS[1]

REFERENCE: Highway Capacity Manual (Special Report 209, 1994)

LEVEL-OF-SERVICE FOR SIGNALIZED INTERSECTIONS

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. The table to the right gives the Level-of-Service criteria.

Level of Service	Stopped Delay Per Vehicle (sec/veh)
A	≤ 5
B	> 5 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 40
E	<40 and ≤ 60
F	>60

Level-of-service A describes operations with very low delay up to 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 or both. 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 ratios (volume of cars to capacity of intersection). 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 lengths, 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.

LEVEL-OF-SERVICE FOR UNSIGNALIZED INTERSECTIONS

The level of service criteria are given in the table to the right. As used here , total delay is defined as the total elapsed time from when a vehicle stops at the end of a queue until the vehicle departs from the stop line; this time includes the time required for the vehicle to travel from the last-in-queue position.

Level of Service	Average Total Delay (sec/veh)
A	≤ 5
B	> 5 and ≤ 10
C	> 10 and ≤ 20
D	> 20 and ≤ 30
E	<30 and ≤ 45
F	>45

The proposed level of service criteria are somewhat different from the criteria for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, several driver behavior considerations combine to make delays at signalized intersections less onerous than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, whereas drivers on the minor approaches to unsignalized intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized than signalized intersections. For these reasons, it is considered that the total delay threshold for any given level of service is less for an unsignalized intersections than for a signalized intersection.

APPENDIX *J*

FAUNAL ASSESSMENT
(by Rana Productions, Ltd.)

REPORT:

AN ASSESSMENT OF THE FAUNAL MAKEUP OF THE PROPOSED UH - HILO UNIVERSITY PARK INFRASTRUCTURE IMPROVEMENT PROJECT, PHASE IIA SITES, HILO, ISLAND OF HAWAI'I, HAWAI'I.

Prepared by:

Reginald E. David
Rana Productions, Ltd.
P.O. Box 1371
Kailua-Kona, Hawai'i 96745

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Figures

Introduction

This report addresses the probable faunal makeup of a 116 acre parcel of land located west of the existing UH Hilo campus, and a 2 acre parcel of state land adjacent to the existing Sunrise Estates subdivision, located in the District of Hilo, Island of Hawai'i, Hawai'i (TMK: 2-4-01:7 and 41) { Fig.1}. No field surveys were undertaken on the subject properties. This assessment is based on published reports, personal experience and the faunal makeup of similar habitat on the Island of Hawai'i.

Avian phylogenetic order used in this report follows *Birds Of The World: A Checklist* (Clements 1991); scientific nomenclature follows *The AOU Checklist of North American Birds* (AOU 1983) and the *35th through the 40th Supplements to The AOU Checklist* (AOU 1985-1995). Mammal scientific names follow *Mammals in Hawaii* (Tomich 1986), and plant names follow *Manual of the Flowering Plants of Hawaii* (Wagner et al. 1990).

General Site Description

The approximately 116 acre University Park Site is located immediately west of the existing UH-Hilo campus. The site is bound by the University Heights subdivision to the north, Komohana Street to the west, and the Wailoa Flood Control Project to the east. Two existing paved roads transverse the site, Nowelo Street running east-west and Aohoku Street running north-south, parallel to Komohana Street. The existing development located along the western border of the site is comprised of various structures that make up the UH-Hilo Research and Technology Park. The site slopes form west to east, starting at approximately 320 feet elevation and ending at approximately 140 feet above sea level. The remaining vegetation on the site is dominated by alien species, as is much of the lowland area on the Hilo side of the Island. The reservoir site is located north of Komhana Street on a parcel of state land adjacent to the existing Sunrise Estates subdivision at approximately 460 feet elevation. The vegetation on this site retains more native vegetation than the University Park site; however, it is also dominated by alien species.

Historical Perspective

The isolation of the Hawaiian Islands from the nearest continental land mass coupled with the volcanic nature of their creation has resulted in the penultimate display of adaptive radiation and endemism in the world. The high degree of adaptation and specialization displayed by many of Hawaii's endemic avian species has contributed to their vulnerability in a rapidly changing world. To date more than 60% of Hawaii's endemic avifauna has gone extinct. Within historical times a total of 69 endemic avian species and sub-species have been described from Hawai'i (Pyle 1992). Of these, 23 have gone extinct. Of the remaining 46 a total of 32 are currently listed as endangered or threatened by the United States Fish and Wildlife Service (USFWS 1992).

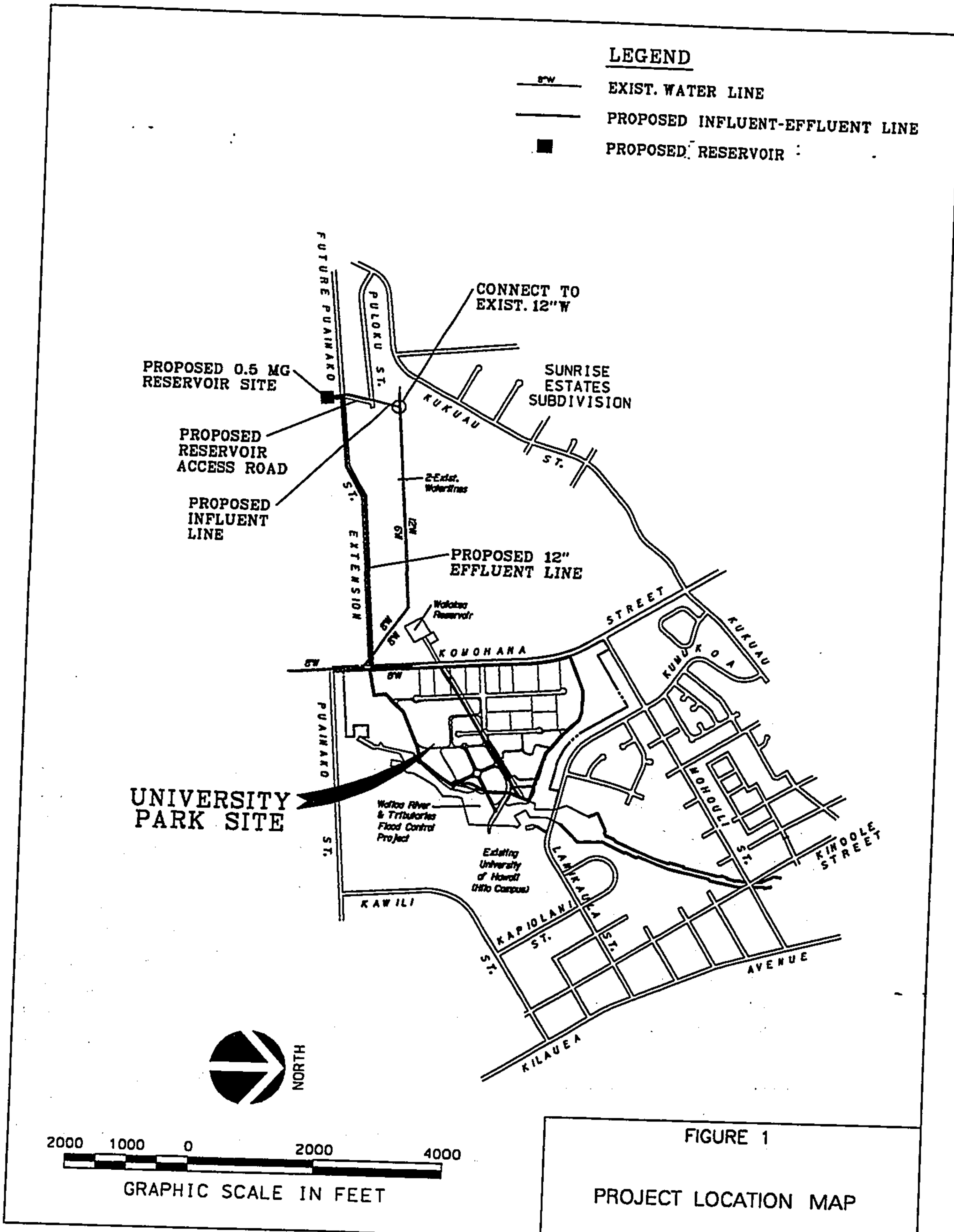

FIGURE 1

PROJECT LOCATION MAP

Thirteen of these are critically endangered or may in fact have already gone extinct. To add to the dismal picture of the status of Hawaii's endemic avifauna, a further 35 species of extinct endemic birds have been described from sub-fossil remains (Olsen & James 1982, 1991; James & Olsen 1991). There may be as many as 26 more undescribed species amongst the bones that have already been collected (Olsen & James 1991, James & Olsen 1991, Giffin 1993). In addition, the only endemic terrestrial mammalian species in Hawai'i, the Hawaiian hoary bat (*Lasiurus cinereus semotus*), is also listed as endangered (USFWS 1992). Of the 32 currently listed endangered avian species and sub-species found in Hawai'i a total of 13 are found on the Island of Hawai'i. Two of these can be expected to at least occasionally utilize parts of the proposd development sites, while one additional endangered and one threatened pelagic species probably overfly both of the sites occasionally between the months of April and October (Tables 2 & 3).

Migratory waterbirds and shorebirds make up a large part of the winter avian population of Hawai'i. These annual visitors are found throughout the Islands from August through May. Currently 82 separate migratory and extralimital waterbird and shorebird species have been documented from the Islands (Pyle 1992, David 1996 d, in prep.). Most of these species are generally associated with wetland habitat, however; three of them, the Pacific Golden Plover (*Pluvialis fulva*), Ruddy Turnstone (*Arenaria interpres*) and Sanderling (*Calidris alba*) are among the commonest of our winter migrants and are regularly found in open, grassy areas, parking lots and other cleared areas.

During the last hundred years more than a 160 species of alien birds have been introduced to the Hawaiian Islands (Long 1981, HAS 1993); a markedly larger number than introduced to any other area on the planet. Many of these species were game birds introduced by a combination of private landowners, the Territorial Board of Agriculture and Forestry, and following statehood, by the State of Hawai'i's Division of Forestry and Wildlife. These birds were introduced in the hope that they would become established and provide a recreational hunting resource which, in turn, would generate federal funding through the Pittman Robinson Act for the maintenance of game bird hunting. Less than a quarter of these introductions have been successful. On the island of Hawai'i more than 60 species of game birds have been introduced. Currently, 14 of these alien introductions have survived and are considered to be established on the Island (Pyle 1992, David 1996 c, in prep.). Little is known of the effect that these species have on Hawai'i's native bird populations. Many of these alien birds out compete Hawai'i's native species for food, cover and nesting resources. They have been implicated in the spread of alien plant species which all too often, have proven to have a deleterious effect on Hawai'i's' native ecosystems. Some of these species are thought to be reservoirs for diseases, which negatively impact Hawai'i's endemic avifauna. Systematic scientific studies of these problems have commenced, but all are nascent. The bulk of the avian species within and close to the study areas were introduced to Hawai'i by man and have managed to sustain viable wild populations.

Most of Hawai'i's endemic avian species have little or no tolerance to most of the common continental avian diseases such as avian malaria and avian poxes. These recently established diseases have taken a stunning toll on native Hawaiian avian species.

The Hawaiian hoary bat or 'Ope'ape'a is Hawai'i's only endemic terrestrial mammal. All the other resident mammalian species were introduced to the Hawaiian Islands by man. This process started when the first aboriginal settlers landed in the Islands some 1500 years ago (Stone and Scott 1985). The aboriginal peoples brought numerous alien species such as pigs (*Sus scrofa*), dogs (*Canis familiaris*) and Polynesian rats (*Rattus exulans*); as well as non-native plants and insects of many kinds with them. Many of Hawai'i's endemic birds, especially the flightless and ground nesting ones, were easy prey for the introduced dogs and hungry humans (Kirch 1982, Steadman 1989, Banko et al. 1991). Both the aboriginal people and their pigs proceeded to markedly alter the endemic ecosystems. The humans cleared and burned the lowlands for agricultural purposes and the pigs moved into the wet forests where they found abundant food in the myriad of endemic understory plants (Kirch 1982). Very little is known of what effect the introduced insect species had, but it is safe to surmise that they had a large effect on the endemic insect and plant populations and in turn on the native avian species. The European re-discovery of the Islands in the late 1700's heralded another wave of introductions that included European rabbits (*Oryclolagus cuniculus*), roof rats (*Rattus rattus*), Norway rats (*Rattus norvegicus*), European house mice (*Mus domesticus*), small Indian mongooses (*Herpestes auropunctatus auropunctatus*), cats (*Felis catus*), horses (*Equus caballus*), cattle (*Bos taurus*), goats (*Capra hircus*) and sheep (*Ovis aries*), as well as countless insect and plants species. All of the introduced mammalian species including man, with the possible exception of the European house mice (*Mus domesticus*) have had a deleterious effect on the native avian and mammalian populations of the Islands.

Table 1.

EXTANT ENDEMIC AVIAN AND BAT SPECIES & SUB-SPECIES ON THE ISLAND OF HAWAI'I		
COMMON NAME	HAWAIIAN NAME	SCIENTIFIC NAME
Dark-rumped Petrel	Ua'u	*Pterodroma phaeopygia sandwichensis*
Newell's Shearwater	'A'o	*Puffinus newelli*
Hawaiian Goose	Nene	*Branta sandvicensis*
Hawaiian Duck	Koloa	*Anas wyvilliana*
Hawaiian Hawk	'Io	*Buteo solitarius*
Hawaiian Coot	'Alae ke'oke'o	*Fulica alai*
Black-necked Stilt	Ae'o	*Himantopus mexicanus knudseni*
Black Noddy	Noio, 'Eki'eki	*Anous minutus melanogenys*
Short-eared Owl	Pueo	*Asio flammeus sandwichensis*
Hawaiian Crow	'Alala	*Corvus Hawai'iensis*
Hawai'i 'Elepaio	'Elepaio	*Chasiempi ssandwichensis sandwichensis*
Hawai'i 'Elepaio	'Elepaio	*Chasiempis sandwichensis bryani*
Hawai'i 'Elepaio	'Elepaio	*Chasiempis sandwichensis ridgwayi*
Hawai'i Thrush	'Oma'o	*Myadestes obscurus*
'O'u **	'O'u	*Psittirostra psittacea*
Palila	Palila	*Loxoides bailleui*
Hawai'i 'Amakihi	'Amakihi	*Hemignathus virens virens*
'Akiapola'au	'Akiapola'au	*Hemignathus munroi*
Hawai'i Creeper	'Alauahio	*Oreomystis mana*
Hawai'i 'Akepa	'Akakane	*Loxops coccineus coccineus*
'I'iwi	'I'iwi	*Vestiaria coccineus*
'Apapane	'Apapane	*Himatione sanquinea sanquines*
Hawaiian hoary bat	'Ope'ape'a	*Lasiurus cinereus semotus*

** Indicate species which is critically endangered, or possibly extinct.

Table 2.

ENDANGERED AND THREATENED TERESTRIAL VERTEBRATE SPECIES ON THE ISLAND OF HAWAI'I		
COMMON NAME	HAWAI'IAN NAME	SCIENTIFIC NAME
Dark-rumped Petrel	Ua'u	*Pterodroma phaeopygia sandwichensis*
Newell's Shearwater	'A'o	*Puffinus newelli*
Hawaiian Goose	Nene	*Branta sandvicensis*
Hawaiian Duck	Koloa	*Anas wyvilliana*
Hawaiian Hawk	'Io	*Buteo solitarius*
Hawaiian Coot	'Alae ke'oke'o	*Fulica alai*
Black-necked Stilt	Ae'o	*Himantopus mexicanus knudseni*
Hawaiian Crow	'Alala	*Corvus Hawai'iensis*
'O'u **	'O'u	*Psittirostra psittacea*
Palila	Palila	*Loxoides bailleui*
'Akiapola'au	'Akiapola'au	*Hemignathus munroi*
Hawai'i Creeper	'Alauahio	*Oreomystis mana*
Hawai'i 'Akepa	'Akakane	*Loxops coccineus coccineus*
Hawaiian hoary bat	'Ope'ape'a	*Lasiurus cinereus semotus*

** Indicate species which is critically endangered, or possibly extinct.

All of the above species and sub-species are listed as endangered by the USFWS, with the exception of the Newell's Shearwater which is listed as threatened (USFWS 1992).

Previous Surveys

The first systematic surveys of the avifauna of Hawai'i were not undertaken until 1976: Starting. in that year and continuing until 1983 the U.S. Fish & Wildlife Service (USFWS) conducted a state wide survey of the avifauna of Hawai'i (Scott et al. 1986). During the course of the Hawai'i Forest Bird Surveys (HFBS) no transects were counted through either of the two development sites addressed in this report, since the existing habitat was considered almost completely alien harboring no native forest bird species. Several Environmental Assessments, and faunal studies have been conducted within recent years of areas adjacent to, or near the proposed sites (Kepler 1986, Kjargaard 1991, 1992, David 1996).

There have only been four comprehensive bat surveys conducted on the Island of Hawai'i (Jacobs 1994, Cooper et al. 1995, Cooper and David 1995, David 1996a). Two of these surveys addressed lands close to the proposed development sites. David Jacobs conducted an Island wide survey between 1990-1993 which attempted to ascertain the distribution and abundance of Hawaiian hoary bats by sampling along paved principal roadways around the Island of Hawai'i (Jacobs 1994). During the course of the recently completed faunal studies for the Saddle Road Project Environmental Impact Statement the author sampled for bats along the Saddle Road, west of the sites (David 1996a). The bulk of the remaining published literature relies heavily on anecdotal and incidental information on bat distribution and abundance on the Island (Baldwin 1950, Bryan 1955, Tomich 1986).

Avian Resources

The avifauna currently found below 500 feet in elevation in the Hilo area, on the Island of Hawai'i, is dominated by introduced species, as are most of the ecological disturbed areas in the State. Of the 22 extant endemic avian species and sub-species currently found on the Island of Hawai'i (Table 1), 2 can be expected to at least occasionally be recorded within the subject properties, and another 2 probably overfly the sites between the months of April and October. An additional species may occasionally been recorded within the reservoir site. The resident avifauna is augmented from September to the end of April by several species of migratory shorebirds from the 82 plus migrant and extralimital vagrant species which have been recorded in Hawai'i to date (P. Pyle et al. 1988, R. Pyle 1992, R. David 1996 d, in prep.).

The species listed in Table 2 represent the avian species that given the location, altitude and vegetation found on the sites probably utilize the habitat present, forage over, or overfly the area at least occasionally. Five of these are endemic to the Hawaiian Islands at either the specific or sub-specific level. Three are considered native migratory species, and the remaining 15 are alien species introduced to Hawai'i by man.

Table 3.

AVIAN SPECIES LIKELY TO UTILIZE OR BE RECORDED FROM THE UH-HILO PROPOSED DEVELOPMENT SITES AT LEAST OCCASIONALLY	
Common Name	**Scientific Name**
PETRELS & SHEARWATERS - Procellarridae	
Dark-rumped Petrel (Hawaiian)	*Pterodroma phaeopygia sandwichensis*
Newell's Shearwater.	*Puffinus newelli.*
HERONS - Ardeidae.	
Cattle Egret.	*Bubulcus ibis.*
Black-crowned Night Heron.	*Nycticorax nyticorax hoactli.*
HAWKS & EAGLES - Accipitridae	
Hawaiian Hawk.	*Buteo solitarius.*
SANDPIPERS & ALLLIES - Scolopacidae	
Ruddy Turnstone.	*Arenaria interpres*
Sanderling.	*Calidris alba.*
PLOVERS & LAPWINGS - Charadriidae	
Pacific Golden Plover.	*Pluvialis fulva.*
PIGEONS & DOVES - Columbidae	
Rock Dove.	*Columba livia.*
Spotted Dove.	*Streptopeia chinensis.*
Zebra Dove.	*Geopelia striata.*
BARN OWLS - Tytonidae	
Barn Owl.	*Tyto alba*
OWLS - Strigidae	
Hawaiian Owl.	*Asio flammeus sandwichensis.*
STARLINGS - Sturnidae	
Common Myna.	*Acridotheres tristis.*
SILVEREYES - Zosteropidae	
Japanese White-Eye.	*Zosterops japonica.*
BABBLERS - Timaliidae	
Melodius Laughing Thrush.	*Garulax canorous.*
Red-billed Leiothrix.	*Leiothrix lutea.*
OLD WORLD SPARROWS - Passeridae	
House Sparrow.	*Passer domesticus*
WAXBILLS & ALLIES - Estrilididae	
Nutmeg Manikin (Scaly-breasted Munia)	*Lonchura punctulata topela*
Java Sparrow.	*Padda oryzivora.*
FRINGILLIDS - Fringillidae	
House Finch.	*Carpodacus mexicanus mexicanus.*

HAWAIIAN HONEYCREEPERS- Drepanididae	
Hawaii Amakihi.	*Hemignathus virens*
EMBERIZIDS - Emberizadae	
Saffron Finch.	*Sicalis flaveola.*
Northern Cardinal.	*Cardinalis cardinalis.*

Avian Species Accounts

In the following species accounts I briefly discuss the natural history and origin of 5 endemic avian species which may either utilize the sites or be detected from them. Federally listed species are addressed first, followed by the remaining native species.

Endangered Avian Species

Dark-rumped Petrel: *Pterodroma phaeopygia sandwichensis* Ua'u

The endemic Hawaiian subspecies of the Dark-rumped Petrel was formerly very common on the Island of Hawai'i (Wilson & Evans 1890-1899). This pelagic seabird reportedly nested in large numbers on the slopes of Mauna Loa and in the saddle area between Mauna Loa and Mauna Kea (Henshaw 1902), as well as the mid to high elevations of Mount Hualalai. The author detected 2 individuals of this species on the northern flank of Mauna Loa during the recently completed radar and visual studies of seabirds and bats of PTA (Cooper & David 1995). There is also a recent record of an individual found stuck on a fence just east of the Mauna Kea summit access road (J. Jeffrey, pers. comm.). Dark-rumped Petrels were a food source of the Hawaiians, and bones of this species are common in ancient Hawaiian middens excavated in numerous locations on Hawai'i (Banko 1980b). By the turn of the century the decline in this species had been noted by local residents, and by the early 1940's at least one observer, George Munro, feared for this species survival in Hawai'i (Munro 1941, 1960). Dark-rumped Petrels were finally listed as endangered by the United States Fish & Wildlife Service in 1967 (USFWS 1992). Seabirds are especially vulnerable to predation by terrestrial mammals. Their nesting burrows are quite odoriferous, especially when there are young birds present, thus making it easy for cats, rats, mongooses and humans to find them. A secondary threat, especially to fledging birds, is being disoriented by lights on their way to sea. When disoriented, seabirds often collide with manmade structures and if not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals. There is no suitable nesting habitat for this species within either site, it is probable that small numbers of this species occasionally over fly the development sites on their way to nesting areas in the mountains.

Newell's Shearwater: *Puffinus newelli* 'A'o

Newell's Shearwaters were listed as threatened by the USFWS in 1975 (USFWS 1992). It is probable that at least a few birds fly over both of the proposed development sites during the breeding season. This species breeds on Kaua'i, Hawai'i and Moloka'i in extremely small numbers Newell's Shearwater populations have dropped precipitously since the 1880's (Banko 1980 b). The taxonomy of this species is poorly resolved. It has long been considered a sub-species of the Manx Shearwater (*Puffinus puffinus*) In 1983 the AOU separated the Pacific forms of the Manx Shearwater from this species. Hawaii's race became a sub-species of the Townsend's Shearwater (*Puffinus auricularis*) (AOU 1983), although other authors, myself included, prefer to consider this a separate species (*Puffinus newelli*) (Pratt 1987, Clements 1991). This pelagic species nests high in the mountains in burrows excavated under thick vegetation, especially uluhe fern (*Dicranopteris linearis*). Although there is no recent record of nesting Newell's Shearwater from the immediate vicinity of either of the sites, there are numerous records of this species being seen, heard or collected close to the Saddle Road (SR 200) on the Hilo side of the Island (Banko 1980a, Kepler et al. 1979, Conant 1980). S. Conant recovered a dead bird on Kaumana drive in 1978 (Conant 1980). Newell's Shearwater have been heard along the Wailkuku river north of (SR 200) (Kepler et al 1979), and numerous downed birds have been recovered from different locations in and around Hilo (R. David pers. obs., Banko 1980 b, Kepler et al. 1979).

Newell's Shearwaters, like Dark-rumped Petrels are extremely vulnerable to predation by terrestrial mammals. Their nesting burrows are quite odoriferous, especially when there are young birds present, this making it easy for cats, rats and mongooses to find them. A secondary threat especially to fledging birds is being disoriented by lights on their way to sea. When disoriented, seabirds often collide with man made structures and if not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals. It is likely that the numerous birds recovered in and around Hilo were victims of just this phenomena.

Hawaiian Hawk : *Buteo solitarius* 'Io

The Hawaiian Hawk is the only extant falconiform in Hawaii; it currently is endemic to the Island of Hawai'i. Sub-fossil remains indicate that it was also formerly found on Moloka'i (Olsen & James 1982). Several incidental unconfirmed sightings of this species exist from Kaua'i (Dole 1879, Beaglehole 1980) and Mau'i (Banko 1980 c). This species was scientifically described by Peale in 1848 from a specimen collected from Kealakekua (Banko 1980 c). The Hawaiian Hawk was first listed as endangered in 1967 (USFWS 1992). This species has seemingly adapted better then any other endemic avian species to the alien dominated lowland areas of the Island. Hawaiian Hawks occupy a wide variety of habitats, in fact they are to be found in almost all habitats not lacking trees .They are all but absent from treeless or close to treeless grasslands and lava fields. The current population of this species is estimated to be 1600 birds (Morrison et al. 1994). It is generally thought that the population as a whole is healthy and maintaining itself, unlike many other endemic species. This species is currently under review by the USFWS for down listing from endangered to threatened status (USFWS 1993). I have repeadedly seen Hawaiian Hawks close to the developmnet sites, it is probable that they occasionally forage within both sites - there is little remaining tree cover suitable for nesting within either site.

Native Avian Species

Short-eared Owl: *Asio flammeus sandwichensis* Pueo

The Pueo is a Hawaiian endemic sub-species of the widely distributed Short-eared Owl (*Asio flammeus*). On Hawai'i it is ubiquitous, being found in almost all habitats. It has been suggested that this species did not become established in the Islands until after the Polynesian arrival and their introduction of Polynesian rats (*Rattus exulans*). It has also been suggested that the Short-eared Owl's population started to decline with western mans arrival and the attendant increase in the clearing of the forests for agriculture (Perkins 1903). From the authors observations over the past 15 years it does appear as if the population is decreasing. During the course of the HFBS no population estimate was made, due in part to the fact that as with most owls Pueo do not meet the basic assumptions that are used in computing forest bird community densities (Scott et al. 1986). During the 1993 Hawaiian Forest Birds Conservation Assessment and Management Plan Workshop a best guess estimate was made of a statewide population of between 500 - 2000 birds (J. Jacobi, pers. comm.). Short-eared Owls eat a diet of mice and small rats augmented by large insects and the occasional bird. It is probable that this species forages on either or both of the proposed development sites at least occasionally.

Hawai'i 'Amakihi: *Hemignathus virens virens* 'Amakihi

The nominate race of 'Amakihi was described by Gmelin in 1788 from one of several specimens collected by Captain Cook's party at Kealakekua in 1779 (Medway 1981). This species is the most adaptive of the drepanids; it was extremely common in Cook's day, and is still numerous. Recent genetic studies by Johnson et al. (1989) and mitochondrial DNA investigations by Tarr and Fleisher (1993) has resulted in the American Ornithologists Union (AOU) splitting the Common Amakihi complex into three separate species. Hawai'i 'Amakihi (*Hemignathus virens*) found on Hawai'i , Mau'i, Moloka'i and formerly Lana'i; the O'ahu 'Amakihi (*Hemignathus chloris*) on O'ahu; and the Kaua'i Amakihi (*Hemignathus kauaiensis*) on Kaua'i (AOU 1995). Hawaii 'Amakihi are currently found as low as 150 meters (500') and are also found in the highest reaches of vegetation on the Island (Banko 1984a, David 1989, 1990, 1991b, 1992, 1993). During the course of the HFBS it was estimated that there was a total population on the Island of some 870,000 ± 11000 (95% CI)birds. They were found in all of the HFBS study areas. It was calculated that 20% of the entire Island population is found in the Hamakua District with population densities reaching levels of 1600 birds/km^2, near Pu'u La'au. (Scott et al. 1986). Hawai'i 'Amakihi, unlike other drepanids, have adapted to exploit a wide selection of food sources ranging from insects and invertebrates to nectar and fruit, often in highly disturbed areas. They are to be found feeding in the canopy, sub-canopy, branches, and even on the ground (Richards and Bock 1973, R. David, pers. obs.). At present this species is doing well. Hawai'i 'Amakihi are not usually encountered below 500 feet in elevation; however given the presence of scrub ohia on the reservoir site it is certainly possible that there is occasional usage of the site by this species.

Mammalian Resources

With the lone exception of the Hawaiian hoary bat (*Lasiurus cinereus semotus*) or 'Ope'ape'a as it is better known here in Hawai'i, all the terrestrial mammalian species currently on the Island of Hawai'i are alien species introduced by man. In Table 3 the mammalian species which probably at least occasionally utilize one or both of the sites are tabulated.

Table 4.

MAMMALIAN SPECIES LIKELY TO UTILIZE THE UH-HILO PROPOSED DEVELOPMENT SITES AT LEAST OCCASIONALLY

COMMON NAME	*SCIENTIFIC NAME*
Hawaiian hoary bat	*Lasiurus cinereus semotus*
Norway rat	*Rattus norvegicus norvegicus*
Roof rat	*Rattus rattus*
Polynesian rats	*Rattus exulans Hawai'iensis*
European house mouse	*Mus domesticus*
Domestic dog	*Canis familiaris familiaris*
Small Indian mongooses	*Herpestes auropunctatus auropunctatus*
Cat	*Felis catus*
Horse	*Equus caballus caballus*
Pig	*Sus scrofa scrofa*
Domestic Cattle	*Bos taurus*

Endangered Mammalian Species

Hawaiian hoary bat: *Lasiurus cinereus semotus* 'Ope'ape'a

The Hawaiian hoary bat is Hawai'i's only endemic terrestrial mammal. It was first listed as endangered by the USFWS in 1970 (USFWS 1992). Originally considered to be a distinct species, it is now taxonomically classified as an endemic Hawaiian sub-species of the American hoary bat (Tomich 1986). There has been very little scientific work attempted on this species, in no small part due to the fact that this bat is usually a solitary arboreal rooster and therefor difficult to study. The existing scientific evidence is conflicting as to what effect alien species, plant or otherwise, may have had on this species (Jacobs, 1994, Kepler and Scott 1990, Tomich 1986). It should be borne in mind that little is known about the possible changes in this species range, population density or habitat preferences since the advent of humans and their impacts on the native Hawaiian ecosystems. It is almost a certainty that this species utilizes both sites at least occasionally.

Limitations of this Report

No field surveys were undertaken on the subject properties. This assessment is based on published reports, personal experience and the faunal makeup of similar habitat on the Island of Hawai'i.

Discussion of Potential Impacts

Given the fact that the avifauna of the proposed development sites is dominated by alien species, and that any usage of either site by endemic avian species is best described as incidental - no impacts are expected to native avian populations by development of either site. Taking into consideration the current knowledge and understanding of the abundance, distribution, and biology of the Hawaiian hoary bat it is unlikely that the construction on either of these sites will have a deleterious impact on this endangered mammalian species.

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