BENJAMIN J. CAYETANO
GOVERNOR

GILBERT S. COLOMA-AGARAN
CHAIRPERSON

ERIC T. HIRANO
DEPUTY DIRECTOR

LINNEL T. NISHIOKA
DEPUTY DIRECTOR

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

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

RECEIVED
'02 OCT 22 A11:32
OFC. OF ENVIRONMENTAL QUALITY CONTROL

October 10, 2002

PSF: 01HD-259
LD-GM

The Honorable Geneieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, HI 96813

Dear Ms. Salmonson:

Subject: Finding of No Significant Impact (FONSI) for USDA Pacific Basin Agricultural Research Center Project, Tax Map Key: 2-4-01: Portion 122, Hilo, Island of Hawaii, Hawaii

The Department of Land and Natural Resources has reviewed the comments received during the 30-day public comment period, which began on June 8, 2002. The Department has determined that this project will not have significant environmental effects and has issued a FONSI. Please publish this notice in the November 8, 2002 OEQC Environmental Notice.

We have enclosed a completed OEQC Publication Form and four copies of the final EA. Please call Gary Martin at 587-0421 if you have any questions.

Aloha,

Eric T. Hirano
for GILBERT S. COLOMA-AGARAN

Enclosures

c: Land Board Member
District Files
Central Files

100

a. Storm water discharges relating to construction activities, such as clearing, grading, and excavation, for projects equal to or greater than five acres;

b. Storm water discharges from industrial activities;

c. Construction dewatering activities;

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

e. Treated groundwater from underground storage tank remedial activities;

f. Hydrotesting water;

g. Treated effluent from petroleum bulk stations and terminals; and

h. Treated effluent from well drilling activities.

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.

3. After construction of the proposed facility is completed, a NPDES individual permit will be required if the operation of the facility involves any wastewater discharge into State waters.

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

Safe Drinking Water Branch (SDWB)

Drainage Injection Control

Drainage injection wells for the disposal of rainfall runoff water are regulated under Hawaii Administrative Rules, Title II, Chapter 23, titled Underground Injection Control (UIC). The construction and operation of drainage injection wells must be authorized by an Underground Injection Control (UIC) permit to be issued by the Department of Health. For UIC permit application information and forms, please contact the UIC program at the Safe Drinking Water Branch at 586-4258.

Public Water System

The Safe Drinking Water Branch will need to know how this facility will be provided potable water. The SDWB regulates all systems servicing 25 or more individuals, 60 days per year or more.

A second water system consists of the SDWB is the proper placement and use of backflow prevention devices and cross connection control. Strict compliance with plumbing codes should be maintained.

Additional information about these comments is available from the SDWB at 586-4258.

Wastewater Branch (WWB)

We have reviewed the document on the subject project submitted which proposes to develop the Pacific Basin Agricultural Research Center (PBARC) in the town of Hilo on the island of Hawaii. It is stated, that the project will be a new research center that includes state-of-the art facilities serving the ARS. In addition to this PBARC facility, the USDA, Forest Service, Institute of Pacific Island Forestry (IPIF) will also be developing a new facility for their activities on a three-acre portion of this property.

We have no objections to the proposed project as long as wastewater generated is treated and disposed of via the County sewer service system.

All wastewater plans must conform to applicable provision of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems." We do reserve the right to review the detailed wastewater plans for conformance to applicable rules.

Should you have any questions, please contact the Planning/Design Section of the Wastewater Branch at 586-4294.

Sincerely,

GARY GILL
Deputy Director
Environmental Health Administration

SSFM INTERNATIONAL

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

May 3, 2002

SSFM 9973000

Mr. Gary Gill, Deputy Director
Environmental Health Administration
Department of Health
State of Hawaii
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Mr. Gill:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letters dated October 15, 2001 and January 16, 2002 (File: 01-142/epo), providing comments on the Pre-Assessment Consultation for Draft Environmental Assessment for the subject project. We have the following responses which correspond to comments offered by the individual branches.

Clean Air Branch

The project will be in compliance with the provisions of Chapter 11.60-1, Hawaii Administrative Rules (Air Pollution Control), and specifically, rules set forth in HAR 11.60-1-33 addressing fugitive dust. The Draft EA will include a discussion on the measures that may be implemented in order to control fugitive dust from the project site and access road areas.

Clean Water Branch

The Draft EA will address the measures proposed to be utilized in order to minimize erosion and surface water runoff. This discussion will address the use of appropriate erosion control measures and best management practices for the project. Your suggestions will be considered in the development of appropriate measures.

The U.S. Army Corps of Engineers will be consulted as to whether Federal permits are required in regards to water pollution. A National Pollutant Discharge Elimination System general permit would be obtained for necessary discharges into waters of the State. A Notice of Intent would be filed at least 30 days prior to commencement of any discharges.

Safe Drinking Water Branch

Drainage injection wells for the disposal of development generated additional surface water runoff is planned to be used. An Underground Injection Control permit would be obtained for such wells at the appropriate time.

The Draft EA will address water system improvements needed to serve the research facilities constructed.

Wastewater Branch

Wastewater generated from the project is planned to be treated by a wastewater treatment system developed on the site as part of the development. Treated wastewater would then be connected to the County's existing sewer system for disposal.

The Draft EA will address the sewer requirements for the facility and the means in which wastewater will be disposed of. Wastewater improvements will conform to applicable provisions of HAR Chapter 11-62, Wastewater Systems.

If you have any further comments or questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

BENJAMIN J. CAYETANO
GOVERNOR

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

BRIAN K. MINAAI
DIRECTOR

DEPUTY DIRECTORS
GLENN M. OKIMOTO
JADINE Y. URASAKI

IN REPLY REFER TO:
HWY-PS
2.4719

FILE COPY

NOV 5 2001

SSFM INTERNATIONAL, INC.
RECEIVED
NOV 06 2001
RRO
FILE

Mr. Ronald A. Sato, AICP
Senior Project Planner
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

Dear Mr. Sato:

Subject: USDA Pacific Basin Agricultural Research Center Project, Pre-Assessment Consultation for Draft Environmental Assessment, Hilo, Hawaii, TMK: 2-04-01: 122 por.

Thank you for consulting us.

We would appreciate the opportunity to review the Draft Environmental Assessment.

If you have any questions, please call Ronald Tsuzuki, Head Planning Engineer, at the Highways Division, 587-1830.

Very truly yours,

Brian K. Minaai

BRIAN K. MINAAI
Director of Transportation

SSFM INTERNATIONAL

**SSFM INTERNATIONAL, INC.**
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

May 3, 2002

SSFM 9973000

Mr. Brian K. Minaai, Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Minaai:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated November 5, 2001 (Reference: HWY-PS 2.4719), providing comments on the Pre-Assessment Consultation for Draft Environmental Assessment for the subject project.

A copy of the Draft Environmental Assessment for the subject project will be provided to your department for review as part of the normal public review process when published.

If you have any questions on this matter, please contact me at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

FILE COPY

SSFM INTERNATIONAL, INC.
RECEIVED
NOV 07 2001
JRAS
FILE

PHONE (808) 594-1888

FAX (808) 594-1865

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

HRD01/341

October 26, 2001

Ronald A. Sato, AICP
Senior Project Planner
SSFM International, Inc.
501 Sumner St., Ste 502
Honolulu, HI 96817

RE: USDA Pacific Basin Agricultural Research Center Project, Section 106 Consultation

Dear Mr. Sata,

This is in response to your letter of October 16, 2001, in which you requested OHA's comments on the above referenced project. OHA has the following comments.

OHA understands that this project has two parts, the ARS Pacific Basin Agricultural Research Center, whose facility will total approximately 110,000 square feet, and the Forest Service IPIF Facility, which will use a three-acre portion of the site. We assume the rest of the property will be used for crop studies. Both are phased projects slated to start in late 2002 or 2003.

We note that there is no archaeological report included with your request for consultation. We will rely on the USDA to ensure that we are contacted in the case that an archaeological report shows there are historical sites that will be impacted, or in the event of any inadvertent discoveries.

We suggest that you contact local civic clubs and community groups in Hilo as part of the 106 process. OHA's Hilo Community Affairs Coordinator may be able to assist you. She can be contacted at:

Ululani Sherlock
Hilo Lagoon Centre
101 Aupuni St., Ste 209-210
Hilo, Hi 96720-4221

Please call Pua Aiu, policy analyst at 594-1931 if you have further questions.

Sincerely,

Colin Kippen Jr.

Colin Kippen, Jr.
Deputy Administrator

CK:pa

cc: Clyde Namu'o, Administrator
BOT
Ululani Sherlock, Hilo CAC

SSFM INTERNATIONAL

**SSFM INTERNATIONAL, INC.**
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

May 3, 2002

SSFM 9973000

Mr. Colin Kippen, Jr., Deputy Administrator
Office of Hawaiian Affairs
State of Hawaii
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

Dear Mr. Kippen:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your follow-up letter dated October 26, 2001 (HRD01/341) providing comments on the Pre-Assessment Consultation for Draft Environmental Assessment for the subject project. The Draft EA will include further details associated with the subject project, and will be provided to your department as part of the normal public review process.

The results of archaeological inventory surveys conducted will be included in the Draft EA for your review. Various local civic clubs and native Hawaiian organizations in the Hilo district will also be consulted as part of the Section 106 consultation process. We have also consulted with Ms. Ululani Sherlock regarding this matter as requested.

If you have any questions on this matter, please contact me at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

BENJAMIN J. CAYETANO
GOVERNOR
SEIJI F. NAYA, Ph.D.
DIRECTOR
SHARON S. NARIMATSU
DEPUTY DIRECTOR
DAVID W. BLANE
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

FILE COPY

SSFM INTERNATIONAL, INC.
RECEIVED
NOV 2 0 2001
JPG
FILE

Ref. No. P-9275

November 16, 2001

Mr. Ronald A. Sato, AICP
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

Dear Mr. Sato:

Subject: USDA Pacific Basin Agricultural Research Center Project
Pre-Assessment Consultation for Draft Environmental Assessment (DEA)
TMK: 2-04-01: portion of 122

Thank you for your letter dated October 16, 2001 regarding new facilities for the U.S. Department of Agriculture (USDA) on a 30-acre property situated along Komohana Street, west of the University of Hawaii at Hilo.

It is our understanding that USDA's Agricultural Research Service (ARS) is proposing to develop the Pacific Basin Agricultural Research Center (PBARC) which will contain approximately 110,000 square feet of floor area. The Center will include an administration and arboretum facility, laboratory facilities, insectary complex and greenhouse complex. In addition, the USDA Forest Service, Institute of Pacific Island Forestry (IPIF) will also be developing a 3-acre portion of the 30-acre property to accommodate a new office, laboratory, and support facilities which will total about 24,000 square feet of floor area.

The PBARC development has an estimated construction budget of between $40 to $50 million and is planned to commence in 2003 and be completed in 2006. The IPIF facility has an estimated construction budget of $6.7 million and will begin construction in late 2002 or early 2003.

The DEA should address impacts to public services and facilities, rare/endangered species, cultural/historical resources and agricultural resources, if any.

Should you have any questions, please call the Land Use Division at 587-2842.

Sincerely,

David W. Blane, AICP
Director
Office of Planning

cc: Seiji F. Naya
Tony Ching, LUC
James Nakatani, DOA

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

May 3, 2002

SSFM 9973000

Mr. David W. Blane, AICP, Director
Office of Planning
Department of Business, Economic Development & Tourism
State of Hawaii
P.O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Blane:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated November 16, 2001 (Ref. No. P-9275), providing comments on the Pre-Assessment Consultation for Draft Environmental Assessment for the subject project.

The Draft EA will include discussion addressing the probable impacts to public services and facilities, rare/endangered species, cultural/historical resources, and agricultural resources.

If you have any further comments or questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

Harry Kim
Mayor

Dixie Kaetsu
Managing Director

Peter T. Young
Deputy Managing Director

COUNTY OF HAWAII

25 Aupuni Street, Room 215 • Hilo, Hawaii 96720-4252 • (808) 961-8211 • Fax (808) 961-6553
KONA: 75-5706 Kuakini Highway, Suite 103 • Kailua-Kona, Hawai'i 96740
(808) 329-5226 • Fax (808) 326-5663

FILE COPY



November 7, 2001

Mr. Ronald A. Sato, AICP
Senior Project Planner
SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawai'i 96817

Re: USDA Pacific Basin Agricultural Research Center Project
Pre-Assessment Consultation for Draft Environmental Assessment

Dear Mr. Sato:

The proposed Pacific Basin Agricultural Research Center will be a major positive factor in the growth and development of an agricultural industry for Hawai'i island, State and the Pacific Basin. This County will work cooperatively in the development of this most needed project. There are no negatives concerns or comments that are known at this time. Any building and zoning training requirements will be addressed at the appropriate time.

Thank you.

Aloha,

Harry Kim

Harry Kim
Mayor

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

May 3, 2002

SSFM 9973000

The Honorable Harry Kim, Mayor
County of Hawaii
25 Aupuni Street, Room 215
Hilo, Hawaii 96720-4252

Dear Mayor Kim:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated November 7, 2001, providing comments on the Pre-Assessment Consultation for Draft Environmental Assessment for the subject project.

We note your comment that the subject project will be a major positive factor in the growth and development of an agricultural industry for island of Hawaii, the State, and the Pacific Basin, and that there are no known negative concerns from your office at this time.

If you have any questions on this matter, please contact me at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

Harry Kim
*Mayor*

Dennis K. W. Lee
*Director*

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

November 6, 2001

Mr. Ronald A Sato, AICP.
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

**SUBJECT:** **PRE-ASSESSMENT CONSULTATION FOR DRAFT EA**
USDA Pacific Basin Agricultural Research Center Project
TMK: 2-4-01: Portion of 122

We have reviewed the subject pre-assessment forwarded by your letter dated October 16, 2001 and have the following comments.

1. All 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 conform with Chapter 10 - Erosion and Sedimentation Control, of the Hawaii County Code.

4. A portion of the subject property is located within Flood Zone A according to the Flood Insurance Rate Map (FIRM) by the Federal Emergency Management Agency (FEMA). Flood Zone A is the Special Flood Hazard Area inundated by the 100-year flood where no base flood elevations are determined.

5. Access onto Komohana Street, a County right-of-way, shall meet the requirements of the department of public works.

Questions may be referred to Mr. Kelly Gomes of our Engineering Division at 961-8327.

Kelly Gomes
for BEN ISHII, Acting Division Chief
Engineering Division

KG

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

SSFM 9973000

May 3, 2002

Mr. Ben Ishii, Acting Division Chief
Engineering Division
Department of Public Works
County of Hawaii
25 Aupuni Street, Room 202
Hilo, Hawaii 96720-4252

Dear Mr. Ishii:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated November 6, 2001 regarding the subject project. We have the following responses which are numbered to correspond to your comments.

1. Construction of the facility buildings will be in conformance with the requirements set forth by the codes and statutes of the County of Hawaii.
2. The project will be designed to accommodate on site additional runoff generated from the development. A series of injection wells is being considered, and drainage improvements will be addressed in the Draft EA.
3. Earthwork and grading will conform to provisions of Chapter 10 of the Hawaii County Code.
4. We would like to clarify that the 30-acre project site is not located within the Zone A, Special Flood Hazard Area pursuant to Flood Insurance Rate Map (FIRM) for the area. The project site is located within Zone X. A figure showing the project site in relation to this FIRM will be included and addressed in the Draft EA.
5. The requirements of the Department of Public Works will be followed for access onto Komohana Street.

If you have any further comments or questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

**DEPARTMENT OF ENVIRONMENTAL MANAGEMENT**
***SOLID WASTE DIVISION***
COUNTY OF HAWAII – 108 RAILROAD AVENUE – HILO, HI 96720
HILO (808) 961-8339 WAIMEA (808) 887-3018 KONA (808) 327-3507

**FILE COPY**

SSFM INTERNATIONAL, INC.
RECEIVED
DEC 18 2001
FILE

December 13, 2001

TO: Mr. Ronald Sato, AICP
Senior Project Planner
SSFM International

FROM: Laurence K. Capellas, P.E.
Solid Waste Division Chief

SUBJECT: USDA Pacific Basin Agricultural Research Center Project

Your October 16, 2001 letter requesting comments on the Draft Environmental Assessment for the subject project has been reviewed. This division has no comments on the draft assessment at this time.

However, please be aware that we do have requirements on disposal of pre-construction (grubbing), construction, and post construction (operations) refuse. Being a commercial facility, all refuse from this development, except for hazardous waste, should be taken to the Hilo Landfill. Government facilities are not exempt from a permit fee and a tipping fee based on tonnage. Waste that requires special handling will be subject to additional charges.

No commercial refuse may be deposited at any of our transfer station. These facilities are for the convenience of homeowners only.

This division should be contacted prior to construction to clarify solid waste disposal rules and regulations.

You may call me at 961-8339 for clarification of issues involving solid waste.

LEC

c: File

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

May 3, 2002

SSFM 9973000

Mr. Laurence E. Capellas, P.E.
Solid Waste Division Chief
Department of Environmental Management
County of Hawaii
108 Railroad Avenue
Hilo, Hawaii 96720

Dear Mr. Capellas:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated December 13, 2001, providing comments on the Pre-Assessment Consultation for Draft Environmental Assessment for the subject project. We note your comment that your division has no comments to offer at this time.

The project will meet the requirements associated with the disposal of pre-construction, construction, and post-construction refuse. Thus, all refuse from this project, except hazardous waste, would be taken to the Hilo Landfill. No commercial refuse would be deposited at any transfer station. Permit and tipping fees for waste disposal will be complied with.

Your division will be contacted prior to construction to clarify solid waste disposal rules and regulations.

If you have any further comments or questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

Harry Kim
*Mayor*

Galen M. Kuba
*Acting Director*

County of Hawai'i

**DEPARTMENT OF ENVIRONMENTAL MANAGEMENT**
25 Aupuni Street, Room 202 • Hilo, Hawai'i 96720-4252

November 6, 2001

RONALD A SATO
SSFM INTERNATIONAL, INC.
501 SUMNER STREET
HONOLULU, HAWAI'I 96817

SUBJECT: USDA Pacific Basin Agricultural Research Center Project
Pre-Assessment Consultation for Draft Environmental Assessment

In response to your letter dated October 16, 2001, the Wastewater Division requests that all facilities being constructed as part of the project be connected to the public sewer system. Planning for extension of the existing sewer system to service the project should be performed in accordance with Section 11 of the Design Standards of the Department of Wastewater Management, City and County of Honolulu, Volume I, dated July, 1993.

Should you have any questions, please feel free to contact the undersigned at 961-8338.

Sincerely,

Peter Boucher, P.E.
Wastewater Division Chief

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

May 3, 2002

SSFM 9973000

Mr. Peter Boucher, P.E.
Wastewater Division Chief
Department of Environmental Management
County of Hawaii
25 Aupuni Street, Room 202
Hilo, Hawaii 96720-4252

Dear Mr. Boucher:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated November 6, 2001, providing comments on the Pre-Assessment Consultation for Draft Environmental Assessment for the subject project.

Facilities being constructed as part of this project will be connected to the public sewer system and addressed in the Draft EA. Extensions to the existing sewer system will be designed in accordance to the design standards cited in your letter.

If you have any questions on this matter, please contact me at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

Harry Kim
*Mayor*

County of Hawaii
PLANNING DEPARTMENT
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720-4252
(808) 961-8288 • Fax (808) 961-8742

Christopher J. Yuen
*Director*

Roy R. Takemoto
*Deputy Director*

FILE COPY

SSFM INTERNATIONAL, INC
RECEIVED
NOV 2 6 2001
RSS

FILE

November 9, 2001

Ronald A. Sato, AICP
Senior Project Planner
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, HI 96817

Dear Mr. Sato:

**Pre-Assessment Consultation Draft Environmental Assessment (DEA)**
**USDA Pacific Basin Agricultural Research Center Project**
**TMK: 2-4-01: 122, Waiakea Cane Lots, S. Hilo, Hawaii Island**

Thank you for your letter dated October 16, 2001 requesting comments on the above-referenced project. We offer the following information:

**Zoning & Other Land Use Designations.**

- County Zoning: A-1a (Agricultural – one acre)
- State Land Use: Agricultural
- Special Management Area (SMA): The project area is not within the County's SMA zone; therefore, a SMA assessment is not required.
- Hawaii County GP Land Use Designation: University

**County Zoning & State Land Use.** Two federal research and development facilities are planned for parcel 122: One devoted to agriculture; the other for forestry. Both aspects of this development are federal government operations and either activity is a permitted public use consistent with County Zoning Code sec. 25-4-11(c). In the County's Agricultural district, public uses and structures necessary for agricultural practices are a permitted use, according to sec. 25-5-72(a)(17). No additional County land use permits are required before these facilities are established. Under both State and County land use laws, accessory structures for these facilities are also permitted uses.

**Plan Approval of Public Use Required.** Although this project is a permitted public use under sec. 25-4-11(c), plan approval must be secured from this office prior to the approval of building permits. Plan approval will include a review of development requirements for off-street parking and loading areas, street access points, exterior lighting issues, landscaping, design, open space, height and setback criteria. A copy of the plan approval application is enclosed.

**County GP Land Use Designation.** The GP designation of the project site is for University use and support community services. This project is consistent with the GP's public facilities policy with standards for government facilities. Three standards are given:

- Public office center sites shall satisfy modern and reasonable requirements of accessibility and compatibility with the surrounding neighborhood.
- The multipurpose concept of flexibility to satisfy changing requirements should be part of the design for these public buildings.
  Comment. Consistent with this GP standard, serious consideration should be made to design a floor plan, site area, and an administrative operations policy that allows public or community groups to hold public meetings and workshops at these federal facilities. For example, the state facility at 875 Komohana Street, the University of Hawaii at Manoa – College of Tropical Agriculture & Human Resources – Cooperative Extension Service receives numerous requests from public or community groups to use its second floor meeting rooms. Whether an event can be accommodated will be limited to the number of persons the room(s) are designed to hold as well as security or safety concerns.
- Architectural and landscaping shall reflect as much as possible the community's attributes.

In examining this proposal against the surrounding land uses, please note that on the east (makai) side of the parcel, land use has been urbanized largely to residential uses, including the university's agricultural Cooperative Extension Service complex.

Thank you for this opportunity to comment on this project. Any follow up on this matter can be made with staff planner Earl Lucero at (808) 961-8288.

Sincerely,

CHRISTOPHER YUEN
Planning Director

EML:pak
p:\wpwin60\Ch343\2001\DEA01-14Preassess-Consult

Enclosure

# APPLICATION FOR PLAN APPROVAL
COUNTY OF HAWAII
PLANNING DEPARTMENT

APPLICANT: ______________________________

APPLICANT'S SIGNATURE: ______________________ DATE: __________

ADDRESS: ______________________________

TELEPHONE NO.: ______________________________

APPLICANT'S INTEREST, if not recorded owner: ______________________________

RECORDED OWNER: ______________________________

OWNER'S SIGNATURE: ______________________ DATE: __________

ADDRESS: ______________________________

TELEPHONE NO.: ______________________________

PROPOSED USE: ______________________________

TAX MAP KEY: ______________________________

STREET ADDRESS OF PROPERTY: ______________________________

STATE LAND USE DISTRICT: ______________ LAND AREA: __________

ZONING: ______________________________

***PURSUANT TO THE ZONING CODE AND THE PLANNING DEPARTMENT'S RULES OF PRACTICE AND PROCEDURE, THIS APPLICATION MUST BE ACCOMPANIED BY A SITE PLAN, DRAWN TO SCALE AND FULLY DIMENSIONED INDICATING CLEARLY THE FOLLOWING INFORMATION:***

*(1) The location and dimension of the building site;*
*(2) The location, size, height, and use of all existing and proposed structures;*
*(3) All yards and open spaces;*
*(4) Location, height, and material of all fences and walls;*
*(5) The standard of improvement and location, number, and size of spaces, arrangements and on-site circulation of all off-street parking and loading facilities including points of access thereto from adjoining streets;*
*(6) The location, general nature, and type, and protection or shielding devices of all exterior lighting;*
*(7) All proposed landscaping and planting;*
*(8) All proposed street dedication and improvement, if any; and*
*(9) Any other information required by the director.*

***A certification of clearance (from the Director of Finance that the real property taxes and all other fees relating to the subject parcel(s) have been paid and that there are no outstanding delinquencies) shall accompany this Application.***

***THE PROJECT SHALL COMPLY WITH ALL REQUIREMENTS OF PERMITS/APPROVALS GRANTED BY THE PLANNING COMMISSION OR COUNTY COUNCIL.***

PD:07/2001 (P:\WP60\FORMS\PD\APPLICATION FOR PLAN APPROVAL.doc)

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

SSFM 9973000

May 3, 2002

Mr. Christopher J. Yuen, Planning Director
Planning Department
County of Hawaii
25 Aupuni Street, Room 109
Hilo, Hawaii 96720-4252

Dear Mr. Yuen:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated November 9, 2001, providing comments on the Pre-Assessment Consultation for Draft Environmental Assessment for the subject project.

We confirm the information provided in your letter on zoning and other land use designations associated with the project site. The Draft EA will address the project's consistency and applicability with these land use designations.

Further, we acknowledge your determination that the facilities proposed for the project site are permitted public uses consistent with the County Zoning Code. No additional County land use permits would be required for these facilities and accessory structures associated with these facilities are also permitted uses. Plan Approval will be secured from the Planning Department prior to approval of building permits for the facilities.

The Draft EA will include discussion of the project's consistency with the County's *General Plan* land use designations along with pertinent policies and standards.

If you have any further comments or questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

Harry Kim
*Mayor*

James S. Correa
*Police Chief*

**FILE COPY**

County of Hawaii
**POLICE DEPARTMENT**
349 Kapiolani Street • Hilo, Hawaii 96720-3998
(808) 935-3311 • Fax (808) 961-8869

SSFM INTERNATIONAL, INC.
RECEIVED
OCT 22 2001
RAS
FILE

October 18, 2001

Mr. Ronald A. Sato, AICP
Senior Project Planner
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, HI 96817

Dear Mr. Sato:

SUBJECT: USDA PACIFIC BASIN AGRICULTURAL RESEARCH CENTER PROJECT
PRE-ASSESSMENT CONSULTATION FOR DRAFT ENVIRONMENTAL ASSESSMENT

Staff has reviewed the proposal for the above-referenced project and has no comments or objections to offer at this time.

Thank you for the opportunity to comment.

Sincerely,

JAMES S. CORREA
POLICE CHIEF

Thomas J. Hickcox

THOMAS J. HICKCOX
ASSISTANT POLICE CHIEF
FIELD OPERATIONS BUREAU

FHR:lk

SSFM INTERNATIONAL

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

SSFM 9973000

May 3, 2002

Mr. Thomas J. Hickcox, Assistant Police Chief
Field Operations Bureau
Police Department
County of Hawaii
349 Kapiolani Street
Hilo, Hawaii 96720-3998

Dear Mr. Hickcox:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated October 18, 2001 regarding the subject project. We note that the Police Department has no comments or objections to offer at this time on the proposed project.

If you have any further comments or questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

Harry Kim
*Mayor*

Patricia G. Engelhard
*Director*

Pamela N. Mizuno
*Deputy Director*

FILE COPY

# County of Hawai'i

**DEPARTMENT OF PARKS AND RECREATION**

25 Aupuni Street, Room 210 • Hilo, Hawai'i 96720-4252
(808) 961-8311 • Fax (808) 961-8411

SSFM INTERNATIONAL, INC.
RECEIVED
OCT 29 2001

FILE

October 25, 2001

Ronald Sato, AICP
SSFM International, Inc.
501 Sumner St., Suite 502
Honolulu, HI 96817

Re: USDA Pacific Basin Agricultural Research Center Project
Pre-Assessment Consultation for Draft Environmental Assessment

Dear Mr. Sato:

We have no comments or objections to offer on the proposed research center project.

Thank you for informing us of the project.

Sincerely,

Pat Engelhard

Patricia G. Engelhard
Director

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

May 3, 2002

SSFM 9973000

Ms. Patricia G. Engelhard, Director
Department of Parks and Recreation
County of Hawaii
25 Aupuni Street, Room 210
Hilo, Hawaii 96720-4252

Dear Ms. Engelhard:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated October 25, 2001 regarding the subject project. We note that the Department of Parks and Recreation has no comments or objections to offer on the proposed project.

If you have any questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

# Appendix B-2

*Section 106 Comment Letters*

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

GILBERT S. COLOMA-AGARAN, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DEPUTIES
JANET E. KAWELO
LINNEL NISHIOKA

SSFM INTERNATIONAL, INC.
RECEIVED
MAY 23 2001
VRAS

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS

May 16, 2001

FILE ~~LOG NO~~: 27484
DOC NO: 0105PM08

Mr. Ronald A. Sato
SSFM International
501 Summer Street, Suite 502
Honolulu, HI 96817

Dear Mr. Sato:

**SUBJECT: "Addendum to Archaeological Inventory Survey of an Approximately 20-Acre Parcel Proposed for the USDA Pacific Basin Agricultural Research Center, Located Near the Intersection of Komohana and Puainako Streets, South Hilo, Hawai'i Island (TMK 2-4-01:Por. 122)" (Bush, McDermott, and Hammatt 2000)**

---

Thank you for your letter of April 6, 2001, and the opportunity to review and comment on the subject report. The report presents the results of an archaeological inventory survey of a 10-acre parcel located adjacent to an approximately 20-acre area that was initially surveyed by Cultural Surveys Hawaii for the proposed USDA facility at the above referenced location. The report on the first survey was reviewed and approved by our office in October, 2000.

We believe that the survey of the additional 10-acre area was adequate, finding two new sites. Site 50-10-35-22734 is a roughly square platform located on a pahoehoe lava flow. The site is thought to be either a planting feature or possibly a platform for a small structure or tank. It is believed to be of historic age. Site 50-10-35-22735 is a stacked stone causeway that appears to have been part of a unimproved roadway. It appears to date the early 20th century and related to agricultural, dairy or ranching activity.

We agree with the significance evaluations for both sites. They are solely significant for their information content (Criterion D).

We concur with the recommendations made in this study. The two sites have been adequately documented. No further archaeological work is required at either site.

In summary, the proposed USDA facility project area will now cover approximately 30 acres. Within this area there are three significant historic properties, the two described in the present report and a burial site (50-10-35-22080) identified in the

Mr. Ronald A. Sato
Page Two

earlier survey. It is our understanding that the burial site will be preserved in place and maintained by the University of Hawaii at Hilo. With the preservation of the burial and its exclusion from the USDA facility, we believe that the proposed facility will have "no adverse effect" on significant historic sites.

If you should have any further questions about this project please contact our Hawaii Island archaeologist, Patrick McCoy (692-8029).

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

PM:jk

c. Hal Hammatt, Cultural Surveys Hawaii

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

TIMOTHY E. JOHNS, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DEPUTIES
JANET E. KAWELO
LINNEL NISHIOKA

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

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

October 4, 2000

Ronald Sato, Project Planner
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

LOG NO: 26293
DOC NO: 0010RC03

Mr. Ronald Sato:

**SUBJECT:** **Review of Archaeological Inventory Survey for USDA Pacific Basin Agricultural Research Center**
**Waiakea, South Hilo, Hawaii**
***TMK: 2-4-01: por. 122***

This letter reviews this survey report which was submitted August 8, 2000 (Bush et al. 2000. Archaeological Inventory Survey of an Approximately 20-Acre Parcel Proposed for the USDA Pacific Basin Agricultural Research Center ... Cultural Surveys Hawaii ms.).

We believe that the survey adequately covered the project area, finding one historic site (22,080). The background section adequately covers the settlement context for the project area, indicating the low likelihood for pre-European contact habitation and farming sites and the low likelihood of late 1800s sugarcane sites. The one site found is acceptably described and interpreted. This site is a lava sinkhole with rockshelter overhangs and a human femur under one overhang. It is argued that this femur was likely intentionally placed in the overhang by native Hawaiians in pre-European contact or early 1800s times, making the probable ethnicity Hawaiian. We agree with this conclusion.

We also agree with the significance evaluation for this site, significant for its information content and culturally significant to native Hawaiians.

The report indicates that it was agreed with our Burials Program to preserve this site, and that details of the preservation plan were agreed to.

In sum, the report is acceptable. As long as the burial site is avoided, we have no objections to any land alteration in this project area. We understand that the Research Center has been moved to include some adjacent lands, and that archaeological survey will be done of the additional lands.

We look forward to the survey findings before concluding Section 106 compliance review for this project.

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

RC:an

c: Dr. H. Hammatt, Cultural Surveys Hawaii
SHPD Burials Program
Chair, Hawaii Island Burial Council

# PRINCE DAVID KAWANANAKOA HCC

FILE COPY

*November 6, 2001*

SSFM INTERNATIONAL, INC.
RECEIVED
NOV 08 2001
FILE

*Mr. Ronald A. Sato, AICP*
*Senior Project Planner*
*SSFM International, Inc.*
*501 Sumner Street, Suite 502*
*Honoiulu, Hi 9681*

*RE: USDA PACIFIC BASIN AGRICULTURAL RESEARCH CENTER PROJECT*
*Section 106*

*Aloha,*

*and mahalo for inviting me to provide comment on the above proposed project. While I am CRC of the East Hawai'i office of OHA, I am also President of the Prince David Kawānanakoa Hawaiian Civic Club [PDKHCC] as well as the 'Ahahui Hale O Na Ali'i O Hawai'i.*

*My comments on behalf of OHA were provided my Honolulu office last week and you should be hearing from them shortly. Before coming to OHA, I was a student at the University of Hawai'i at Hilo until graduation and was familiar with a Historical Documentary Research and Oral History prepared for one of the Environmental Clubs at UHH makai of the proposed project area.*

*While the interviews were limited, it did shed a little about the area in which USDA is proposing its development as being dairy/pasture/agricultural, etc., and to my knowledge nothing was found to require a Section 106 consultation.*

*'Owau no me ka oiā'i 'o,*

Ululani Sherlock

*Ululani Sherlock, President*
*Prince David Kawānanakoa HCC*
*Keaukaha, Hilo, HI*

**203 Todd Avenue, Hilo, HI 96720-4852**

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

SSFM 9973000

May 3, 2002

Mr. Ululani Sherlock, President
Prince David Kawananakoa HCC
203 Todd Avenue
Hilo, Hawaii 96720

Dear Ms. Sherlock:

Subject: USDA Pacific Basin Agricultural Research Center
Section 106 Consultation

Thank you for your letter dated November 6, 2001 providing comments on the subject project as part of the Section 106 consultation process. We will include your letter in the Draft Environmental Assessment (Draft EA) document being published.

We did receive a comment letter from OHA on the subject and have included it in the Draft EA. We greatly appreciate your comments and information associated with the project site area.

If you have any questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

# Appendix B-3

*Section 7 Consultation*

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Box 50088
Honolulu, Hawaii 96850

SSFM INTERNATIONAL, INC.
RECEIVED
MAY 20 2002
JTAS
FILE

In Reply Refer To:
JTN

MAY

Mr. Ronald A. Sato, AICP
Senior Project Planner
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, HI 96817

Re: U.S. Department of Agriculture, Pacific Basin Agricultural Research Center Informal Section 7 Consultation

Dear Mr. Sato:

The U.S. Fish and Wildlife Service (Service) has received your March 21, 2002, letter requesting our concurrence under Section 7 of the Endangered Species Act (Act) of 1973, as amended, that the proposal by the U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS) to develop the Pacific Basin Agricultural Research Center (PBARC) in the town of Hilo on the Island of Hawai`i is not likely to affect endangered or threatened species. Thank you for the botanical survey, survey of avian and terrestrial mammalian species, and project summary you enclosed with this letter.

The PBARC project would be a new agricultural research facility developed on a 30-acre parcel situated along Komohana Street west of the University of Hawai`i at Hilo. The Tax Map Key for this site is 2-04-01: portion of 122.

We have reviewed the information you provided and in our files. To the best of our knowledge no federally endangered, threatened, or candidate species, significant wetlands, or other Federal trust resources under Service jurisdiction occur at the immediate project site, nor in the immediate vicinity of the proposed project site. However, the Hawaiian dark-rumped petrel (*Pterodroma phaeopygia sandwichensis*), a federally listed endangered species, and the Newell's Shearwater (*Puffinus auricularis newelli*), a federally listed threatened species, may occur in the vicinity of the proposed project site.

Anecdotal observations and experimental evidence have shown that artificial lighting can disorient seabirds when flying between inland nesting areas and offshore feeding grounds. This disorientation is caused by excessively bright outdoor lighting and can result in seabird collisions with man-made structures such as light poles and wires. Injured seabirds that "fall out" due to such collisions are highly vulnerable to predation by dogs and cats. We concur with recommendations provided in the draft survey of avian and terrestrial mammalian species that any external lighting planned within the proposed USDA facility be shielded. At a minimum, we recommend that any light poles erected at the site be limited to a maximum height of 25 feet.

The endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) was not detected at the project site on one evening and one morning (during crepuscular periods) using visual surveys. However, according to the survey report, although no Hawaiian hoary bats were recorded during the course of the survey, it is likely that bats do use resources within the site. This use could include foraging or roosting. The Hawaiian hoary bat breeds during the summer months at lower elevations on the Island of Hawai`i. During the months of June and July when young bats are non-volant (unable to fly), harm to young may result by the felling of trees or other vegetation in which this species may roost. The Service recommends that site clearing and tree felling for the project occur outside the months of June and July to minimize risk of possible harm to breeding bats and their young that could be at the project site.

Under Section 7 of the Act, it is the action agency's responsibility to determine if a project will affect any listed species. This determination includes an evaluation of effects that may be beneficial, insignificant, or discountable. By phone conversation with Ronald A. Sato of SSFM International, Inc., on May 8, 2002, Mr. Sato contacted USDA and then conveyed to us that USDA agrees to implement the above Service recommendations to avoid harm to federally listed species as result of project activities. At your request, the Service has reviewed the project and given the amended project measures concurs with your finding that no federally listed species are likely to be affected by the proposed project. Should project plans change, or if additional information on listed or proposed species becomes available, this determination may be reconsidered.

We appreciate the opportunity to comment on the proposed project. If you have any questions regarding these comments, please contact Fish and Wildlife Biologist Jay Nelson by telephone at 808 541-3441 or by facsimile transmission at 808 541-3470.

Sincerely,

for Paul Henson
Field Supervisor
Ecological Services

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

March 21, 2002

SSFM 9973000

Mr. Robert P. Smith, Pacific Islands Manager
Pacific Islands Ecoregion
Fish and Wildlife Service
U.S. Department of the Interior
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96813

Subject: U.S. Department of Agriculture, Pacific Basin Agricultural Research Center
Section 7 Consultation, Endangered Species Act

Dear Mr. Smith:

The U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS) is proposing to develop the Pacific Basin Agricultural Research Center (PBARC) in the town of Hilo on the Island of Hawaii. This PBARC project would be a new agricultural research facility developed on a 30-acre parcel situated along Komohana Street west of the University of Hawaii at Hilo. The Tax Map Key for this site is 2-04-01: portion of 122.

This project will be a new research center that includes state-of-the-art facilities serving the ARS. In addition to this PBARC facility, the USDA, Forest Service, Institute of Pacific Island Forestry (IPIF) will also be developing a new facility for their research activities on an approximately 5-acre portion of this property. Facilities constructed for this entire project will have a total of about 152,775 square feet of floor area, and consist of offices, laboratories, field plots, and various accessory facilities.

As a result of this project, informal consultation under Section 7 of the Endangered Species Act is being conducted by the USDA, ARS. This consultation is being conducted as part of a joint environmental document being prepared to meet both National Environmental Policy Act (NEPA) and State Chapter 343, Hawaii Revised Statutes requirements. A pre-assessment consultation letter associated with the preparation of a Draft Environmental Assessment (Draft EA) was previously provided in October 2001.

Included with this letter are the following items to assist with your review of the project as part of this informal consultation. A copy of the published Draft EA will also be provided to your agency for review as part of the public review process sometime in May of this year.

1. Project summary with exhibits showing the project's location and preliminary Site Plans.
2. Botanical survey report for project.
3. Avian and terrestrial mammalian survey report for project.

This PBARC project is not considered a "major construction activity," and a Finding of No Significant Impact under both NEPA and State Chapter 343, HRS environmental procedures is anticipated. The results of the botanical and faunal studies determined that there is no critical habitat present on the project site or in the immediate area, nor any listed endangered or threatened species present on the site. Consequently, the project should have no affect on such species or critical habitat.

If your agency has any further information on listed endangered or threatened species present on the site, we would appreciate receiving this information. If desired, a meeting can be held with your staff along with representatives from the USDA to discuss the project and answer any questions. We would greatly appreciate your cooperation in providing any information or response within 30 days or less of this letter.

If you have any questions, or require additional information, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato

Ronald A. Sato, AICP
Senior Project Planner
Email: rsato@ssfm.com

Enclosures: Botanical Survey (Char 2001)
Fauna Survey (David 2001)
Project Summary

cc: Dr. Paul Moore, PBARC
Mr. Herb Leong – Richard Matsunaga & Assoc. Architects, Inc.

# APPENDIX B-4

*Draft EA Comment Letters and Responses*

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

REPLY TO
ATTENTION OF

June 14, 2002

SSFM INTERNATIONAL, INC.
RECEIVED
~~JUN 1 7 2002~~

√RAS

FILE

Regulatory Branch

**FILE COPY**

Mr. Ronald A. Sato, AICP
SSFM International, Inc
501 Summer Street, Suite 502
Honolulu, Hawaii 96817

Dear Mr. Sato:

This letter responds to your request for comments dated June 7, 2002, on the draft Environmental Assessment for the USDA Pacific Basin Agricultural Research Center. Based on the information you provided I have determined that there are no waters of the United States including wetlands at the project site and therefore a Department of the Army (DA) permit will not be required for this project.

If you have any questions concerning this determination, please contact William Lennan of my staff at 438-6986 or FAX 438-4060, and reference File No. 200200370.

Sincerely,

William B. Lennan
for George P. Young, P.E.
Chief, Regulatory Branch

Copies furnished:
Mr. Eric Leong, Department of Land and Natural Resources, P.O. Box 631, Honolulu, Hawaii 96809
Office of Environmental Quality Control, Department of Health, 235 South Beretania Street, Room 702, Honolulu, Hawaii 96813

SSFM INTERNATIONAL

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

Mr. George P. Young, P.E.
Chief, Regulatory Branch
U.S. Army Engineer District, Honolulu
Department of the Army
Fort Shafter, Hawaii 96858-5440

Dear Mr. Young:

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated June 14, 2002 providing comments on the Draft Environmental Assessment for the subject project.

We note your determination that there are no waters of the United States, including wetlands, at the project site, and therefore, a Department of the Army permit will not be required for this project.

If you have any questions on this matter, please contact me at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

# United States Department of the Interior

U.S. GEOLOGICAL SURVEY

WATER RESOURCES DISCIPLINE
677 Ala Moana Blvd., Suite 415
Honolulu, HI 96813
Phone: (808) 587-2400/Fax: (808) 587-2401

SSFM INTERNATIONAL, INC
RECEIVED
JUN 14 2002
✓RAS
FILE

June 12, 2002

Mr. Ronald A. Sato, AICP
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

FILE COPY

Dear Mr. Sato:

Subject: Draft Environmental Assessment for the USDA Pacific Basin Agricultural Research Center Project being proposed by U.S. Department of Agriculture, Agricultural Research Service

Thank you for forwarding the subject Draft Environment Assessment for review and comment by the staff of the U.S. Geological Survey, Water Resources Division, Hawaii District office. We regret however, that due to prior commitments and lack of available staff, we are unable to review this document and are returning it for your future use.

We appreciate the opportunity to participate in the review process.

Sincerely,

Gordon Tribble
District Chief

Enclosure

Cc: Mr. Eric Leong
Department of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

Office of Environmental Quality and Control
Department of Health
State of Hawaii
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

**SSFM INTERNATIONAL, INC.**
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

Mr. Gordon Tribble, District Chief
Water Resources Discipline
U.S. Geological Survey
U.S. Department of the Interior
677 Ala Moana Boulevard, Suite 415
Honolulu, Hawaii 96813

Dear Mr. Tribble:

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated June 12, 2002 on the Draft Environmental Assessment for the subject project.

We note your department was unable to review this document due to prior commitments and lack of available staff.

If you have any questions on this matter, please contact me at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

BENJAMIN J. CAYETANO
GOVERNOR

GLENN M. OKIMOTO
COMPTROLLER

MARY ALICE EVANS
DEPUTY COMPTROLLER

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

LETTER NO. PWD02.P327

JUN 17 2002

Mr. Ronald A. Sato, AICP
SSFM International Inc.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

Dear Mr. Sato:

Subject: USDA Pacific Basin Agricultural Research Center
Draft Environmental Assessment
TMK: (3) 2-4-1: 122

We have reviewed your June 7, 2002, transmittal which described the proposed project and have no comments because the project is being coordinated with the University of Hawaii at Hilo, the Department of Land and Natural Resources and the Department of Agriculture.

Should there be any questions on this matter, please have your staff contact Mr. Ralph Morita of the Planning Branch at 586-0484.

Very truly yours,

GLENN M. OKIMOTO
State Comptroller

RECEIVED
JUN 18 2002
FILE

c: The Honorable James Nakatani, DOA
Mr. Lo-Li Chih, UH Hilo
Ms. Genevieve Salmonson, OEQC
Mr. Eric Leong, DLNR Land Division
Mr. Glenn Okada, DAGS Hawaii

SSFM INTERNATIONAL

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

SSFM 9973000

October 4, 2002

Mr. Glenn M. Okimoto, State Comptroller
Department of Accounting and General Services
State of Hawaii
P.O. Box 119
Honolulu, Hawaii 96810

Dear Mr. Okimoto

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated June 17, 2002 providing comments on the Draft Environmental Assessment for the subject project.

We note that your department has no comments on the project at this time.

If you have any questions on this matter, please contact me at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

BENJAMIN J. CAYETANO
GOVERNOR

[redacted]
PATRICIA HAMAMOTO
XXXX SUPERINTENDENT

**STATE OF HAWAI'I**
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTENDENT

SSFM INTERNATIONAL, INC.
RECEIVED
JUL 0 5 2002
RAS

FILE COPY
FILE

July 5, 2002

Mr. Ronald A. Sato, AICP
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawai`i 96817

Dear Mr. Sato:

Subject: USDA Pacific Basin Agricultural Research Center
TMK: 2-04-01: portion of 122

The Department of Education (DOE) has reviewed the Draft Environmental Assessment for the proposed research center for the U.S. Department of Agriculture's Agricultural Research Service and Forest Service. The center would be built on a 30-acre site owned by the State of Hawaii.

DOE has no comment on the application but appreciates the opportunity to review the plans.

Very truly yours,

Patricia Hamamoto

Patricia Hamamoto
Superintendent

PH:hy

cc: A. Suga, OBS
E. Leong, Land Division/DLNR
OEQC/DOH

SCANNED

SSFM INTERNATIONAL

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

Ms. Patricia Hamamoto, Superintendent
Department of Education
State of Hawaii
P.O. Box 2360
Honolulu, Hawaii 96804

Dear Ms. Hamamoto:

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated July 5, 2002 providing comments on the Draft Environmental Assessment for the subject project.

We note that your department has no comments on the project at this time.

If you have any questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

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

In reply, please refer to:
File:
02-149/epo

SSFM INTERNATIONAL, INC.
RECEIVED
JUL 3 0 2002

FILE COPY

FILE

July 26, 2002

Mr. Ronald Sato, AICP
SSFM International, Inc
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

Dear Mr. Sato:

Subject: Draft Environmental Assessment (DEA)
USDA Pacific Basin Agricultural Research Center Project
South Hilo, Hawaii State Dept. of Health
Tax Map Key: (3) 2-4-001: portion 122

Thank you for the opportunity to review and comment on the subject proposal. The DEA was routed to the various branches of the Environmental Health Administration. We have the following comments.

Clean Water Branch (CWB)

The Army Corps of Engineers should be contacted to identify whether a Federal permit (including a Department of Army permit) is required for any of the future projects. If it is determined that a Federal permit is required for the subject project, then a Section 401 Water Quality Certification would also be required from our office.

If the construction project involves any of the following discharges into State waters, a national Pollutant Discharge Elimination System (NPDES) permit coverage is required for each discharge:

a. Storm water runoff associated with construction activities, including clearing, grading, and excavation that result in the disturbance of equal to or greater than five (5) acres of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale.

*(Note: After March 10, 2003, an NPDES permit will be required for discharges of storm water associated with construction activities, including clearing, grading, and excavation that result in the disturbance of one (1) acre or more.)*

b. Hydro-testing water; and

c. Construction dewatering effluent.

The Clean Water Branch requires that Notices of Intent (NOI), for NPDES general permits, be submitted 30 days before the discharge is to occur. NPDES individual permit applications should be submitted 180 days before the discharge is to occur. NOI and NPDES individual permit applications can be picked up at our office or downloaded from our website at http://www.state.hi.us/doh/eh/cwb/forms/index.html.

Please note that the current NPDES general permits will expire at midnight, September 21, 2002. If the project continues after this date, you will need to reapply for all applicable NPDES general permit coverage's prior to the expiration date.

If you have any questions, please contact Kris Poentis of the Engineering Section, Clean Water Branch, at (808) 586-4309.

Clean Air Branch (CAB)

The Clean Air Branch has concerns on construction activities where potential dust problems may arise. There is a significant potential for fugitive dust to be generated during all phases of the project. Implementation of adequate dust control measures during all phases of development and construction activities is warranted.

Construction activities must comply with provisions of Hawaii Administrative Rules, Chapter 11-60.1, "Air Pollution Control," Section 11-60.1-33, Fugitive Dust.

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

a. Planning the different phases of construction, focusing on minimizing the amount of dust generating materials and activities, centralizing on-site vehicular traffic routes, and locating potentially dusty equipment in areas of the least impact;

b. Providing an adequate water source at the site prior to start up of construction activities;

c. Landscaping and rapid covering of bare areas, including slopes, starting from the initial grading phase;

d. Controlling of dust from shoulders and access roads; and

e. Providing adequate dust control measures during weekends, after hours, and prior to daily start-up of construction activities.

If you have any questions regarding these issues on fugitive dust, please contact the Clean Air Branch at (808) 586-4200.

Wastewater Branch (WWB)

The Wastewater Branch concurs with the proposal to use a wastewater treatment works and effluent reclamation for this project. All wastewater plans must conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems". We reserve the right to review the detailed wastewater plans for conformance to applicable rules.

If you have any questions, please contact the Wastewater Branch at (808) 586-4294.

Solid and Hazardous Waste Branch (SHWB)

The Office of Solid Waste Management recommends the development of a solid waste management plan that encompasses all project phases including demolition, construction, and occupation of the buildings.

Specific examples of elements that the plan should address include:

- Recycling of green-waste during clear and grub activities;
- Recycling construction and demolition wastes, as appropriate;
- Use of locally produced compost in landscaping;
- Use of recycled content building materials; and
- The provision of recycling facilities in the design of the project.

In reviewing this DEA, it appears that a large amount of green waste will be generated during the clear and grub phase of the project. Emphasis should be given to diverting this green waste from landfill disposal and directing the green waste to a recycling facility in order to conserve landfill space.

The developer shall ensure that all solid waste generated during project construction is directed to a solid waste disposal or recycling facility permitted by the Department of Health.

If you have any questions, please contact the Solid and Hazardous Waste Branch at (808) 586-4226.

Noise, Radiation and Indoor Air Quality (NRIAQ) Branch

All project activities shall comply with the Administrative Rules of the Department of Health, Chapter 11-46, on "Community Noise Control".

If you have any questions, please contact the NRIAQ at (808) 586-4701.

Sincerely,

GARY GILL
Deputy Director
Environmental Health Administration

c: Hawaii District Health Office
CWB
CAB
WWB
SHWB
NRIAQ

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

Mr. Gary Gill, Deputy Director
Environmental Health Administration
Department of Health
State of Hawaii
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Mr. Gill:

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated July 26, 2002 providing comments on the Draft Environmental Assessment for the subject project from your various branches. We have the following responses which correspond to comments offered by the individual branches.

Clean Water Branch

We received a comment letter from the Department of Army as part of their review of the Draft EA determining that a Department of Army permit will not be required for this project since there are no waters of the U.S. at the project site. Therefore, a Section 401 Water Quality Certification should not be required from your office.

Construction activities associated with this project would require NPDES permit coverage since it would be greater than 5-acres. A NPDES permit application would be submitted at least 30 days prior to any discharge occurring. If an individual permit is required, an application would be submitted 180 days before the discharge is to occur. Thank you for the update on the State's NPDES general permit coverage expiration date and renewal coverage.

Clean Air Branch

Construction activities associate with this project will be conducted in compliance with the provisions of Chapter 11.60-1, Hawaii Administrative Rules (Air Pollution Control), and specifically, the rules set forth in HAR 11.60-1-33 addressing fugitive dust.

The Draft EA did include a discussion of measures that may be considered for implementation in order to control fugitive dust from the project site which includes development of a dust control plan. The measures identified in your comments will be considered for implementation as part of the project's design.

Wastewater Branch

We note your concurrence with the planned use of a wastewater treatment works and effluent reclamation for this project. Wastewater improvements will conform to applicable provisions of HAR Chapter 11-62, Wastewater Systems. Wastewater plans developed for this project will be coordinated with your branch for review during the project's design phase.

Solid and Hazardous Waste Branch

A solid waste management plan encompassing all project phases (demolition, construction and occupation of facilities) for the site will be developed as part of the design phase for this project. The elements identified for inclusion in this solid waste management plan would be incorporated.

Emphasis will be given to trying to divert green waste generated from clearing and grubbing activities to a recycling facility to minimize use of landfill space. All solid-waste generated during the project's construction would be directed to a solid waste disposal or recycling facility permitted by the Department of Health.

Noise, Radiation and Indoor Air Quality Branch

All research related activities conducted at the project site will comply with the Department of Health's Administrative Rules Chapter 11-46, Community Noise Control.

If you have any further comments or questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

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

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

July 23, 2002

USDAPACIFICBASIN.RCM

LD/NAV
L-326/377/401/286/115/3593/3402/3708

SSFM INTERNATIONAL, INC.
RECEIVED
~~JUL 24 2002~~
√RAS
FILE COPY
FILE

SSFM International
Ronald A. Sato, AICP, Senior
Project Manager
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

Dear Mr. Sato:

Subject: Review: Draft Environmental Assessment
Project: USDA Pacific Basin Agricultural Research Center
Applicant: United States Department of Agriculture
Agriculture Research Services
Authority: State of Hawaii DLNR
Proposed: Research Complex
Location: South Hilo, Island of Hawaii, Hawaii
TMK: 3rd/ 2-4-001: portion of 122

Thank you for the opportunity to review and comment on the subject matter. A copy of the Draft Environmental Assessment covering the proposed project was distributed to the following Department of Land and Natural Resources' Divisions for their review and comment.

- Division of Forestry and Wildlife
- Division of State Parks
- Historic Preservation Division
- Commission on Water Resource Management
- Land Division Engineering Branch
- Land Division Hawaii District Land Office

Attached herewith is a copy of the Commission on Water Resource Management, Division of Forestry & Wildlife and Land Division Engineering Branch comments.

The Department of Land and Natural Resources has no other comment to offer based on the attached responses. Should you have any questions, please feel free to contact Nicholas A. Vaccaro of the Land Division Support Services Branch at 587-0438.

Very truly yours,

Charlene E. Unoki

for DIERDRE S. MAMIYA
Administrator

C: Hawaii District Land Offices

SCANNED

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

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

June 12, 2002

LD/NAV/L-3402
Ref.: USDAPACIFICBASIN.CMT

Suspense Date: 7/22/02

MEMORANDUM:

TO:
Division of Aquatic Resources
XXX Division of Forestry & Wildlife
XXX Division of State Parks
Division of Boating and Ocean Recreation
XXX Historic Preservation Division
XXX Commission on Water Resource Management
**Land Division Branches of:**
Planning and Technical Services
XXX Engineering Branch
OOO Hawaii District Land Office (Eric Leong)

FROM: for Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Review: Draft Environmental Assessment
Project: USDA Pacific Basin Agricultural Research Center
Applicant: United State Department of Agriculture, Agriculture Research Services
Authority: State of Hawaii DLNR
Proposed: Research Complex
Location: South Hilo, Hawaii
TMK: 3rd/ 2-4-001: portion of 122

Please review the attached Draft Environmental Assessment covering the subject matter and submit your comments (if any) on Division letterhead (signed and dated) within the time requested above. Should you need more time to review the subject matter, please contact Nick Vaccaro at ext.: 7-0438.

**If this office does not receive your comments on or before the suspense date, we will assume there are no comments.**

( ) We have no comments.

( ) Comments attached.

Signed:

Date:

# Division of Forestry & Wildlife

1151 Punchbowl Street, Rm. 325 • Honolulu, HI 96813 • (808) 587-0166 • Fax (808) 587-0160

RECEIVED
LAND DIVISION

DEPT. OF
NATURAL
STATE OF

June 14, 2002

**MEMORANDUM**

TO: Nick Vaccaro, Land Agent
Land Division

THRU: Dierdre S. Mamiya, Administrator
Land Division

FROM: Michael G. Buck, Administrator
Division of Forestry and Wildlife

SUBJECT: **Request for Comments: Draft EA for USDA Pacific Basin Agriculture Research Center Project, Hilo, Hawaii TMK: 2-04-01: portion of 122, 30 acre parcel along Komohana Street west of University of Hawaii at Hilo.**

We have reviewed the subject request and provide the following comments for your considerations. The attached brochure explains our concerns regarding exterior light problems for young Newell Shearwaters. Since young Shearwaters have a natural attraction to bright lights, they oftentimes become disoriented by the blinding lights and fly into utility wires and poles, trees, and buildings. DOFAW appreciates the planners recognition of this problem and the resulting recommendations proposed in the draft EA on page 86. Mitigative measures described on this page will effectively reduce the potential bird strikes by shielding exterior lights and aiming them downward, or using cut-off luminaires or indirect lighting. Finally, this brochure will help identify the bird, its problem with lights and explain how planners can effectively mitigate this problem on seabirds. Thank you for the opportunity to comment on this project.

Attachment

C: Hawaii DOFAW Branch
Jack Ewel, IPIF Director

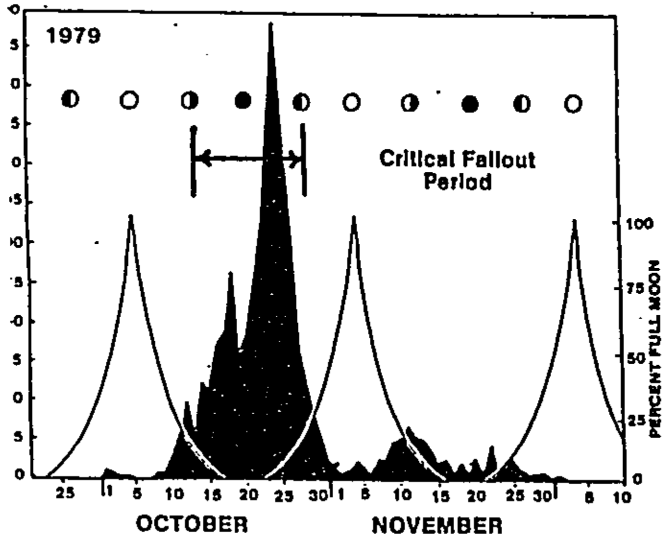



Figure 4. Relationship of shearwater "fallout" to the moon phases. The critical period of fallout occurs during the week before and after the new moon (darkest nights). Dowsing lights that are not absolutely necessary during that period could substantially reduce the annual shearwater fallout problem.

### What To Do If Shearwaters Fall In Your Area

1. Collect birds as soon as possible to avoid losses to dogs and cats. They are generally docile birds and are easily handled. Take them to the nearest "shearwater aid station" located at county fire stations and at a few private business locations around the island. If birds must be held overnite, keep them in ventilated cardboard box with a secure lid.

2. Do not release birds by tossing them into the air. They may have unseen internal injuries and could become more badly injured.

**TECHNICAL ASSISTANCE IS AVAILABLE**

**FOR ADDITIONAL INFORMATION, CONTACT:**

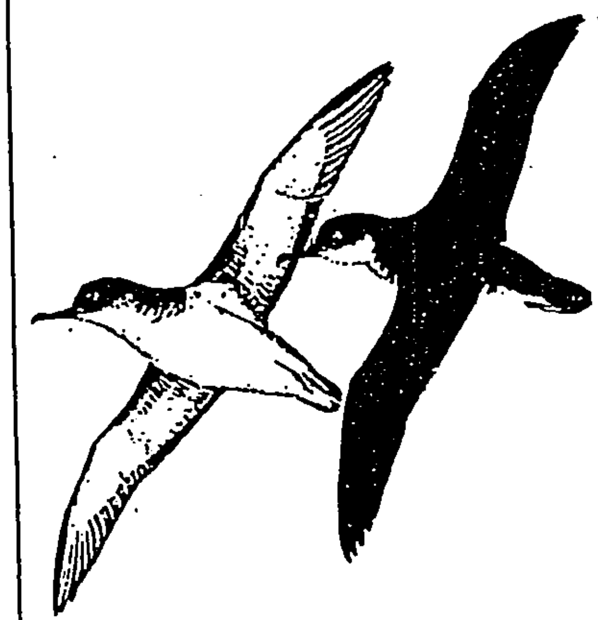
State of Hawaii
Department of Land and Natural Resources
Division of Forestry and Wildlife
P.O. Box 1671
Lihue, Hawaii 96766
245-4433

U.S. Dept. of the Interior
Fish and Wildlife Service
P.O. Box 87
Kilauea, Hawaii 96754
828-1413

The Nature Conservancy
of Hawaii
1026 Nuuanu Avenue, Suite 201
Honolulu, Hawaii 96813
537-4508

FORESTRY & WILDLIFE
HAWAII

DEPARTMENT OF
LAND AND NATURAL RESOURCES



# THE NEWELL'S SHEARWATER LIGHT ATTRACTION PROBLEM

A GUIDE FOR ARCHITECTS, PLANNERS, AND RESORT MANAGERS

ADMINISTRATOR
__ASST ADMIN
__DEV BR
__PLAN BR
__RES MGT BR
__CLERICAL
__ADMIN ASST
__INTERP BR

TO:
__CIRC/POST/STAFF RIA
__COMMENTS & REC
__DRAFT REPLY
__FILE
__FOLLOW UP
__INFO
__RUN COPIES______
__RUSH DUE______
__SEE ME
__SEND COPY TO

8 ?

RECEIVED
2002 JUN 18

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

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

June 12, 2002

LD/NAV/L-3402
Ref.: EA/USDAPACIFICBASIN.CMT

Suspense Date: 7/22/02

MEMORANDUM:

TO:
Division of Aquatic Resources
XXX Division of Forestry & Wildlife
✓XXX Division of State Parks
Division of Boating and Ocean Recreation
XXX Historic Preservation Division
XXX Commission on Water Resource Management
**Land Division Branches of:**
Planning and Technical Services
XXX Engineering Branch
OOO Hawaii District Land Office (Eric Leong)

FROM: for Dierdre S. Mamiya, Administrator
Land Division

SUBJECT:
Review: Draft Environmental Assessment
Project: USDA Pacific Basin Agricultural Research Center
Applicant: United State Department of Agriculture, Agriculture Research Services
Authority: State of Hawaii DLNR
Proposed: Research Complex
Location: South Hilo, Hawaii
TMK: 3rd/ 2-4-001: portion of 122

Please review the attached Draft Environmental Assessment covering the subject matter and submit your comments (if any) on Division letterhead (signed and dated) within the time requested above. Should you need more time to review the subject matter, please contact Nick Vaccaro at ext.: 7-0438.

If this office does not receive your comments on or before the suspense date, we will assume there are no comments.

(✓) We have no comments.

( ) Comments attached.

Signed:

Date: 6/17/02

## INTRODUCTION:

The future of a native Hawaiian seabird, the Newell's Shearwater, is threatened by the growth of new urban developments. Every year on Kauai, nearly 1,500 Newell's Shearwaters are attracted to bright urban lights, fly into unseen objects and fall stunned to the ground. Fortunately, 90% of them are recovered and successfully returned to the wild through the "SOS" (save our shearwater) program which involves the cooperation of the general public.

This brochure is designed to describe the bird, its problems with lights and specifically what architects planners, resort managers and the general public can do to reduce or avoid the light attraction problem.

## THE BIRD

The Newell's Shearwater once nested on all of the major Hawaiian Islands, but the mongoose, introduced to Hawaii, Maui, Molokai and Oahu in the late 1800's is believed to have caused the extinction of shearwaters on those islands. Kauai is the last strong-hold for this unique native Hawaiian seabird.

Newell's Shearwaters nest during the spring and summer months in the interior mountains of Kauai. They dig a long burrow in the ground beneath dense vegetation and lay a single egg each year. The eggs hatch during July and August, and the nestlings are reared within the burrow. The adult birds abandon the nestlings a week or two before they are old enough to fly. The nestlings become hungry, and leave the nesting grounds by themselves shortly after nightfall. They head for the open ocean, and must depend upon their instincts to find food. They do not return to their nest, but fly south towards the equator where they will remain all winter on the open seas until the following spring.

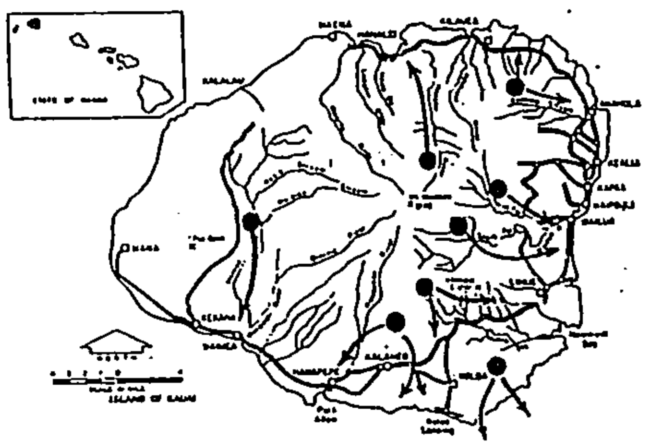


**Figure 1.** Map showing known nesting areas of the Newell's

## THE THREATS:

PREDATORS: Dogs, cats, rats and feral pigs are known to kill some shearwaters and their young on the nesting grounds each year. The accidental establishment of a new predator to Kauai such as the mongoose, could cause the rapid extinction of this bird. Mongoose sightings on Kauai should be reported to wildlife officials promptly.

LIGHT ATTRACTION: Young shearwaters leaving their nests for the first time, do so only after dark. They are inexperienced and have a natural attraction to bright lights. Flying near urban areas, they become temporarily blinded by the lights and fly into unseen objects such as utility wires, trees, buildings and automobiles. Oftentimes they are just confused and exhausted. Most often they are only stunned and fall to the ground, but about 10 percent of them die each year. The problem is growing because of the increased number of urban lights associated with new resort and residential developments. The greatest "fallout" problem occurs near coastal towns, particularly near river mouths.

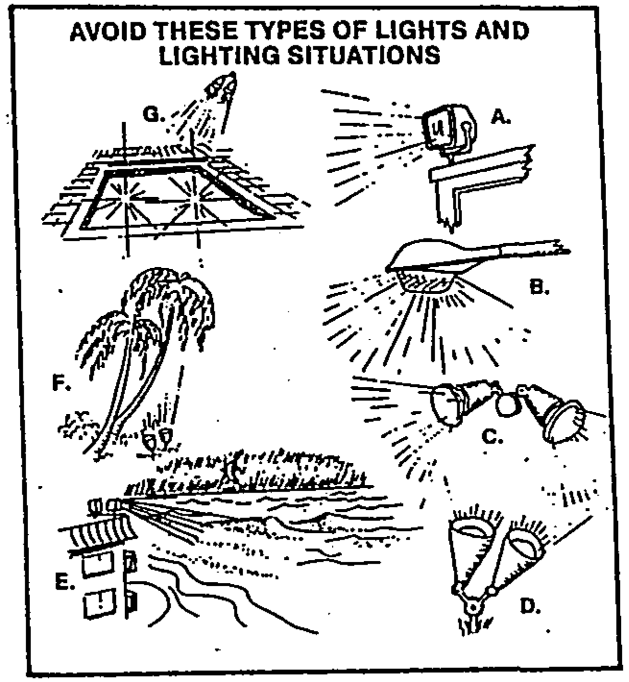



**Figure 2.** Avoid these types of lights: A. Unshielded high intensity floodlights on tall structures, B. Street lights without shields, C. Unshielded spotlights, D. Spotlights aimed upwards. Avoid using these types of lighting situations during peak fallout periods (new moon) during October and November. E. Floodlights on surf, F. Spotlights aimed up at vegetation, G. Spotlights

## WHAT CAN WE DO TO HELP ?

### Architects and Planners

- Be aware of the light attraction problem during the planning stages of new development.
- Make every effort to avoid lighting situations where light glare projects upwards or laterally (see figure 2). Avoid large high-intensity floodlights located on building tops or poles whenever possible.
- Use shielded lights, cut-off luminaires, or indirect lighting whenever possible. (see figure 3).
- Avoid locating bright lights near utility wires or other objects that could be difficult for birds to see at night.

### Hotel, Resort and Condominium Managers

- When converting to new exterior light fixtures, consider installing shielded lights, cut-off luminaires or indirect lighting.
- Consider installing shields on exterior lights that are known to attract shearwaters. Some light manufacturers offer ready made sheilds. In some cases inexpensive shields can be fabricated.
- Avoid using unnecessary lighting during the critical shearwater fallout period: (October and November each year). **Note:** The heaviest fallout occurs on and around the new moon, generally for only 10 to 12 days. (See figure 4). Dowsing unnecessary floodlights that light up the surf or shine upward upon buildings or trees for that short period, could significantly reduce shearwater fall-out.

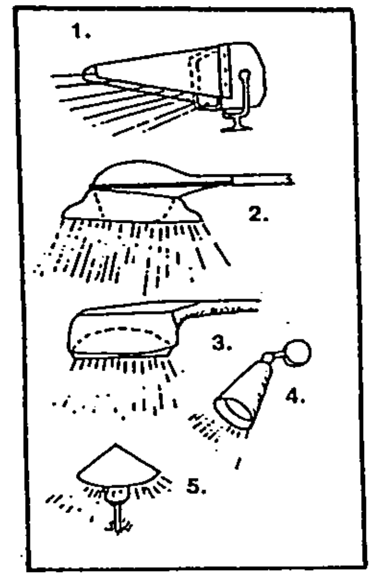



**Figure 3.** Use these types of lights whenever possible: 1. Shielded floodlights, 2. Shielded streetlights, 3. Cut-off luminare

RECEIVED

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

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

June 12, 2002

'02 JUN 14 AM 10:08 WATER & LAND

LD/NAV/L-3402
Ref.: USDAPACIFICBASIN.CMT

Suspense Date: 7/22/02

MEMORANDUM:

TO:
Division of Aquatic Resources
XXX Division of Forestry & Wildlife
XXX Division of State Parks
Division of Boating and Ocean Recreation
XXX Historic Preservation Division
XXX Commission on Water Resource Management
**Land Division Branches of:**
Planning and Technical Services
✓ XXX Engineering Branch
OOO Hawaii District Land Office (Eric Leong)

FROM: for Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Review: Draft Environmental Assessment
Project: USDA Pacific Basin Agricultural Research Center
Applicant: United State Department of Agriculture, Agriculture Research Services
Authority: State of Hawaii DLNR
Proposed: Research Complex
Location: South Hilo, Hawaii
TMK: 3rd/ 2-4-001: portion of 122

Please review the attached Draft Environmental Assessment covering the subject matter and submit your comments (if any) on Division letterhead (signed and dated) within the time requested above. Should you need more time to review the subject matter, please contact Nick Vaccaro at ext.: 7-0438.

**If this office does not receive your comments on or before the suspense date, we will assume there are no comments.**

( ) We have no comments.

(X) Comments attached.

Signed:

Date:

DLNR-LAND DIVISION
ENGINEERING BRANCH

COMMENTS

We confirm that the proposed project site, according to FEMA Community-Panel No. 155166 0880 C, is located in Zone X. This is an area determined to be outside the 500-year flood plain.

Please inform the Engineering Branch, Land Division should there be changes to the water demands included in the Draft Environmental Assessment. The Department of Land and Natural Resources prepared and updates a Statewide Water Master Plan, and will include the water demands in its next update.

Signed: Andrew M. Monden
ANDREW M. MONDEN, CHIEF ENGINEER

Date: 7/16/02

N:\WLD\MAKAI\DENNIS\WORD\Hilo_USDAPacificBasinAgResearchCtrProj_EA_com_H3.doc

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

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

'02 JUN 13 P1:45

June 12, 2002

LD/NAV/L-3402
Ref.: USDAPACIFICBASIN.CMT

Suspense Date: 7/22/02

MEMORANDUM:

TO:
Division of Aquatic Resources
XXX Division of Forestry & Wildlife
XXX Division of State Parks
Division of Boating and Ocean Recreation
XXX Historic Preservation Division
✓ XXX Commission on Water Resource Management
**Land Division Branches of:**
Planning and Technical Services
XXX Engineering Branch
OOO Hawaii District Land Office (Eric Leong)

FROM: for Dierdre S. Mamiya, Administrator
Land Division

SUBJECT:
Review: Draft Environmental Assessment
Project: USDA Pacific Basin Agricultural Research Center
Applicant: United State Department of Agriculture, Agriculture Research Services
Authority: State of Hawaii DLNR
Proposed: Research Complex
Location: South Hilo, Hawaii
TMK: 3rd/ 2-4-001: portion of 122

Please review the attached Draft Environmental Assessment covering the subject matter and submit your comments (if any) on Division letterhead (signed and dated) within the time requested above. Should you need more time to review the subject matter, please contact Nick Vaccaro at ext.: 7-0438.

If this office does not receive your comments on or before the suspense date, we will assume there are no comments.

( ) We have no comments.

(X) Comments attached.

Signed:

Date: 6/27/02

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

July 2, 2002

2002 JUL -3 A 10:

RECEIVED

| | |
|---|---|
| TO: | Ms. Dede Mamiya, Administrator<br>Land Division |
| FROM: | Linnel T. Nishioka, Deputy Director<br>Commission on Water Resource Management (CWRM) |
| SUBJECT: | Draft EA – USDA Pacific Basin Agricultural Research Center |
| FILE NO.: | USDAPACIFICBASIN.CMT |

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas, which are important for the maintenance of streams and the replenishment of aquifers.

[x] We recommend coordination with the county government to incorporate this project into the county's Water Use and Development Plan.

[ ] We recommend coordination with the Land Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

[ ] We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

[ ] A Well Construction Permit and/or a Pump Installation Permit from the Commission would be required before ground water is developed as a source of supply for the project.

[ ] The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the Commission would be required prior to use of this source.

[ ] Groundwater withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

[ ] We are concerned about the potential for degradation of instream uses from development on highly erodible slopes adjacent to streams within or near the project. We recommend that approvals for this project be conditioned upon a review by the corresponding county's Building Department and the developer's acceptance of any resulting requirements related to erosion control.

[ ] If the proposed project includes construction of a stream diversion, the project may require a stream diversion works permit and amend the instream flow standard for the affected stream(s).

[ ] If the proposed project alters the bed and banks of a stream channel, the project may require a stream channel alteration permit.

[ ] OTHER:

If there are any questions, please contact Ryan Imata at 587-0255.

SSFM INTERNATIONAL

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

Ms. Dierdre S. Mamiya, Administrator
Land Division
Department of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

Dear Ms. Mamiya:

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated July 23, 2002 providing comments on the Draft Environmental Assessment for the subject project from your divisions. Our responses to the comments from your divisions are provided.

Division of Forestry and Wildlife

Thank you for the brochure which explains your concerns regarding exterior light problems for young Newell Shearwaters. The mitigative measures identified in the Draft Environmental Assessment would be implemented to minimize impacts to these Newell Shearwaters, and your brochure will forwarded to the design team for their reference.

Division of State Parks

We note this division had no comments on the subject project.

Engineering Branch

We note this branch's confirmation that the project site is located in Zone X of the Flood Insurance Rate Map. Zone X is an area determined to be outside the 500-year flood plain.

Any changes to the projected water demands resulting from this project would be provided to your branch so that the Statewide Water Master Plan can be appropriately updated. More specific water demands resulting from this project would be quantified as part of the project's design.

Commission on Water Resource Management

The use of non-potable water resources would be considered as part of the project's design if available and feasible. The design of research facilities and project site will include measures as appropriate to protect water recharge areas. The project's design will be coordinated with the County of Hawaii so that they can incorporate this project in the County's Water Use and Development Plan.

If you have any questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

GILBERT S. COLOMA-AGARAN, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCES MANAGEMENT

DEPUTIES
ERIC T HIRANO
LINNEL NISHIOKA

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING, ROOM 555
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS

# HAWAI'I HISTORIC PRESERVATION DIVISION REVIEW

**LOG NO.: 30224**
**DOC NO.: 0207PM01**

SSFM INTERNATIONAL, INC.
RECEIVED
JUL 0 9 2002
KAS

**Agency/Applicant:** SSFM International, Inc.
**Address:** 501 Sumner Street, Suite 502
Honolulu, HI 96817

**Project:** USDA Pacific Basin Agricultural Research Center
**Location:** Waiakea, South Hilo, Hawaii Island
**TMK:** (3) 2-04-001:Por. 122

FILE COPY

FILE

1. We believe there are no historic properties present because:

--------a. intensive cultivation has altered the land
--------b. residential development/urbanization has altered the land
--------c. previous grubbing/grading has altered the land
--------d. an acceptable archaeological assessment or inventory survey found no historic properties
--------e. other:

2. This project has already gone through the historic preservation review process, and mitigation has been completed. _X_

Thus, we believe that "~~no~~ historic properties will be affected" by this undertaking.

Signed ______________________ Date 7/22/02
Gilbert Coloma-Agaran
State Historic Preservation Officer

SCANNED

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

Mr. Gilbert Coloma-Agaran, Director
Historic Preservation Division
Department of Land and Natural Resources
State of Hawaii
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

Dear Mr. Coloma-Agaran:

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated July 2, 2002 providing comments on the Draft Environmental Assessment for the subject project.

We note your department's determination that the project has already gone through the historic preservation review process, and mitigation has been completed. Furthermore, your department has determined that "no historic properties will be affected" by this project.

If you have any questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

BENJAMIN J. CAYETANO
GOVERNOR

BRIAN K. MINAAI
DIRECTOR

DEPUTY DIRECTORS
JEAN L. OSHITA
JADINE Y. URASAKI

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

IN REPLY REFER TO:

HWY-PS
2.7269

SSFM INTERNATIONAL, INC.
RECEIVED
JUL 23 2002

FILE

FILE COPY

JUN 22 2002

Mr. Ronald A. Sato, AICP
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

Dear Mr. Sato:

Subject: Draft Environmental Assessment, USDA Pacific Basin Agricultural Research Center Project, Hilo, Hawaii, TMK: (3) 2-04-001: por. 122

Thank you for the opportunity to review the subject document.

The following are our comments:

1. The widening of Puainako Street to four lanes by 2010 is contingent upon availability of funds.

2. The proposed project is not anticipated to have a significant impact on the State highway system.

If you have any questions, please contact Ronald Tsuzuki, Head Planning Engineer, Highways Division, at 587-1830.

Very truly yours,

Brian K. Minaai

BRIAN K. MINAAI
Director of Transportation

SCANNED

SSFM INTERNATIONAL

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

SSFM 9973000

October 4, 2002

Mr. Brian K. Minaai, Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Minaai:

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated June 22, 2002 providing comments on the Draft Environmental Assessment for the subject project.

We acknowledge that the widening of Puainako Street to four lanes by 2010 is contingent upon the availability of funds. We further note your determination that the project is not anticipated to have significant impact on the State highway system.

If you have any questions on this matter, please contact me at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

UNIVERSITY OF HAWAI'I
ENVIRONMENTAL CENTER

A UNIT OF THE WATER RESOURCES RESEARCH CENTER

July 8, 2002

Dr. Paul Moore
U.S. Department of Agriculture
Pacific Basin Agriculture Research Center
P.O. Box 4459
Hilo, Hawai'i 96720

**USDA Pacific Basin Agricultural Research Center**
**Draft Environmental Assessment**

The U.S. Department of Agriculture (USDA), Agricultural Research Service's (ARS) Pacific Basin Agricultural Research Center (PBARC) is proposing development of a new research facility in the Hilo district of the Island of Hawai'i. This new research center will include state-of-the-art facilities allowing the PBARC to consolidate most of their existing research activities at this new site. In addition, the USDA, Forest Service, Pacific Southwest Research Station's Institute of Pacific Islands Forestry (IPIF) will also be developing a new facility for its existing research and technical assistance activities on the site. This project would be developed on a 30-acre parcel situated along Komohana Street west of the University of Hawai'i at Hilo. The PBARC complex would be developed on approximately 25 acres of this 30-acre property while the IPIF facility would be developed on the remaining approximately 5 acres. The need for these new facilities derives from several issues: 1) some existing research facilities have deteriorating building conditions; 2) many facilities lack sufficient space to accommodate existing and future staff demands; 3) permanent and consolidated facilities are needed to allow these agencies to better plan, fund, and staff projects and improve efficiency of operations; and 4) modernized facilities are needed to sustain current and future research efforts that support the State's growing diversified agriculture industry. The PBARC complex will include four main components which are: 1) Administration Complex, 2) Laboratory Facilities, 3) Insectary and Greenhouse Complex, and 4) Central Utilities Plant. The IPIF complex would include three primary components which are: 1) a main Office/Laboratory Building, 2) Field Support Building, and 3) Head House and Shade Houses.

This review was conducted with the assistance of Kenneth Y. Kaneshiro, Center for Conservation Research & Training; and Dave Sims, Environmental Center.

<u>**General Comments**</u>

USFS programs are very much involved with research and education concerning Hawai'i's native ecosystem, and personnel in this program are very sensitive about potential impact of their activities on the native environment. However, ARS programs are mostly concerned with agricultural issues, including control and eradication of fruit fly species and other insect pests.

On the basis of prior experience, our reviewers expressed concerns regarding the use and management of chemical pesticides that may have potential impacts on non-target species, particularly endemic native fauna. Also of concern here is the containment of experimentally altered material and alien, invasive plant species. Although there is mention of the Insectary facilities being designed in conformance of the Hawai'i State APHIS requirements, there is no detailed description of quarantine and containment methods for plant material at the new facility.

The potential for impacts on Waiakea Stream biota is of concern both during and after construction of the facilities. While only 4 endemic species are listed in Table 4.1 (page 76), the stream ecosystem could easily host many more native species if existing pollutants and alien species were reduced or eliminated. Our reviewers expressed surprise that some of the native aquatic diptera species were not identified during the biotic survey of the stream. This may mean either that such species were not collected during the survey work or that the stream already is so heavily affected that these fauna, which are usually quite common in native Hawaiian streams, have been extirpated. We also note the potential for highly organic wastewater reaching the stream ecosystem and continuing down into the fringing coastal marine ecosystem, further affecting the aquatic and marine biota.

Thus, the most critical issue would appear to be runoff or seepage of wastewater material, which may have further impact on the aquatic biota. We note that fruit fly mass-rearing programs utilize high concentrations of organic materials, and we suggest that the final EA include explicit discussion of measures proposed to prevent these organic wastes from entering both the stream as well as the marine ecosystem.

Thank you for the opportunity to comment on this draft EA.

Sincerely,

John T. Harrison, Ph.D.
Environmental Coordinator

cc: OEQC
Eric Leong, Dept. of Land & Natural Resources
Ronald Sato, SSFM International, Inc.
James Moncur
Dave Sims

SSFM INTERNATIONAL

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

Dr. John T. Harrison, Environmental Coordinator
Environmental Center
University of Hawaii
Krauss Annex 19
2500 Dole Street
Honolulu, Hawaii 96822

Dear Dr. Harrison:

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated July 8, 2002 providing comments on the Draft Environmental Assessment for the subject project. We have the following responses to your comments.

The PBARC scientific and administrative staffs have experience in program compliance with Federal and State regulations for working with biological and chemical materials whatever the source and type to avoid impacting native fauna. PBARC is especially alert to the problem of alien species in Hawaii and will thus avoid introduction of any biological species without a thorough justification and then only under the most secure conditions including proper oversight by regulatory agencies.

The PBARC project will be designed under the management of a comprehensive team that includes the USDA ARS for assuring construction compliance with all Federal and State rules and regulations along with the safety standards of OSHA, etc. Appropriate coordination will also be conducted with the State Department of Agricultural to address Insectary requirements as part of the facility's design. Details of these facilities would be developed as part of the project's design phase.

The project would be designed in compliance with County regulations and drainage requirements addressing runoff from the site. Thus, this project's design measures would mitigate effects from runoff pollutants and should not adversely affect other coastal aquatic and marine biota. As discussed in the project description, an industrial wastewater treatment system will be provided on the project site to treat wastewater from the insectary to meet disposal requirements and minimize impacts on stream and marine ecosystem. This section included a discussion of the planned treatment system and facilities which would be developed as part of the project's design phase.

If you have any further comments or questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

BENJAMIN J. CAYETANO
GOVERNOR

ANTHONY J.H. CHING
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

SSFM INTERNATIONAL, INC
RECEIVED
JUL 18 2002

July 16, 2002

FILE COPY

FILE

Mr. Ronald A. Sato
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

Dear Mr. Sato:

Subject: Draft Environmental Assessment (DEA) for USDA Pacific Basin Agricultural Research Center Project, Hilo, Hawaii
TMK No: 2-4-01: por. 122

We have reviewed the DEA for the subject project and confirm that the project site, as generally represented on the Project Vicinity Map, is designated within the boundary of the State Land Use Agricultural District.

We also confirm that the subject project is a permissible use within the Agricultural District inasmuch as it will provide new facilities to support the current agricultural and forestry research programs and activities being conducted by the Pacific Basin Agricultural Research Center and the Institute of Pacific Islands Forestry, respectively.

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

Mr. Ronald A. Sato
July 16, 2002
Page 2

Please feel free to contact Bert Saruwatari of my office at 587-3822, should you require clarification or any further assistance.

Sincerely,

Bert Saruwatari

for ANTHONY J. H. CHING
Executive Officer

c: Eric Leong, Department of Land and Natural Resources
Office of Environmental Quality Control

SSFM INTERNATIONAL

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

Mr. Anthony J. H. Ching, Executive Officer
Land Use Commission
Department of Business, Economic Development & Tourism
State of Hawaii
P.O. Box 2359
Honolulu, Hawaii 96804-2359

Dear Mr. Ching:

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated July 16, 2002 providing comments on the Draft Environmental Assessment for the subject project.

We note your confirmation that the project site is designated within the boundary of the State Land Use Agricultural District. Furthermore, that the project is a permissible use within this Agricultural District.

If you have any questions on this matter, please contact me at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

BENJAMIN J. CAYETANO
GOVERNOR

GENEVIEVE SALMONSON
DIRECTOR

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

SSFM INTERNATIONAL, INC.
RECEIVED
JUL 10 2002

FILE COPY

FILE

July 8, 2002

Dr. Paul Moore
U.S. Department of Agriculture
Pacific Basin Agricultural Research Centre
P.O. Box 4459
Hilo, Hawai'i 96720

Mr. Ronald Sato
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawai'i 96817

Mr. Eric Leong, Land Division
State of Hawai'i Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu, Hawai'i 96813

Dear Messrs. Moore, Sato, and Leong:

Having reviewed the draft environmental assessment (DEA) for the United States Department of Agriculture (USDA) Pacific Basin Agricultural Research Centre,, Tax Map Key 2-4-1, portion 122, on land owned by the State of Hawai'i in the district of South Hilo, the Office of Environmental Quality Control offers the following comments for your consideration.

1. **ENDANGERED SPECIES CONSULTATION:** While a survey for avian fauna on the project site did not disclose any rare or endangered species, the document does acknowledge the possible presence of the Hawaiian Hoary Bat (*Lasiurus cinereus semotus*). We are uncertain as to when the bat may be nesting and we respectfully recommend that you consult with Ms. Theresa Menard of the University of Hawai'i at Manoa, Department of Zoology as to possible mitigation measures to minimize takes of young bats during the clearing of the 'ohi'a forest.
2. **GUIDELINES FOR SUSTAINABLE BUILDING DESIGN IN HAWAI'I:** We ask that you consider implementing some of the techniques discussed in the guidelines for sustainable building design available at our website at http://www.state.hi.us/health/oeqc/index.html.
3. **USE OF RECYCLED GLASS:** To promote the use of recycled materials in-state as found in section 103D-407, Hawai'i Revised Statutes, we ask that you consider using materials with minimum recycled glass content in the design.
4. **INDIGENOUS AND POLYNESIAN INTRODUCED PLANTS FOR USE IN PUBLIC LANDSCAPING:** We note that the Air Force Station is essentially devoid of any native vegetation and uses turf grass, a non-native species. We ask that you consider the use of native, indigenous and polynesian introduced plants in your landscaping.

If you have any questions concerning this letter, please call Leslie Segundo, Environmental Health Specialist, at (808) 586-4185; alternatively, you may send electronic mail to him at lsegund@mail.health.state.hi.us. Thank you for the opportunity to comment.

Sincerely,

GENEVIEVE SALMONSON
Director

SCANNED

SSFM INTERNATIONAL

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
State of Hawaii
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson:

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated July 8, 2002 providing comments on the Draft Environmental Assessment for the subject project. We have the following responses to your comments which are numbered to correspond to your comments.

1. Endangered Species Consultation. We appreciate your comments on seeking input from the University of Hawaii on possible mitigative measures associated with the Hawaiian Hoary Bat. However, consultation with the U.S. Fish and Wildlife Service has already been conducted to address necessary mitigative measures. Based upon this consultation, site clearing and tree clearing for the project would occur outside the months of June and July to minimize the risk of possible harm to breeding bats and their young which could be present at the project site. If deemed appropriate, additional consultation would be conducted with the University of Hawaii as suggested.
2. Guidelines for Sustainable Building Design. The guidelines for sustainable building design referred to in your letter will be considered by the design team as part of their work as appropriate. However, both Federal along with State design requirements associated with this research facility would need to be first complied with.
3. Use of Recycled Glass. Consideration would be given to the use of materials with minimum recycled glass content, as appropriate, in the design of this facility.
4. Indigenous and Polynesian Introduced Plants. The use of native, indigenous, and Polynesian introduced plants would be considered as part of the landscaping plans developed for this facility.

If you have any questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

PHONE (808) 594-1888

FAX (808) 594-1865

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

SSFM INTERNATIONAL, INC.
RECEIVED
JUN 18 2002

FILE COPY

HRD#02-341B

June 13, 2002

Mr. Ronald A. Sato
SSFM International, Inc.
501 Sumner Street – Suite 502
Honolulu, HI 96817

SUBJECT: DEA – USDA PACIFIC BASIN AGRICULTURAL RESEARCH CENTER PROJECT - HILO

Dear Mr. Sato:

Thank you for the opportunity to review the above referenced project that will construct a new research center to consolidate a number of USDA projects and facilities.

The Office of Hawaiian Affairs (OHA) agrees with the mitigation measure proposed. OHA relies on the assurance that the project will work closely with the State Historic Preservation Division, and that the proper mitigation and consultation will occur should any unidentified archaeological, cultural, historic or burial sites or items be encountered during any of the project development.

If you have any questions, please contact Jerry B. Norris at 594-1847 or email him at jerryn@oha.org.

Sincerely,

Valna S. Keala
Acting Director, Hawaiian Rights Division

cc: OHA Board of Trustees
Clyde W. Namu'o, OHA Administrator
Ululani Sherlock, Hilo CRC

SCANNED

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

Ms. Jalna S. Keala, Acting Director
Hawaiian Rights Division
Office of Hawaiian Affairs
State of Hawaii
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

Dear Ms. Keala:

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated June 13, 2002 providing comments on the Draft Environmental Assessment for the subject project.

We note your department's concurrence with the mitigative measures proposed concerning historic sites. The applicant will continue to work closely with the State Historic Preservation Division on this project, and proper mitigation and consultation would be conducted should any unidentified historic or cultural sites be encountered during the project's development.

If you have any questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

Harry Kim
*Mayor*

Patricia G. Engelhard
*Director*

Pamela N. Mizuno
*Deputy Director*

**County of Hawai'i**
**DEPARTMENT OF PARKS AND RECREATION**
101 Pauahi Street, Suite 6 • Hilo, Hawai'i 96720
(808) 961-8311 • Fax (808) 961-8411



July 17, 2002

SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, HI 96817

Attn: Ronald Sato, AICP

Re: USDA Pacific Basin Agricultural Research Center
South Hilo, Hawaii
TMK: 2-4-01:por 122

Dear Mr. Sato:

We have reviewed the project's draft environmental assessment and have no adverse comments to offer.

Thank you for the opportunity to review the document.

Sincerely,

Pat Engelhard

Patricia Engelhard
Director

cc DLNR
OEQC

SSFM INTERNATIONAL

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

Ms. Patricia G. Engelhard, Director
Department of Parks and Recreation
County of Hawaii
101 Pauahi Street, Suite 6
Hilo, Hawaii 96720

Dear Ms. Engelhard:

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated July 17, 2002 providing comments on the Draft Environmental Assessment for the subject project.

We note that your department has no comments to offer on the project at this time.

If you have any questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

Harry Kim
*Mayor*

Dennis K. W. Lee
*Director*

Ronald Ueoka
*Deputy Director*

# County of Hawaii
## DEPARTMENT OF PUBLIC WORKS

Aupuni Center
101 Pauahi Street, Suite 7 · Hilo, Hawaii 96720-3043
(808) 961-8321 · Fax (808) 961-8630

SSFM INTERNATIONAL, INC
RECEIVED
JUL 25 2002

FILE COPY

FILE

July 22, 2002

Mr. Ronald A Sato, AICP
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

SUBJECT: **DRAFT ENVIRONMENTAL ASSESSMENT**
USDA Pacific Basin Agricultural Research Center Project
Location: Off Komohana Street, Waiakea, S. Hilo, Hawaii
TMK: 2-4-01: Portion of 122

We have reviewed the subject DEA forwarded by your letter dated June 7, 2002 and have the following comments.

1. All building construction shall comply with current code requirements.

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

   The applicant shall be informed that if they include dry wells in the subject development, an Underground Injection Control (UIC) permit may be required from the Department of Health, State of Hawaii.

3. A drainage study shall be prepared, and the recommended drainage system shall be constructed meeting with the approval of the Department of Public Works.

4. Based on our determination, a small portion of the northwest corner of the subject parcel is within Flood Zone A as designated on the Flood Insurance Rate Map (FIRM) by the Federal Emergency Management Agency (FEMA). Refer to the enclosed sketch. Flood Zone A is the Special Flood Hazard Area inundated by the 100-year flood where no base flood elevations are determined. The remainder of the parcel is within Zone X.

5. All earthwork activity shall conform to Chapter 10, Erosion & Sedimentation Control, of the Hawaii County Code.

6. The temporary access to the subject project from an existing driveway on Komohana Street (now servicing a water reservoir and electrical substation) shall meet the requirements of the Department of Public Works. The Nowelo Street extension and intersection signalization shall be constructed prior to the approval of the Certificate of Occupancy for the first building within the subject development.

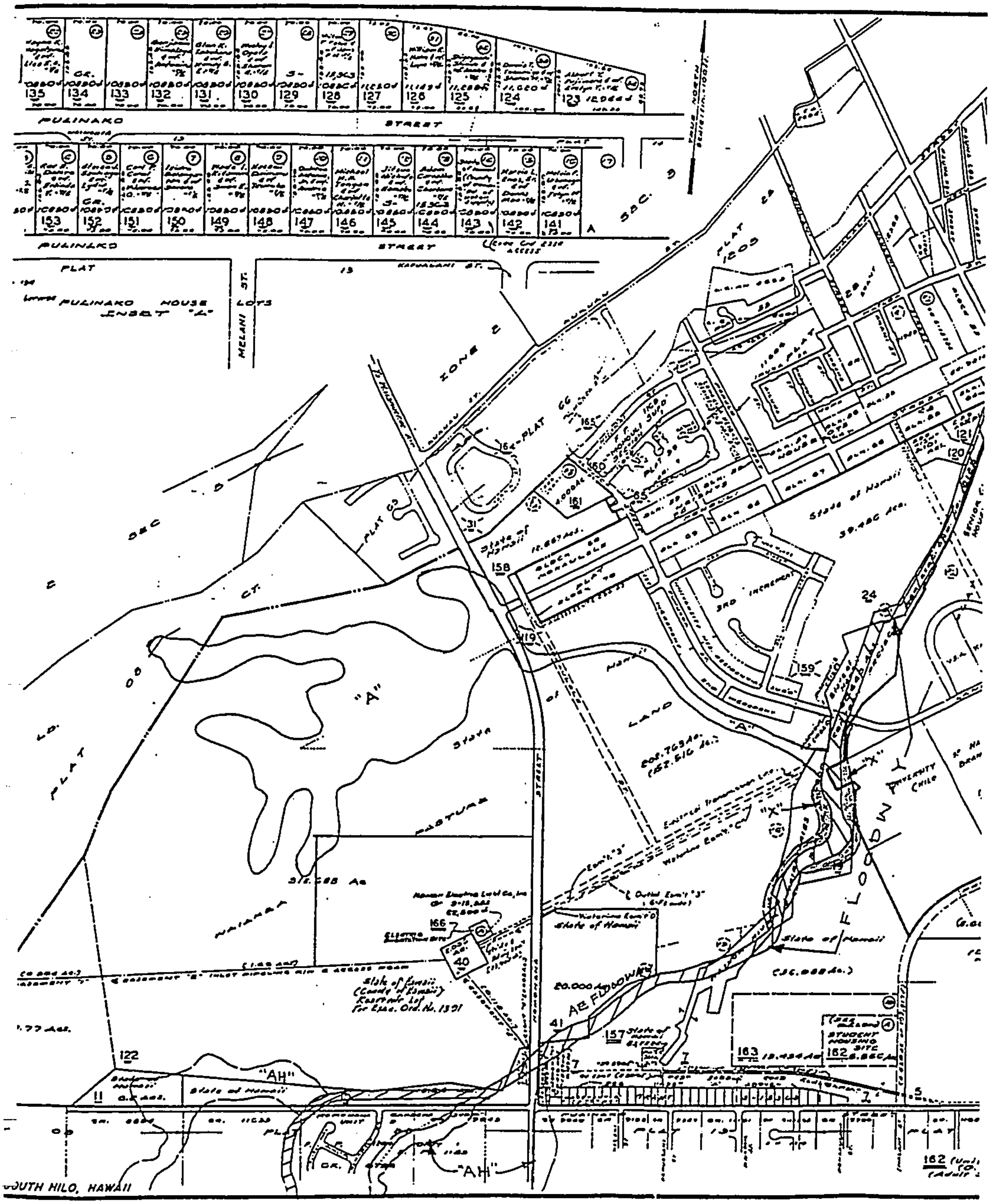
7. Streetlights and any other traffic control devices shall be installed as required by the Traffic Division, Department of Public Works.

Questions may be referred to Mr. Kelly Gomes of our Engineering Division at 961-8327.

BEN ISHII, Acting Division Chief
Engineering Division

KG

Enclosure



135
134
133
132
131
130
129
128
127
126
125
124
123
PULINAKO
STREET
TRUE NORTH
153
152
151
150
149
148
147
146
145
144
143
142
141
PULINAKO
STREET
PLAT
13
KAPUALANI ST.
PULINAKO HOUSE LOTS
INSET "A"
MELANI ST.
ZONE 2
PLAT 25
PLAT 1205
PLAT 66
165
164
150
161
131
158
119
State of Hawaii
"A"
24
159
"X"
FLOODWAY
315.588 Ac.
166
40
41
157
163
162
STUDENT HOUSING SITE
122
"AH"
State of Hawaii
5
162
SOUTH HILO, HAWAII

SSFM INTERNATIONAL

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

Mr. Ben Ishii, Acting Division Chief
Engineering Division
Department of Public Works
County of Hawaii
25 Aupuni Street, Room 202
Hilo, Hawaii 96720-4252

Dear Mr. Ishii:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated July 22, 2002 providing comments on the Draft Environmental Assessment for the subject project. We have the following responses which are numbered to correspond to your comments.

1. Construction of facility buildings will be in conformance with current code requirements.
2. The project is planned to be designed to accommodate within the site additional runoff generated from the development through a series of injection wells. An Underground Injection Control permit would be obtained from the State Department of Health as necessary for drainage improvements.
3. A drainage study will be prepared for this project and provided to your department for review and approval.
4. We have consulted with your staff regarding this mapping of the floodway in relation to the project site, and obtained a copy of your department's flood map. Using your department's map, we graphically placed the project's boundary map over it to determine the location of the floodway. Based upon this, it still appears that the 30-acre project site is not located within the Zone A, Special Flood Hazard Area. A copy of this map is enclosed for your information. Nevertheless, appropriate coordination with your department will be conducted by the design team to address any flood or drainage improvements and requirements associated with the project.
5. Earthwork and grading will conform to provisions of Chapter 10 of the Hawaii County Code.
6. Appropriate coordination with your department will be conducted by the design team if the existing driveway on Komohana Street, which is now serving the water reservoir and electrical substation, is implemented to serve as a temporary access to the site. However, we understand that the University of Hawaii at Hilo is moving ahead with plans to improve the existing Nowelo Street intersection at this time. As a result, the project would utilize

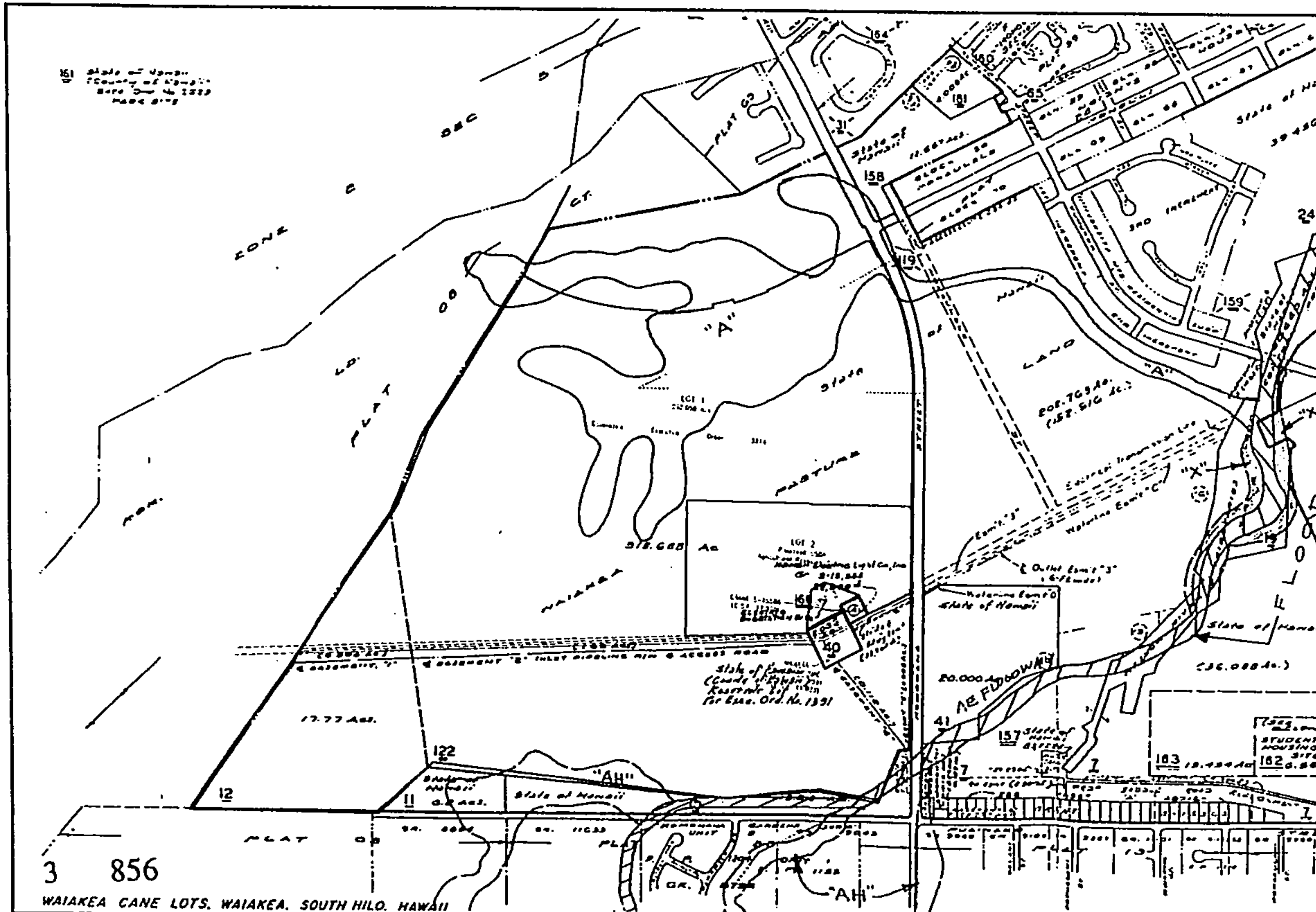
this improved Nowelo Street intersection and extension if implemented. Such plans are intended to alleviate potential concerns with using the driveway as a temporary access. The University will be coordinating such intersection improvements with your department.

7. Necessary coordination would be conducted between your department and the University of Hawaii at Hilo to determine requirements for streetlights and other traffic control devices along Komohana Street and Nowelo Street.

If you have any further comments or questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner




**FLOOD INSURANCE RATE MAP**

**Figure 4.4**

USDA Pacific Basin Agricultural Research Center
USDA ARS & Forest Service

Source:
County Dept. of Public Works (Flood Base)
ControlPoint Surveying, Inc. (Boundary Map)

WASTEWATER DIVISION

*DEPARTMENT OF ENVIRONMENTAL MANAGEMENT*
108 Railroad Avenue - Hilo, Hawaii 96720
(808) 961-8338 – Fax (808) 961-8644

SSFM INTERNATIONAL, INC
RECEIVED
JUL 03 2002
RAS

FILE

July 1, 2002

RONALD A SATO
SSFM INTERNATIONAL, INC.
501 SUMNER STREET
HONOLULU, HAWAI'I 96817

FILE COPY

SUBJECT: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment

The Wastewater Division has reviewed the subject environmental asessment and has the following comments:

1. Table of Contents
   - Incorrect page numbers.
2. Section 6.2.1
   - Should read Department of Environmental Management
   - Hilo WTP located near airport, not industrial area fronting Puhi Bay
3. Section 6.2.2
   - Second paragraph. I don't agree with statement that projected flows for University Park would be less since several observatories have been built after the estimates. Projected flows are required to be calculated based on C&C of Honolulu Design Standards.
   - Third paragraph. Change "developed" to "development". Also, I do not recall reviewing Terry & SSFM 2001 study which indicated the existing sewerage system was adequate. Please provide me a copy of this report.
   - Subsection Title. Should read "Project Effects on <u>Wastewater</u> Facilities".
   - Fifth paragraph. Design of industrial wastewater system did not take into consideration the domestic flows and would need to be adjusted accordingly.
4. Page 140
   - Third paragraph. Am skeptical of storage tank to hold wastewater for release during off-peak periods. Tank would need to be aerated to prevent sedimentation and anaerobic conditions. As such it would be similar to conventional unit process. Also would want description of control mechanism for off-peak discharge.
   - Forth paragraph. Projected wastewater flows should be calculated using the C&C of Honolulu Design Standards.

Thank you for the opportunity to comment on this environmental assessment. Should you have any comments or questions, please contact me at 961-8338.

Peter Boucher
Division Chief

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

Mr. Peter Boucher, P.E.
Wastewater Division Chief
Department of Environmental Management
County of Hawaii
25 Aupuni Street, Room 202
Hilo, Hawaii 96720-4252

Dear Mr. Boucher:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated July 1, 2002 providing comments on the Draft Environmental Assessment for the subject project. We have the following responses which are numbered to correspond to your comments.

1. The table of contents page numbers will be corrected.
2. The department's name will be corrected, and the Hilo WTP location description will be revised appropriately.
3. The information on projected flows for the University Park was based upon the EIS prepared for that project by another firm. Projected flows for this project will be based upon the City and County of Honolulu design standards.
   The word "develop" will be appropriately revised. A copy of pertinent sections from the EIS document for the China-U.S. Center was provided to your department.
   The subsection title will be revised as indicated.
   Regarding the industrial wastewater system, this system was not intended to include domestic flows. Its main purpose was to treat industrial wastewater such as fruitflies. However, the treatment of wastewater associated with the project would be appropriately coordinated with your division during the design phase.
4. The concept of using a storage tank to hold wastewater for release during off-peak periods is being developed by the design team. Thus, appropriate coordination would be conducted with your division during the project's design phase to properly address tank requirements and other design issues associated with this system. Projected flows for this project will be based upon the City and County of Honolulu design standards.

If you have any questions on this matter, please contact me at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

Harry Kim
*Mayor*

Darryl J. Oliveira
*Fire Chief*

Desmond K. Wery
*Deputy Fire Chief*

County of Hawai'i
**FIRE DEPARTMENT**
25 Aupuni Street • Suite 103 • Hilo, Hawai'i 96720
(808) 961-8297 • Fax (808) 961-8296

SSFM INTERNATIONAL, INC.
RECEIVED
JUN 2 1 2002
JYAS

FILE

FILE COPY

June 19, 2002

Mr. Ronald A. Sato, AICP
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, HI 96817

Dear Mr. Sato:

RE: DRAFT ENVIRONMENTAL ASSESSMENT
USDA PACIFIC BASIN AGRICULTURAL RESEARCH CENTER PROJECT
SOUTH HILO DISTRICT, HAWAII
TAX MAP KEY: (3) 2-04-001: PORTION OF 122

This responds to your request for comments on the above-referenced Draft Environmental Assessment.

We have no comments to offer at this time regarding the Draft EA.

Thank you for the opportunity to comment.

Sincerely,

DARRYL J. OLIVEIRA
Fire Chief

RK:lk

cc: Department of Land and Natural Resources
Office of Environmental Quality and Control

SCANNED

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

Mr. Darryl J. Oliveira, Fire Chief
Fire Department
County of Hawaii
25 Aupuni Street, Suite 103
Hilo, Hawaii 96720

Dear Mr. Oliveira:

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated June 19, 2002 providing comments on the Draft Environmental Assessment for the subject project.

We note that your department has no comments to offer on the project at this time.

If you have any further comments or questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

Harry Kim
*Mayor*

James S. Correa
*Police Chief*

**County of Hawaii**
**POLICE DEPARTMENT**
349 Kapiolani Street • Hilo, Hawaii 96720-3998
(808) 935-3311 • Fax (808) 961-8869

SSFM INTERNATIONAL, INC
RECEIVED
JUL 0 2 2002

FILE COPY

FILE

June 27, 2002

Mr. Ronald A. Sato, AICP
Senior Project Planner
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

Dear Mr. Sato:

RE: USDA PACIFIC BASIN AGRIGULTURAL RESEARCH CENTER PROJECT
DRAFT ENVIRONMENTAL ASSESSMENT

Staff is satisfied with the proposed usage of Nowelo Street as the roadway providing direct access to this project and the eventual change from a three-way intersection to a four-way signalized intersection.

Should construction of this project mandate the partial/temporary closure of Komohana Street, appropriate County agencies inclusive of the police shall be notified to mitigate safety concerns.

Sincerely,

JAMES S. CORREA
POLICE CHIEF

RN:vta

cc: Department of Land and Natural Resources
Office of Environmental Quality and Control

SCANNED

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348
Toll-free Fax: (866) 887-8885

Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

October 4, 2002

SSFM 9973000

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

Dear Mr. Correa:

Subject: USDA Pacific Basin Agricultural Research Center Project
Draft Environmental Assessment Comments

Thank you for your letter dated June 27, 2002 providing comments on the Draft Environmental Assessment for the subject project.

We note your satisfaction with the proposed usage of Nowelo Street as the ultimate roadway providing vehicular access to the project site, and eventual change to a four-way signalized intersection.

If construction activities for the project require the partial temporary closure of a lane along Komohana Street, your department along with other appropriate County agencies will be notified.

If you have any further comments or questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

# APPENDIX C

*An Environmental Reconnaissance Survey, of Waiakea Stream for the USDA Pacific Basin Agricultural Research Center on the Island of Hawaii*

Prepared By:
AECOS, Inc. (May 2002)

# An Environmental Reconnaissance Survey of Waiakea Stream for the USDA Pacific Basin Agricultural Research Center on the Island of Hawai`i

Prepared For:

SSFM
501 Summer Street, Suite 502
Honolulu, Hawaii 96817

Prepared By:

*AECOS*, Inc.
45-939 Kamehameha Highway, No. 104
Kane`ohe, Hawai`i 96744

May 1, 2002

# An Environmental Reconnaissance Survey of Waiakea Stream for the USDA Pacific Basin Agricultural Research Center on the Island of Hawai`i[1]

*May 1, 2002*



Susan Burr and Eric Guinther
*AECOS*, Inc. 45-939 Kamehameha Highway No.104,
Kaneohe, Hawaii 96744
Phone: (808) 234-7770 Fax: (808) 234-7775 Email: aecos@aecos.com

## Introduction

This report presents results of a biological survey conducted by *AECOS* biologists along Waiakea Stream in the South Hilo District of the Island of Hawai`i. The survey was conducted to assess water resources and identify potential sources of water quality and aquatic habitat degradation related to the proposed USDA Pacific Basin Agricultural Research Center (PBARC).

The proposed project is a research facility on a 12-hectare (30-acre) site near Waiakea Stream in the South Hilo District of the Island of Hawai`i (Figure 1). The project site is southwest of downtown Hilo, close to the University of Hawaii Hilo (UHH) campus. Originally, the facility was planned for a part of the property above Komohana Street that abutted on Waiakea Stream, but has since been moved further upslope, away from the stream and now lies over 365 m (1200 ft) upslope of the stream bed. A 1.4-acre buffer area will be created between the stream and the water reservoir and power substation to preserve an archaeological site. This buffer will be a preserve area under UHH jurisdiction.

The site is mostly undeveloped land leased from the State Department of Land and Natural Resources (DLNR) to the USDA Agricultural Research Service and is located at the southwest corner of existing Komohana Street and future Nowelo Street extension (TMK: (3) 2-4-01: 12 & 122, Lot 2). The PBARC research facility will include a 76,000 square feet (GSF) building for entry/arboretum/administration and laboratory, 13,225

[1] Report prepared for SSFM Inc. in support of the Environmental Assessment entitled "USDA Pacific Basin Agricultural Research Project." This document will become part of the public record.

GSF greenhouse, and 24,000 GSF insectary. Approximately five acres will be provided for a USDA Forest Service, Pacific Southwest Research Station, Institute of Pacific Island Forestry (IPIF) facility. The IPIF facility will include a 32,200 GSF office, laboratory, shade houses, and accessory facilities.

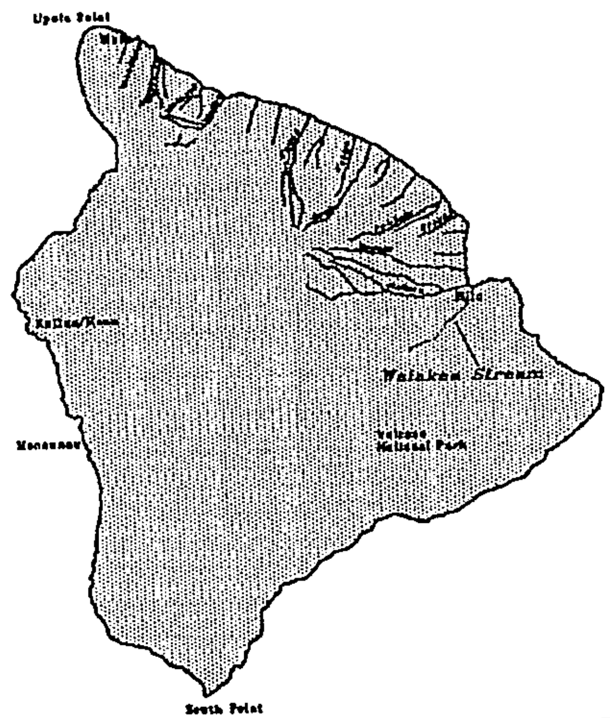



Figure 1. Island of Hawaii showing distribution of perennial streams and the location of Waiakea Stream.

The PBARC and IPIF complexes are estimated to have a 52,000 gallons per day (gpd) average daily water demand, which is likely to be met by the planned improvements to the County Department of Water Supply (DWS) Hilo System. The Hilo System consumes water from five surface sources and five deep well sources (SSFM, 2002).





An on-site wastewater treatment system will treat wastewater from the proposed PBARC insectary where fruitfly research will be conducted. The treatment system will provide treated recycled water for irrigation of demonstration gardens, ornamental plants, field plots, and landscaped areas. On-site sewer system improvements are also planned, which will connect the PBARC and IPIF facilities to an existing municipal sewer line (SSFM, 2002).

Approximately 13 injection wells will be created on the project site to retain site-generated runoff. These dry wells will meet the county's policy of no increase in pre-development quantities of surface runoff (SSFM, 2002).

## Survey Methods

Biology — A survey of Waiakea Stream was conducted on November 23, 2001, limited to the stream reach between the upper part of the UH Hilo campus and the Komomala Gardens Subdivision.

Water Quality — Water quality measurements were made in three locations (described elsewhere in the report). Selected parameters were measured to characterize the aquatic environments present. All measurements represent conditions at a single point in time and may not be representative of average conditions. The methods pertaining to the water quality analyses are given in Table 1. All water samples were taken to *AECOS* laboratory (assigned Log No. 15060) in Kane'ohe, O'ahu and either preserved or analyzed immediately as required by standard methodology for each analysis. Temperature and dissolved oxygen were measured with probes *in situ*.

## Stream Description

Waiakea Stream is one of several streams that flow into Waiakea Pond and the Wailoa River, which discharges into the south part of Hilo Bay (Figure 2). This stream system is one of only a few that drains the Mauna Loa side of the boundary between ancient lava flows originating from Mauna Kea and those originating from Mauna Loa. Streams are sparse on the Mauna Loa lavas despite an annual rainfall averaging over 100 inches in the Hilo area and nearly 200 inches at Mountain View further upslope (Telliaferro, 1959). The absence of perennial streams is characteristic of volcanic islands where the surface material is composed of recently (in a geological sense) laid down lavas[1]. In contrast, the much older Mauna Kea slopes are deeply dissected by streams. The Hamakua Coast, which extends northwest from Hilo along the north flank of Mauna

[1] The project site is dominated by 'ohi'a (*Metrosideros polymoroha*) trees and uluhe (*Dicranopteris linearis*) fern, an assemblage that "represents a fairly early stage in plant succession on wet lava flows...[t]his vegetation type is fairly common on the geologically young lava flows in the Puna and Hilo region" (Char, 2001, p. 5).

Kea, supports many streams, including the extensive Wailuku River system on the cleft between Mauna Kea and Mauna Loa. The latter discharges into the southwest corner of Hilo Bay.

Table 1. Analytical methods and instruments used for the November 23, 2001 sampling in Waiakea Stream above Hilo, Hawai`i.

| Analyses List | Method | Reference | Instrument |
|---|---|---|---|
| Ammonia | alkaline phenol | Koroleff in Grasshoff et al. (1986) | Technicon AutoAnalyzer II |
| Dissolved Oxygen | EPA 360.1 | EPA (1979) | YSI Model 550 DO meter |
| Nitrate + Nitrite | EPA 353.2 | EPA (1993) | Technicon AutoAnalyzer II |
| Temperature | thermister calibrated to NBS cert. Thermometer (EPA 170.1) | EPA (1979) | YSI Model 550 DO meter |
| Total Nitrogen | persulfate digestion /EPA 353.2 | D'Elia et al. (1977) / EPA (1993) | Technicon AutoAnalyzer II |
| Total Phosphorus | persulfate digestion /EPA 365.1 | Koroleff in Grasshoff et al. (1956) / EPA (1993) | Technicon AutoAnalyzer II |
| Total Suspended Solids (TSS) | Method 2540D (EPA 160.2) | Standard Methods 18th Edition (1992); EPA (1979) | Mettler H31 balance |
| Turbidity | Method 2130B (EPA 180.1) | Standard Methods 18th Edition (1992); EPA (1993) | Hach 2100P Turbidimeter |

D'Elia, C.F., P.A. Stendler, & N. Corwin. 1977. *Limnol. Oceanogr.* 22(4): 760-764.
EPA. 1979. Methods for Chemical Analysis of Water and Wastes. U.S. Environmental Protection Agency, EPA 600/4-79-020.
EPA. 1993. Methods for the Determination of Inorganic Substances in Environmental Samples. EPA 600/R-93/100.
EPA. 1994. Methods for Determination of Metals in Environmental Samples, Supplement I. EPA/600/R-94/111. May 1994.
Grasshoff, K., M. Ehrhardt, & K. Kremling (eds). 1986. Methods of Seawater Analysis (2nd ed). Verlag Chemie, GmbH, Weinheim.
Standard Methods. 1992. Standard Methods for the Examination of Water and Wastewater. 18th Edition. 1992. (Greenberg, Clesceri, and Eaton, eds.). APHA, AWWA, & WEF. 1100 p.

Waiakea Stream is essentially a drainage channel from upstream of the project area, through the UH Hilo campus, and all the way to Waiakea Pond, modified to move freshet flows quickly through Hilo onto the lowlands at Wailoa River State Park. Along most of this stream course, portions of the channel have been modified with levees and revetments (reinforced channel margins), but the stream bed remains in a fairly natural state, or at least comprised of a natural, bedrock material. A few sections of concrete-lined channel are associated with roadway crossings.





Waiakea Stream has several branches, some fed by springs at higher elevations above Hilo, and segments of these may be perennial over short distances. However, between

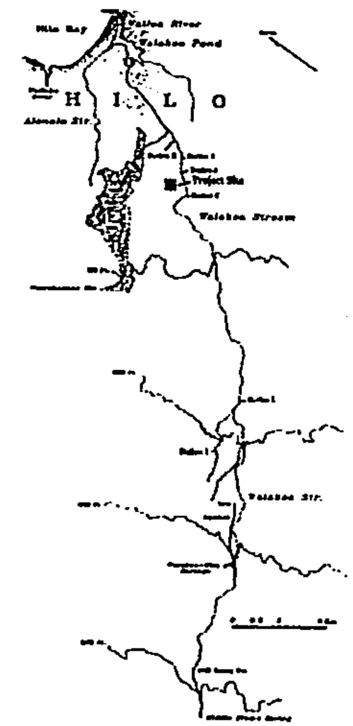



Figure 2. Map of Waiakea Stream and its tributaries. Water quality sampling locations discussed in the text are indicated.

about the 300 m (1000-ft) elevation down to the UH Hilo campus at around 30 m (100 ft) above sea level, Waiakea Stream is intermittent flowing. During the field survey conducted on November 23, 2001, the stream reach of Waiakea Stream near the project site could be defined as interrupted. This reach includes a few short flowing sections, some completely dry segments, isolated pools, and some seeps. Pools of water are retained in areas where the bed is dense basalt. These pools are fed by both the considerable rainfall received in the Hilo area and, in some cases, seeps - producing short segments of interconnected pools that may approach permanency.

## Review of Previous Stream Surveys

Waiakea Stream and Alenaio Stream are branches of the Wailoa River (State ID No. 8-2-61). Timbol and Maciolek (1978) represent the stream system as perennial down to about the 400 m (1300 ft) elevation. These authors estimated that 12% of the stream channel was altered by culverts and reveted banks as of the late 1970s. This percentage is probably greater today because the stream skirts and traverses a number of recent housing developments in Waiakea Homesteads. Timbol and Maciolek classify Wailoa River as interrupted, of low to moderate value (exploitive consumptive), with two upstream diversions, and crossed 22 times by roadways. 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.

A survey of stream macrofauna by Timbol and Maciolek (1978) on Alenaio Stream within Hilo yielded introduced guppy (*Poecilia reticulata*) as abundant, and ʻoʻopu naniha (*Awaos genivittatus*), ʻoʻopu okuhe (*Eleotris sandwicensis*), aholehole (*Kuhlia sandvicensis*), mosquitofish (*Gambusia affinis*), and southern platyfish (*Xiphophorus maculatus*) as common. The ʻopae oehaʻa (*Macrobrachium grandimanus*), a native crustacean, was listed as abundant.

The Wailoa River in Hilo is listed in the Hawaii Stream Assessment document as a perennial stream with some tributaries separately listed in the stream database: Alenaio as 8-2-61.01.1; and Kaluiiki, Waiakea, and Waipahoehoe as 8-2-61.01 (Hawaii Cooperative Park Service Unit, 1990). The stream is listed under "special areas" as including a natural area reserve or sanctuary, special marine or estuarine reach, and waterfall. The later is probably Naʻalapa Falls. The "special" estuary may refer to the Wailoa River at the head of Hilo Harbor, which includes the Waiakea Public Fishing Area on the western border of Wailoa River State Park. The "aquatic resources" rank is "substantial," listing ʻoʻopu nakea (*Awaous stamineus*) present.

*AECOS*, Inc. has conducted two previous surveys along Waiakea Stream in the vicinity of the project. On October 30, 1993, *AECOS* biologists undertook a field reconnaissance of lower Waiakea Stream (*AECOS*, 1994). The survey was for the purpose of assessing the effect of a proposed sewerage pipe crossing at the UH Hilo campus. This survey began in the stream bed just above the West Lanikaula Street bridge at the campus and extended upstream to the area beside the baseball field (upper part of campus). A second reconnaissance survey of Waiakea Stream was conducted on August 7, 1996 with an emphasis on the area around the proposed bridge crossing for the University Park across the stream from the existing campus (*AECOS*, 1997).





Despite the intermittent and interrupted nature of the lower reaches of Waiakea Stream, the number and variety of aquatic inhabitants observed within the isolated pool systems was higher than anticipated (*AECOS*, 1994). The wet environment of the Hilo area confers a longevity on these pools that allows the inhabitants to survive all but the more severe drought periods, and disperse up and down the stream during relatively frequent freshets associated with local rain events (*AECOS*, 1994). In the 1993 survey, numerous juvenile ʻoʻopu nakea (*Awaous guamensis*) were observed (*AECOS*, 1994). However, despite a concerted effort to locate native fauna, none was seen in the 1996 survey (*AECOS*, 1997).

Both of the previous *AECOS* surveys focused mainly on the stream segment below the FBARC project site, although reconnaissance surveys of selected segments of Waiakea Stream above the UH Hilo campus were undertaken to provide a general description of the upstream aquatic environments. Observations were limited to accessible areas. Stream flow was observed off Hoaka Road within Waiakea Homesteads. At the end of Hoaka Road, where private property (posted) begins, considerable flow was present, but the stream could not be observed up close. This area is actually a separate, relatively short, branch of Waiakea Stream that must arise from springs around the 400 m (1300 ft) elevation. The flow was observed to disappear before the bridge under Hoaka Road at the 265 m (870 ft) elevation where only standing water was seen. The stream was explored along a short reach at the 230 m (750 ft) elevation, where a modified channel and culvert cross under a side road off Hoaka Road. Here, as in the project area, small pools are present on dense basalt. Swordtail (*Xiphophorus helleri*), guppy (*Poecilia reticulata*), and crayfish (*Procambarus clarki*) inhabited these pools. The August 1996 survey provided the following additional descriptions of these upstream locations:

> 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.

The stream was also accessed along Olaa Flume Road off Stainback Highway in October 1993. Flow in the vicinity of the USGS gage was considerable. Only *Anax* naiads and tadpoles of *Rana* cf. *catesbeiana* were observed in the water, although impending darkness limited the time spent in the area. The stream gage operated by USGS (No. 16700000) on Waiakea Stream is above all diversions (off Olaa Flume Road). Average flow is listed as 11.8 cfs (USGS, 1998).

Aquatic species observed during all of these several surveys are included in Table 2 and water quality characteristics from water sampling in 1996 and 2001 are included as Table 3.

## Survey Results

In the vicinity of the PBARC project, the stream bed consists of exposed basalt bedrock with scattered pools in depressions in the rock. Above Komohana Street, much of the stream bank is revetted and there are only a small number of small pools. Larger pools are found more frequently well upstream from the project site and one very large pool extends to a fence line that traverses the stream (the upper limit of this survey). There are a few more pools downstream from the Komohana Street bridge, with some originating as seeps from the stream banks and bed. Below Komohana Street, the left bank of the stream is flanked by elephant grass (*Pennisetum purpureum*) and the right bank harbors a dense growth of strawberry guava (*Psidium cattleianum*). The stream bed is fairly wide and does not receive much shade.

A list of aquatic species for Waiakea Stream is presented in Table 2. Freshwater fauna are most abundant in the deeper pools located well upstream of and well downstream of the project site. Introduced guppies (*Poecilia reticulata*) were found in most pools, as were introduced frog and toad tadpoles (*Rana catesbeiana* and *Bufo marinus*). The introduced swordtail (*Xiphophorus helleri*) was abundant in some pools and several indigenous ʻoʻopu nakea (*Awaous guamensis*) and endemic ʻoʻopu ʻakupa (*Eleotris sandwicensis*) were found in the large pool downstream from the project site (above the baseball fields near UH Hilo campus). Several dragonflies (*Pantala flavescens*, *Anax junius*, *Crocothemis servilia* and *Orthemis ferruginea*) and a damselfly (*Megalagrion hawaiiense*) were observed near the margins of the isolated pools just below Komohana Street, below the project site. The only aquatic crustacean observed was one live individual and several molted exoskeletons of the American crayfish (*Procambarus clarki*).





TABLE 2. Checklist of aquatic biota observed or reported from Waiakea Stream.

| Species | Common name | Status | ID QA | Abundance |
|---|---|---|---|---|
| | **ALGAE** | | | |
| MIXOPHYCEAE (CYANOPHYCEAE) | | | | |
| *?Oscillatoria* sp. | algal turf | | 01^ | Abundant |
| CHLOROPHYCEAE | | | | |
| *Spirogyra* sp. | green filamentous alga | | 01^ | Occasional |
| | **INVERTEBRATES** | | | |
| ARTHROPODA, INSECTA | | | | |
| ODONATA - AESHNIDAE | | | | |
| *Anax junius* (Drury) | green darner (adult) | Ind. | 10 | Common |
| ODONATA - LIBELLULIDAE | | | | |
| *Crocothemis servilia* Drury | scarlet skimmer (adult) | Nat. | 10 | Uncommon |
| *Orthemis ferruginea* (Fabricius) | | Nat. | 10 | Uncommon |
| *Pantala flavescens* (Fabricius) | globe skimmer (adult) | Ind. | 10 | Common |
| " " | " " (naiad) | Ind. | 01^ | Common |
| ODONATA - COENAGRIOIDAE | | | | |
| *Ischnura ramburi* (Selys-Longchamps) | Rambur's forktail (adult) | Nat. | 10 | Uncommon |
| ARTHROPODA, CRUSTACEA | | | | |
| DECAPODA - PALAEMONIDAE | | | | |
| *Macrobrachium grandimanus* | ʻopae oʻehaʻa | End. | 01* | Abundant |
| DECAPODA - CAMBARIDAE | | | | |
| *Procambarus clarki* (Girard) | Amer. swamp crayfish | Nat. | 10 | Occasional |
| MOLLUSCA | | | | |
| PULMONATA - LYMNAEIDAE | | | | |
| indeterminate | pond snail (sinistral) | | 01^ | Not reported |
| | **VERTEBRATES** | | | |
| FISHES - ELEOTRIDAE | | | | |
| *Eleotris sandwicensis* (Vaillant & Savage) | ʻoʻopu ʻakupa | End. | 10 | Uncommon |
| FISHES - GOBIIDAE | | | | |
| *Awaous guamensis* (Valenciennes) | ʻoʻopu nakea | Ind. | 10 | Occasional |
| *Stenogobius genivittatus* (Cuv. & Val.) | ʻoʻopu naniha | End. | 01* | Not reported |
| FISHES - KUHLIIDAE | | | | |
| *Kuhlia sandvicensis* (Steindachner) | aholehole | End. | 01* | Not reported |
| FISHES - POECILIIDAE | | | | |
| *Gambusia affins* (Baird & Girard) | mosquitofish | Nat. | 01* | Not reported |
| *Poecilia reticulata* (Peters) | guppy | Nat. | 10 | Abundant |
| *Xiphophorus helleri* (Heckel) | green swordtail | Nat. | 10 | Abundant |
| *Xiphophorus maculatus* (Günther) | moonfish | Nat. | 01* | Not reported |
| AMPHIBIANS - BUFONIDAE | | | | |
| *Bufo marinus* L. | giant neotrop. toad (juv.) | Nat. | 10 | Abundant |
| " " | " " " (tadpole) | Nat. | 10 | Abundant |
| AMPHIBIANS - RANIDAE | | | | |
| *Rana catesbeiana* (Shaw) | American bullfrog (adult) | Nat. | 10 | Common |
| " " | " " (tadpole) | Nat. | 10 | Abundant |

Table 2 (continued)

KEY TO SYMBOLS USED:
Status:
Nat. - naturalized. An introduced or exotic species.
Ind. - indigenous. A native species also found elsewhere in the Pacific.
End. - endemic - A native species found only in the Hawaiian Islands.
ID QA Code:
01 - Reported by biologist from prior survey(s).
10 - Observed in the field by biologist on November 23, 2001.
Superscripts:
A - Observed in 1993 or 1996, but not in 2001 survey.
B - Reported in Timbol & Maciolek (1978) from Alenaio Stream (see Figure 2).

Water quality Stations No. 1 and 2 were sampled in 1996 and Stations A, B, and C were sampled in 2001 in the general area of the project (Figure 2). Station 1 was located well upstream off Hoaka Road and Station 2 was located downstream in a pool in the immediate vicinity of the UH Hilo dormitories. Station A was located just downstream of Komahana Street in a pool fed by a seep and connected to a series of other pools. Station B was located in a large isolated pool below Station A. Station C was located in a pool upstream of Komohana Street and above the entrance point of a large drainage culvert on the right bank of Waiakea Stream. Results of water quality measurements are given in Table 3.

Table 3. Water quality characteristics of Waiakea Stream from samples collected in August 1996 and November 2001

| | Time sampled | Temp. (°C) | Cond. (umhos/cm) | DO (mg/l) | DO (% sat) | Turbidity (ntu) |
|---|---|---|---|---|---|---|
| 7 Aug 1996 | | | | | | |
| Sta. 1 | ---- | 23.6 | 14.6 | 9.30 | 110 | 1.06 |
| Sta. 2 | ---- | 27.7 | 26.9 | 8.95 | 135 | 1.22 |
| 23 Nov 2001 | | | | | | |
| Sta. A | 1150 | 27.4 | 47.1 | 6.14 | 78 | — |
| Sta. B | 1200 | 24.9 | 49.4 | 7.20 | 87 | — |
| Sta. C | 1220 | 23.9 | 46.3 | 5.88 | 70 | — |

| | | TSS (mg/l) | Ammonia (ug N/l) | Nitrate + nitrite (ug N/l) | Total N (ug N/l) | Total P (ug P/l) |
|---|---|---|---|---|---|---|
| 7 Aug 1996 | | | | | | |
| Sta. 1 | ---- | 1.4 | 28 | 26 | 321 | 16 |
| Sta. 2 | ---- | 2.0 | 5 | 1 | 292 | 18 |
| 23 Nov 2001 | | | | | | |
| Sta. A | 1150 | 0.9 | <1 | 2 | 230 | 42 |
| Sta. B | 1200 | 1.5 | 28 | 2 | 363 | 41 |
| Sta. C | 1220 | 1.8 | 108 | 19 | 680 | 44 |





Turbidity (not analyzed for in November 2001) and TSS levels are relatively low, suggesting still water, isolated from runoff inputs, and biological primary productivity dominated by benthic algae. Although 2001 values compared with 1996 values show slightly lower dissolved oxygen (DO) and slightly higher conductivity, the values obtained are not indicative of water quality problems.

The primarily unshaded sites (Stations 2, A, and B) had lower inorganic nutrients (nitrate + nitrite at least) and abundant benthic algae, suggesting these plants are utilizing available dissolved nutrients to support growth. High ammonia values, such as those found at Station C, can be indicative of stagnant water. Total N and total P values are fairly typical for Hawaiian streams in rural or undeveloped watersheds, although the total N values are all above the perennial streams criteria of 180 and 250 µg N/L (as dry and wet seasons geometric means, respectively) set forth in Hawai'i's Water Quality Standards (Hawaii Administrative Rules Chapter 11-54; HDOH, 2000). Total P values obtained in November 2001 are also slightly elevated, but do not exceed the stream criterion of 50 µg P/L (as a wet season geometric mean).

## Assessment

The quality of the water of Waiakea Stream near the proposed project site is good. Based upon the two sets of samples taken in 1996 and 2001, the water appears to meet or exceed the criteria set forth in Hawaii's Water Quality Standards for most parameters, although additional testing would be required to confirm this observation. Ammonia levels are likely to be high in the stagnant pools and total nitrogen levels would probably exceed Hawaii's Water Quality Standards on most sampling occasions. The aquatic macrofauna community appears to be typical for an interrupted stream in a rural or urban setting. Freshets provide passage up and down the stream for animals, including the native fishes. The permanent pools provide habitat for native and introduced fishes, crustaceans, and insects when the stream is not flowing.

A ridge on the south side of the project site separates the project site from Waiakea Stream and is forested with strawberry guava and other vegetation. This land will become a preserve area under UHH jurisdiction to protect an archaeological site (SFFM, 2002). This buffer, the nature of the geological formation (extremely porous), and proposed on-site runoff management plans should limit impacts that runoff from the PBARC facility will have on Waiakea Stream. It is presumed to be true that any increases in traffic in the area must be accompanied by pollutants from automobiles utilizing existing and new roads. Increases in traffic for this project are not considered of such a magnitude that measurable increases in pollutants would occur. Road runoff in the project area is generally infiltrated rather than directed into the stream channel. Somewhat further downstream, the extensive suburbanization of the watershed imposes a more direct impact on stream quality from streets and neighborhood storm drains that feed runoff from developed properties and roadways into Waiakea Stream. The present project represents a relatively low ratio of automobile and habitation structure per acre than all surrounding developed lands. With a proper buffer maintained between the PBARC Facility and Waiakea Stream, the ecological impact on the aquatic environment from the PBARC Facility should be minimal.

None of the aquatic species observed during these surveys is listed as threatened or endangered by the U.S. Fish and Wildlife Service under the Endangered Species Act of 1973, as amended, or by the State of Hawaii under it's endangered species program (DLNR 1998; Federal Register 1999a, 1999b, 2001).

## References Cited

*AECOS*, Inc. 1994. An environmental reconnaissance survey of Waiakea Stream, Hilo, Hawai'i for a sewerage crossing at U.H. Hilo. Prep. For Engineering Concepts, Inc., Honolulu. *AECOS* No. 765A: 9p.

———. 1997. An Assessment of Stream Impacts for a Bridge Crossing of Waiakea Stream at University of Hawai'i, Hilo, Hawai'i. Prep. For Engineering Concepts, Inc., Honolulu. *AECOS* No. 765C: 12p.

Char, W. 2001. Botanical survey, USDA Pacific Basin Agricultural Research Center, Waiakea, South Hilo District, Hawaii. Prep. for SSFM International Inc., Honolulu. Char & Assoc., Inc., Honolulu. 18 p.

Department of Land and Natural Resources (DLNR). 1998. Indigenous wildlife, endangered and threatened wildlife and plants, and introduced wild birds. Department of Land and Natural Resources. State of Hawaii. Administrative Rule §13-134-1 through §13-134-10, dated March 02, 1998.

Federal Register 1999a. Department of the Interior, Fish and Wildlife Service, endangered and threatened wildlife and plants. 50CFR 17:11 and 17:12 - December 3, 1999

———. 1999b. Department of the Interior, Fish and Wildlife Service, 50 CFR 17. Endangered and threatened wildlife and plants. Endangered and threatened wildlife and plants; Review of plant and animal taxa that are candidates or proposed for listing as endangered or threatened; Annual Notice of Findings on Recycled Petitions, and Annual Description of Progress on Listing Actions. *Federal Register*, 64 No. 205 (Monday, October 25, 1999): 57534-57547.





Federal Register. 2001. Department of the Interior, Fish and Wildlife Service, 50 CFR 17. Endangered and threatened wildlife and plants. Notice of Findings on Recycled Petitions. *Federal Register*, 66 No. 5 (Monday, January 8, 2001): 1295 - 1300.

Hawaii Cooperative Park Service Unit. 1990. Hawaii stream assessment, a preliminary appraisal of Hawaii's stream resources. Prep. For Commission on Water Resource Management, State of Hawaii. Report R84.

Polhemus, D. A. and A. Asquith. 1996. Hawaiian Damselflies: A Field Identification Guide. Bishop Museum Press, Honolulu. 122 p.

State of Hawaii - Department of Health (DOH). 2000. Hawaii Administrative Rules, Title 11, Department of Health, Chapter 54, Water Quality Standards. State of Hawaii, Department of Health. 61 pp.

SSFM International (SSFM). 2002. USDA Pacific Basin Agricultural Research Center Project, Draft Environmental Assessment. Chapters 2 and 6.

Telliaferro, W. J. 1959. Rainfall of the Hawaiian Islands. State of Hawaii, Hawaii Water Authority, Honolulu, Hawaii. 394 p.

Timbol, A.S. and J. A. Maciolek. 1978. Stream channel modification in Hawaii, Part A: Statewide inventory of streams, habitat factors and associated biota. U.S. Fish and Wildlife Service, FWS/OBS-78/16. 158 p.

U.S. Geological Survey (USGS). 1998. Water Resources Data, Hawaii, Water Year 1997. Hawai'i. U.S. Geological Survey Water-Data Report HI-89-1. 505 p.

# Appendix D

## *Botanical Survey*

Prepared By:
Char & Associates (August 2001)

# BOTANICAL SURVEY
# USDA PACIFIC BASIN AGRICULTURAL RESEARCH CENTER
# WAIAKEA, SOUTH HILO DISTRICT, HAWAI'I

by

Winona P. Char

CHAR & ASSOCIATES
Botanical Consultants
Honolulu, Hawai'i

Prepared for: SSFM INTERNATIONAL, INC.

August 2001

BOTANICAL SURVEY
USDA PACIFIC BASIN AGRICULTURAL RESEARCH CENTER
WAIAKEA, SOUTH HILO DISTRICT, HAWAI'I

## INTRODUCTION

The proposed 30-acre project site is located mauka of Komohana Street, above the University of Hawai'i at Hilo (UHH) research and technology lots. An existing utility easement, the Waiakea Reservoir, a HELCO substation, and paved access road border the property on the south. 'Ohi'a/uluhe forest covers the majority of the site, while weedy, ruderal vegetation occurs on the disturbed areas along the southern boundary.

The project site initially consisted of 20 acres, but an additional 10 acres were added later. Field studies for the 20-acre parcel were conducted on 20 May 2000. Field studies for the 10-acre portion were made on 15 March 2001. A team of two botanists was used in each of the surveys. The primary objectives of the field studies were to:

1) provide a general description of the vegetation on the 30-acre project site;
2) inventory the flora;
3) search for threatened and endangered species as well as species of concern; and
4) identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

## 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 and lot maps were examined to determine terrain characteristics, access, boundaries, and reference points.

A walk-through survey method was used. Notes were made on plant associations and distribution, substrate types, disturbances, topography, drainage, etc. Plant identifications were made in the field; plants which could not be positively identified were collected for later determination in the herbarium, and for comparison with the recent taxonomic literature.

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 of the year 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

A description of the vegetation found on the 30-acre project site follows. An inventory of all the plants observed on the site during the field studies is presented in the checklist at the end of the report.



### 'Ohi'a/Uluhe Forest

Large tracts of 'ohi'a *(Metrosideros polymorpha)*/uluhe *(Dicranopteris linearis)* forest are found on the lower, windward slopes of the Puna and Hilo Districts; these forests occur on young lava flows and shallow soils (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 species associated with this vegetation type.

On the project site, the mats of uluhe are 5 to 6 ft. tall. Scattered here and there are 'ohi'a trees, 15 to 35 ft. tall. Strawberry guava *(Psidium cattleianum)* and melastoma *(Melastoma candidum)* shrubs form dense thickets, 7 to 15 ft. tall, throughout the 'ohi'a/uluhe forest; in some places, shrub cover can be 50 to 60 ft. Other woody components which occur here in smaller numbers include guava *(Psidium guajava)*, hala *(Pandanus tectorius)*, gunpowder tree *(Trema orientalis)*, melochia *(Melochia umbellata)*, and king palm *(Archontophoenix alexandrae)*. Along the northern portion of the project site where there is shallow soil, a row of large albizia trees *(Falcataria moluccana)* is found adjacent to an overgrown road. Piles of old bottles and rusted cans are occasionally observed in this area. A few large common mango trees *(Mangifera indica)* also occur along the northern boundary.

Ground cover is absent in most places under the thick mats of uluhe. The more open areas under and around the strawberry guava and melastoma thickets support scattered clumps of young strawberry guava seedlings, molasses grass *(Melinis minutiflora)*, blechnum fern *(Blechnum occidentale)*, star of Bethlehem *(Hippobroma* *longiflora)*, Glenwood grass *(Sacciolepis indica)*, Hilo grass *(Paspalum conjugatum)*, bamboo orchid *(Arundina graminifolia)*, etc. Lygodium *(Lygodium japonicum)*, a lacy, slender, climbing fern is occasional to locally common in some places. Pig wallows are often associated with these more open, sunny areas.

**Ruderal Vegetation**

Along the southern boundary adjacent to the utility easement and around the substation and access road, the vegetation consists of a weedy mixture of introduced grasses and herbs. These areas are infrequently maintained. Commonly observed species include hairy swordfern *(Nephrolepis multiflora)*, molasses grass, sensitive plant *(Mimosa pudica)*, *Desmodium* sp., owi *(Stachytarpheta australis)*, California grass *(Brachiaria mutica)*, and broomsedge *(Andropogon virginicus)*. Two ornamental species which were probably planted along the easement as ground cover are common to abundant; these are wedelia *(Sphagneticola trilobata)* and dissotis *(Dissotis rotundifolia)*.

A woody scrub composed of melochia, gunpowder tree, lantana *(Lantana camara)*, guava, melastoma, strawberry guava, and pluchea *(Pluchea carolinensis)* borders these disturbed areas. Uluhe is common to abundant. Other native species which prefer these more open, disturbed areas include neneleau trees *(Rhus sandwicensis)*, 'uhaloa *(Waltheria indica)*, and two sedge–*Scleria testacea* and *Cyperus polystachyos*.



## DISCUSSION AND RECOMMENDATIONS

The native-dominated 'ohi'a/uluhe forest occurs on the majority of the project site. In places, thickets of the introduced strawberry guava and melastoma are common to abundant. 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 is fairly common on the geologically young lava flows in the Puna and Hilo region.

Along the southern boundary where it has been disturbed, the vegetation consists of a weedy mixture of species. A few native species which prefer more open, sunny locations border the ruderal vegetation.

A total of 100 plant species was inventoried on the 30-acre project site. Of these, 76 (76%) are introduced or alien; the majority of the plants occur within the ruderal vegetation. Introduced species are all those plants which were brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact, that is, Cook's arrival in the islands in 1778. One plant (1%), the ti *(Cordyline fruticosa)*, is originally of Polynesian introduction. Twenty-three species (23%) are native. Of the natives, 17 are indigenous, that is, they are native to the Hawaiian Islands and elsewhere, and 6 are endemic, that is, they are native only to the Hawaiian Islands. These endemic species are: 'ohi'a, 'ama'u *(Sadleria pallida)*, hapu'u *(Cibotium glaucum)*, wahine noho mauna *(Adenophorus tamariscinus)*, neneleau, and 'ahaniu or 'uki *(Machaerina mariscoides* ssp. *meyenii)*.

None of the plants found during the field studies is a threatened and endangered species or a species of concern (U.S. Fish and Wildlife Service 1999; Wagner *et al.* 1999). All of the plants can be found in similar vegetation types throughout the Hilo and Puna districts.

Two earlier botanical studies on nearby areas recorded similar findings. The first study (Char 1992) was for the UHH research and technology lots located makai of the project site. The second study (Char 1996) was for a 0.5 MG reservoir and water line alignment located mauka of the project site, near Puloku Street (Sunrise Estates Subdivision).

Given these findings, the proposed research center is not expected to have a significant negative impact on the botanical resources. However, it is recommended that wherever possible the existing 'ohi'a trees be incorporated into the landscaping plans; this may also include transplanting some of the trees. Other native species should also be considered for landscaping. The UHH research and technology lots study (Char 1992) recommended tree ferns *(Cibotium)*, 'ahanui *(Machaerina)*, 'ohe *(Tetraplasandra)*, and loulu *(Pritchardia)*. It also recommended that botanists, horticulturists, and others familiar with growing native species be contacted for a list of native plants suitable for landscape use.



## LITERATURE CITED


Char, W.P. (Char & Associates). 1992. Botanical Survey, University of Hawai'i - Hilo, Proposed Infrastructure for Research and Technology Lots, South Hilo District, Island of Hawai'i. Prepared for Engineering Concepts, Inc. December 1992.

Char, W.P. (Char & Associates). 1996. Botanical Resources Assessment Study, UH Hilo University Park, Infrastructure Improvements, Phase TIA, Reservoir and Water Line Alignment, Hilo, Island of Hawai'i. Prepared for Engineering Concepts, Inc. May 1996.

Cuddihy, L.W. and C.P. Stone. 1990. Alteration of Native Hawaiian Vegetation Effects of Humans, Their Activities and Introductions. Cooperative National Park Resources Studies Unit, University of Hawai'i, Manoa.

Evenhuis, N.L. and L.G. Eldredge, editors. 1999-2000. Records of the Hawaii Biological Survey. Bishop Museum Occasional Papers Nos. 58-64.

Lamoureux, C.H. 1988. Draft Checklist of Hawaiian Pteridophytes, "Kupukupu 0 Hawai'i Ne'i." Lyon Arboretum, University of Hawai'i, Manoa.

U.S. Fish and Wildlife Service. 1999. U.S. Fish and Wildlife Service Species List, Plants. March 23, 1999. Pacific Islands Ecoregion Office, Honolulu, HI.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1990. Manual of the Flowering Plants of Hawai'i. 2 vols. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. Bishop Museum Special Publication 83.

Wagner, W.L. and D.R. Herbst. 1999. Supplement to the Manual of the Flowering Plants of Hawai'i, p. 1855-1918. *In:* Wagner, W.L., D.R. Herbst, and S.H. Sohmer, Manual of the Flowering Plants of Hawai'i. Revised edition. 2 vols. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.

Wagner, W.L., M.M. Bruegmann, D.R. Herbst, and J. Q.C. Lau. 1999. Hawaiian Vascular Plants at Risk: 1999. Bishop Museum Occasional Papers No. 60: 1-58.



## PLANT SPECIES LIST —USDA Agricultural Research Center

The following checklist is an inventory of all the plants observed on the ±30-acre project site during the field studies. The plant names are arranged alphabetically by families into each of three groups: Ferns and Fern Allies, Dicots, and Monocots. The taxonomy and nomenclature of the Ferns and Fern Allies follow Lamoureux (1988), while the flowering plants, Dicots and Monocots, are in accordance with Wagner *et al.* (1990) and Wagner and Herbst (1999). The more recent name changes for some of the flowering plants follow those reported in the Hawaii Biological Survey series (Evenhuis and Eldredge, 1999-2000).

For each species, the following information is provided:

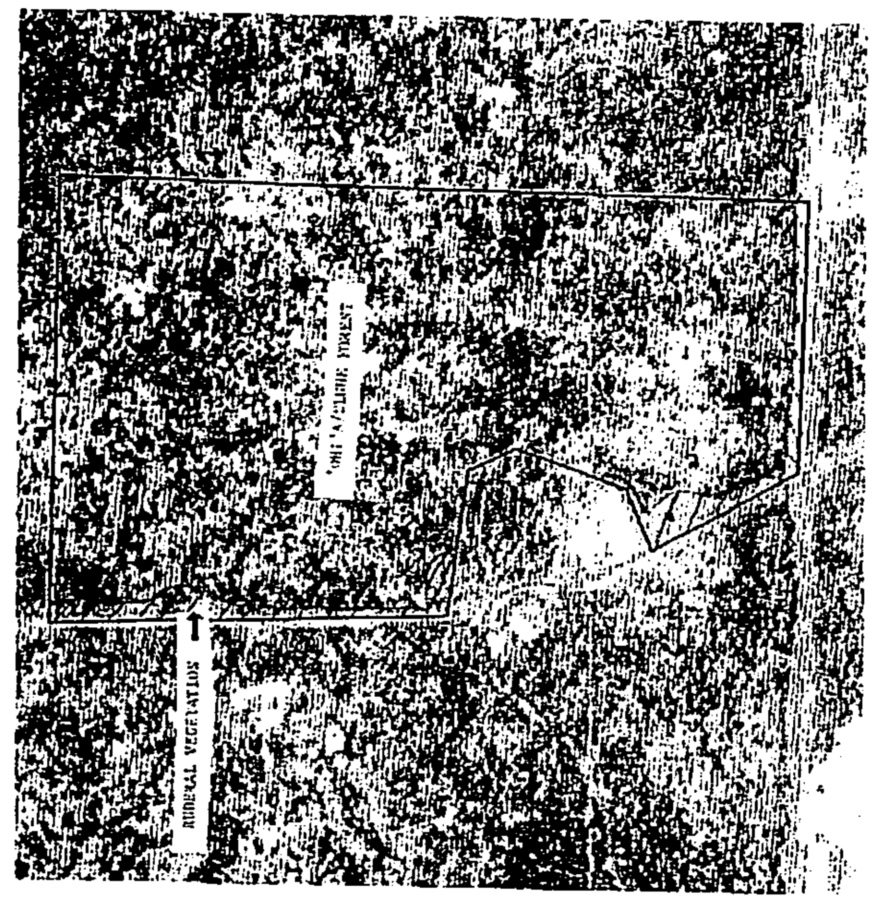
1. Scientific name with author citation.
2. Common English and/or Hawaiian name(s), when known.
3. Biogeographic status. The following symbols are used:
   - E = endemic = native only to the Hawaiian Islands.
   - I = indigenous = native to the Hawaiian Islands and also elsewhere.
   - I? = questionably indigenous = data not clear if dispersal to the islands by natural or human-related mechanisms, but weight of evidence suggests probably indigenous.
   - P = Polynesian introduction = introduced by the Polynesians Prior to Western contact, that is, Cook's arrival in the Islands in 1778.

X = introduced or alien = all those plants which were brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact, 1778.

4. Presence (+) or absence (-) of a particular species within each of two vegetation types recognized on the project site (see text for discussion):

f = 'Ohi'a/Uluhe Forest

r = Ruderal Vegetation



| Scientific name | Common name | Status | Vegetation Type f | Vegetation Type r |
|---|---|---|---|---|
| **FERNS & FERN ALLIES** | | | | |
| BLECHNACEAE (Blechnum family) | | | | |
| Blechnum occidentale L. | blechnum | X | + | - |
| Sadleria pallida Hook. & Arnott | 'ama'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 | + | + |
| GRAMMITACEAE (Grammitis family) | | | | |
| Adenophorus tamariscinus (Kaulf.) Hook. & Grev. | wahina noho mauna | E | + | - |
| LINDSAEACEAE (Lace fern family) | | | | |
| Sphenomeris chinensis (L.) Maxon | pala'a, pala pala'a | I | + | - |
| LYCOPODIACEAE (Clubmoss family) | | | | |
| Lycopodium cernuum L. | wawae'iole | I | + | - |
| LYGODIACEAE (climbing fern family) | | | | |
| Lygodium japonicum (Thunb.) Sw. | lygodium | X | + | - |
| NEPHROLEPIDACEAE (Swordfern family) | | | | |
| *Nephrolepis exaltata* (L.) Schott | ni'ani'au, kupukupu | I | + | + |
| Nephrolepis multiflora (Roxb.) Jarrett ex Morton | hairy swordfern, 'okupukupu | X | - | + |
| POLYPODIACEAE (Common fern family) | | | | |
| Phlebodium aureum (L.) J. Sm. | laua'e haole | X | + | - |

| Scientific name | Common name | Status | Vegetation Type f | Vegetation Type r |
|---|---|---|---|---|
| Phymatosorus scolopendria (Burm.) Pic.-Ser. | laua'e, lauwa'e | X | - | + |
| Pleopeltis thunbergiana Kaulf. | pakahakaha, 'ekaha 'akolea | I | + | - |
| PSILOTACEAE (Whisk fern family) | | | | |
| Psilotum nudum (L.) Beauv. | moa, moa nahele, pipi | I | + | - |
| PTERIDACEAE (Pteris family) | | | | |
| Pteris vittata L. | pteris | X | + | - |
| THELYPTERIDACEAE (Downy wood-fern family) | | | | |
| Christella parasitica (L.) Levl. | wood-fern, oakfern | X | + | - |
| Macrothelypteris torresiana (Gaud.) Ching | | I | - | + |
| **FLOWERING PLANTS** | | | | |
| **DICOTS** | | | | |
| ANACARDIACEAE (Mango family) | | | | |
| Mangifera indica L. | mango, manako | X | + | - |
| Rhus sandwicensis A. Gray | neneleau | E | + | + |
| APIACEAE (Parsley family) | | | | |
| Centella asiatica (L.) Urb. | Asiatic pennywort, pohe kula | X | + | - |
| APOCYNACEAE (Dogbane family) | | | | |
| Allamanda cathartica L. | allamanda | X | - | + |
| ARALIACEAE (Ginseng family) | | | | |
| Schefflera actinophylla (Endl.) Harms | octopus tree | X | + | - |

| Scientific name | Common name | Status | Vegetation Type f | r |
|---|---|---|---|---|
| ASTERACEAE (Daisy family) | | | | |
| Ageratum conyzoides L. | maile hohono | X | + | + |
| Bidens pilosa L. | Spanish needle, ki, ki nehe | X | - | + |
| Emilia sonchifolia (L.) DC | purple puslele | X | + | - |
| Erechtites valerianifolia (Wolf) DC | fireweed | X | + | - |
| Pluchea carolinensis (Jacq.) G. Don | sourbush, pluchea | X | + | + |
| Spagneticola trilobata (L.) Pruski | wedelia | X | - | + |
| BIGNONIACEAE (Bignonia family) | | | | |
| Spathodea campanulata P. Beauv. | African tulip tree | X | - | + |
| BUDDLEIACEAE (Butterfly bush family) | | | | |
| Buddleia asiatica Lour. | dog tail, huelo 'ilio | X | + | + |
| CAMPANULACEAE (Bellflower family) | | | | |
| Hippobroma longiflora (L.) G. Don | star of Bethlehem | X | + | - |
| CANNABACEAE (Cannabis family) | | | | |
| Cannabis sativa ssp. indica (Lam.) E. Small & Cronq. | pakalolo, marijuana, pot | X | + | - |
| CASUARINACEAE (She-oak family) | | | | |
| Casuarina sp. | ironwood | X | + | - |
| CLUSIACEAE (Mangosteen family) | | | | |
| Clusia rosea Jacq. | autograph tree, copey, Scotch attorney | X | - | + |
| CONVOLVULACEAE (Morning glory family) | | | | |
| Ipomoea indica (J. Burm.) Merr. | koali 'awa, koali 'awahia | I | + | + |
| Ipomoea obscura (L.) Ker-Gawl. | field bindweed | X | - | + |
| EUPHORBIACEAE (Spurge family) | | | | |
| Chamaesyce hirta (L.) Millsp. | hairy spurge, garden spurge | X | - | + |

| Scientific name | Common name | Status | Vegetation Type f | r |
|---|---|---|---|---|
| FABACEAE (Pea family) | | | | |
| Chamaecrista nictitans (L.) Moench | partridge pea, lauki | X | + | + |
| Crotalaria incana L. | fuzzy rattlepod, kukaehoki | X | - | + |
| Crotalaria micans Link | | X | - | + |
| Crotalaria retusa L. | rattle-box, sauni | X | - | + |
| Desmodium incanum DC | Spanish clover, ka'imi | X | - | + |
| Desmodium sandwicense E. Mey. | Spanish clover, chili clover | X | + | - |
| Desmodium triflorum (L.) DC | three-flowered beggarweed | X | - | + |
| Desmodium sp. | | X | - | + |
| Falcataria moluccana (Miquel) Barneby & Grimes | albizia | X | + | - |
| Mimosa pudica var. unijuga (Duchass. & Walp.) Griseb. | sensitive plant, puahilahila | X | + | + |
| Samanea saman (Jacq.) Merr. | monkeypod | X | + | - |
| GOODENIACEAE (Goodenia family) | | | | |
| Scaevola sericea Vahl | naupaka, naupaka kahakai, beach naupaka | I | - | + |
| LAMIACEAE (Mint family) | | | | |
| Hyptis ipectinata (L.) Poit. | comb hyptis | X | - | + |
| LYTHRACEAE (Loosestrife family) | | | | |
| Cuphea carthagenensis (Jacq.) Macbr. | tarweed, Colombian cuphea | X | + | + |
| MALVACEAE (Mallow family) | | | | |
| Sida rhombifolia L. | Cuba jute | X | - | + |
| MELASTOMATACEAE (Melastome family) | | | | |
| Dissotis rotundifolia (Sm.) Triana | dissotis | X | - | + |
| Melastoma candidum D. Don | melastoma | X | + | + |
| MENISPERMACEAE (Moonseed family) | | | | |
| Cocculus orbiculatus (L.) DC | huehue, hue | I | + | - |

| Scientific name | Common name | Status | Vegetation Type f | r |
|---|---|---|---|---|
| MYRTACEAE (Myrtle family) | | | | |
| Metrosideros polymorpha Gaud. | 'ohi'a, 'ohi'a lehua, lehua | E | + | - |
| Psidium cattleianum Sabine | strawberry guava | X | + | - |
| Psidium guajava L. | guava, kuawa | X | + | + |
| Rhodomyrtus tomentosa (Aiton) Hassk. | downy myrtle, rose myrtle | X | - | + |
| Syzygium cumini (L.) Skeels | Java plum | X | + | - |
| POLYGALACEAE (Milkwort family) | | | | |
| Polygala paniculata L. | | X | - | + |
| POLYGONACEAE (Buckwheat family) | | | | |
| Persicaria capitatum (Buch.-Ham. ex D. Don) Masamune | | X | - | + |
| PROTEACEAE (Protea family) | | | | |
| Grevillea robusta A. Conn. ex R. Br. | silk oak, 'oka kilika | X | + | - |
| ROSACEAE (Rose family) | | | | |
| Rubus rosifolius Sm. | thimbleberry | X | + | - |
| RUBIACEAE (Coffee family) | | | | |
| Paederia foetida L. | maile pilau | X | - | + |
| Spermacoce mauritiana Gideon | | X | - | + |
| Spermacoce sp. | | X | - | + |
| SCROPHULARIACEAE (Figwort family) | | | | |
| Castilleja arvensis Cham. & Schlechtend. | *Indian paintbrush* | X | - | + |
| STERCULIACEAE (Cacao family) | | | | |
| Melochia umbellata (Houtt.) Stapf | melocia | X | + | + |
| Waltheria indica L. | 'uhaloa, hi'aloa, kanakaloa | I? | + | + |

| Scientific name | Common name | Status | Vegetation Type f | r |
|---|---|---|---|---|
| ULMACEAE (Elm family) | | | | |
| Trema orientalis (L.) Blume | gunpowder tree, charcoal tree | X | + | + |
| VERBENACEAE (Verbena family) | | | | |
| Citharexylum caudatum L. | fiddlewood | X | + | - |
| Lantana camara L. | lantana, lakana | X | + | + |
| Stachytarpheta australis Moldenke | owi, oi | X | + | + |
| **MONOCOTS** | | | | |
| AGAVACEAE (Sisal family) | | | | |
| Cordyline fruticosa (L.) A. Chev. | ti, ki | P | + | + |
| ARACEAE (Aroid family) | | | | |
| Philodendron sp. | philodendron | X | - | + |
| ARECACEAE (Palm family) | | | | |
| Archontophoenix alexandrae (F.v. Muell.) H.A. Wendl. & Drude | king palm, Alexandra palm | X | + | - |
| COMMELINACEAE (Spiderwort family) | | | | |
| Commelina diffusa N.L. Burm. | honohono | X | - | + |
| CYPERACEAE (Sedge family) | | | | |
| Cyperus halpan L. | | X | + | - |
| Cyperus polystachyos Rottb. | | I | - | + |
| Fimbristylis dichotoma (L.) Vahl | | I | + | + |
| Kyllinga brevifolia Rottb. | kyllinga, kili'o'opu | X | - | + |
| Machaerina mariscoides ssp. meyenii (Kunth) T. Koyama | 'ahaniu, 'uki | E | + | + |
| Rhynchospora chinensis Nees & Meyen | kuolohia, beak-rush | I | + | + |
| Scleria testacea Nees | | I | + | + |

| Scientific name | Common name | Status | Vegetation Type f | r |
|---|---|---|---|---|
| IRIDACEAE (Iris family) | | | | |
| Crocosmia X crocosmiiflora (lemaine ex E. Morr.) N.E. Brown | montbretia | X | - | + |
| ORCHIDACEAE (Orchid family) | | | | |
| Arundina graminifolia (D. Don) Hochr. | bamboo orchid | X | + | + |
| Phaius tankervilleae (Banks ex L'Her.) Blume | Chinese ground orchid, nun's orchid | X | + | - |
| PANDANACEAE (Hala family) | | | | |
| Pandanus tectorius S. Parkinson ex Z | hala, pu hala, pandanus | I | + | - |
| POACEAE (Grass family) | | | | |
| Andropogon virginicus L. | broomsedge | X | + | + |
| Axonopus fissifolius (Raddi) Stapf | narrow-leaved carpetgrass | X | + | + |
| Brachiaria mutica (Forssk.) Stapf | California grass | X | - | + |
| Cynodon dactylon (L.) Pers. | Bermuda grass, manienie | X | - | + |
| Digitaria sp. | crabgrass | X | - | + |
| Melinis minutiflora P. Beauv. | molasses grass | X | + | + |
| Paspalum conjugatum Bergius | Hilo grass, mau'u Hilo | X | + | + |
| Paspalum scrobiculatum L. | ricegrass, mau'u laiki | I? | + | + |
| Sacciolepis indica (L.) Chase | Glenwood grass | X | + | + |
| Setaria gracilis Kunth | yellow foxtail, mau'u Kaleponi | X | - | + |
| Themeda villosa (Poir.) A. Camus | Lyon's grass | X | - | + |

# APPENDIX E

## *A Survey of Avian and Terrestrial Mammalian Species*

Prepared By:
Rana Production, Ltd. (December 2001)

Federal Register 1999a. Department of the Interior, Fish and Wildlife Service, Endangered and Threatened Wildlife and Plants. 50CFR 17:11 and 17:12 – December 3, 1999

______. 1999b. Department of the Interior, Fish and Wildlife Service, 50 CFR 17. Endangered and Threatened Wildlife and Plants. Endangered and Threatened Wildlife and Plants; Review of Plant and Animal Taxa that are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Recycled Petitions, and Annual Description of Progress on Listing Actions. *Federal Register*, 64 No. 205 (Monday, October 25, 1999): 57534-57547.

______. 2001. Department of the Interior, Fish and Wildlife Service, 50 CFR 17. Endangered and Threatened Wildlife and Plants. Notice of Findings on Recycled Petitions. *Federal Register*, 66 No. 5 (Monday, January 8, 2001): 1295 – 1300.

Harrison, C. S. 1990. *Seabirds of Hawaii: Natural History and Conservation*. Cornell University Press, Ithaca, N.Y. 249 pp.

Henshaw, H.W. 1902. *Complete list of birds of the Hawaiian Possessions with notes on their habits*. Thrum, Honolulu. 146 pp.

Kepler, C. B., J. Jeffrey and J.M. Scott 1979. Possible breeding colonies of Manx Shearwaters on the Island of Hawaii. 'Elepaio, Vol. 39, No.: 115–116

Menard, T. 2001. Seasonal Activity of the Endangered Hawaiian Hoary Bat on the Island of Hawai'i. Unpublished Draft Master of Science Thesis, Univ. Hawai'i, Honolulu, Hawai'i.

Pukui , M. K., S. H. Elbert, and E. T. Mookini 1976. *Place Names of Hawaii*. University of Hawaii Press. Honolulu, Hawai'i. 289 pp.

Reed, J. R., J. L Sincock, and J. P. Hailman 1985. Light Attraction in Endangered Procellariform Birds: Reduction by Shielding Upward Radiation. Auk 102: 377-383.

Reynolds, R.T., J.M. Scott and R.A. Nussbaum. 1980. A variable circular plot method for estimating bird numbers. Condor. 82:309-313.

Tomich, P.Q. 1986. *Mammals in Hawaii*. Bishop Museum Press. Honolulu, Hawaii. 375 pp.

USGS. 1981. Hilo Quadrangle, Hawaii-Island and County of Hawaii. 7.5 minute series (Topographic). Denver, Colorado.

Wagner, W.L., D.R Herbst, S.H. Sohmer 1990. *Manual of the Flowering Plants of Hawai'i*. University of Hawaii Press, Honolulu, Hawaii 1854 pp.

Wilson, S. B., and A. H. Evans 1890-1899. *Aves Hawaiiensis: The birds of the Sandwich Islands*. R. H. Porter, London.

Wolfe, E. W., and J. Morris 1996 Geological Map of the Island of Hawaii. U.S. Department of the Interior, U.S. Geological Survey.

*Literature Cited:*


Ainley, D. G, R. Podolsky, L. Deforest, G. Spencer, and N. Nur. 1995. Kauai endangered seabird study. Volume 2: The ecology of Dark-rumped Petrels and Newell's Shearwaters. Final Report TR-105847-V2, Electric Power Research Institute, Palo Alto, California, by PRBO Stinson Beach, CA.

______. 1997. New Insights into the Status of the Hawaiian Petrel on Kauai. Colonial Waterbirds, 20 (1): 24-30

______. 2001. The Status and Population Trends of the Newell's Shearwater on Kaua'i: Insights from Modeling, *in*: Scott, J. M, S. Conant, and C. Van Riper III (editors) *Evolution, Ecology, Conservation, and Management of Hawaiian Birds: A Vanishing Avifauna*. Studies in Avian Biology No. 22: Cooper's Ornithological Society, Allen Press, Lawrence, Kansas. (Pg. 108-123)

American Ornithologist's Union. 1998. *Check-list of North American Birds*. 7th edition. AOU. Washington D.C. 829pp.

______. 2000. Forty-second supplement to the American Ornithologist's Union *Check-list of North American Birds*. Auk 117:847-858

Banko, W. E. 1980 a. Population Histories- Species Accounts Seabirds: Hawaiian Dark-rumped Petrel ('Ua'u). Cooperative National Park Resources Studies Unit, University of Hawaii at Manoa, Department of Botany, Technical Report #5B.

______. 1980 b. Population Histories- Species Accounts Seabirds: Newell's Shearwater ('A'o). Cooperative National Park Resources Studies Unit, University of Hawaii at Manoa, Department of Botany, Technical Report #5A.

Banko, P. C., R. E. David, J. D. Jacobi, and W. E. Banko 2001. Conservation Status and Recovery Strategies for Endemic Hawaiian Birds, *in:* Scott, J. M, S. Conant, and C. Van Riper III (editors) *Evolution, Ecology, Conservation, and Management of Hawaiian Birds: A Vanishing Avifauna*. Studies in Avian Biology No. 22. Cooper's Ornithological Society, Allen Press, Lawrence, Kansas (Pg. 359-376).

Conant, S. 1980. Recent records of the 'U'au (Dark-rumped Petrel) and 'A'o ( Newell's Shearwater ) in Hawai'i. 'Elepaio, Vol. 41: 11-13

Cooper, B. A. and R. E. David 1995. Radar and Visual Surveys of Seabirds in the HELCO SSP Unit 71, Puna, Hawaii, During July 1995. Prepared for R. M. Towill Corporation & Hawaii Electric Light Co.

Cooper, B. A and R. H. Day. 1995. Kauai endangered seabird study. Volume 1: Interactions of Dark-rumped Petrels and Newell's Shearwaters with utility structures on Kauai, Hawaii: Final Report, TR-105847-V1, Electric Power Research Institute, Palo Alto, California.

______. 1998. Summer Behavior and Mortality of Dark-rumped Petrels and Newell's Shearwaters at Power Lines on Kauai. Colonial Waterbirds, 21 (1): 11-19

David, R. E. 1992. Ornithological and Mammalian Survey of Ainaloa, Puna District, Island of Hawaii Prepared for Sidney Fuke & Associates & Ainaloa Development Corp.





David, R. E. 1995. Faunal Survey of Helco SSPP Unit 71- Rauenhorst, Kehena- Keekee Homestead, Puna, Hawaii. Prepared for R. M. Towill Corporation & Hawaii Electric Light Co.

______. 1996. Ornithological and Mammalian Surveys of the Proposed Improvement and Realignment Corridors of the Saddle Road (State of Hawaii Route 200), Island of Hawai'i, Hawaii. Prepared for: Rust E&I & The Federal Highways Administration, Central Federal Lands Highway Division.

______. 1997. Avian and Mammalian Surveys of the Hawaii Electric Light Company (HELCO) Puna Generating Station Site, Kea'au, District of Puna, Island of Hawai'i, Hawai'i. Prepared for: CH2M Hill and HELCO.

______. 1998 a. A Reconnaissance Survey of Terrestrial Vertebrate Species for the Kolekole Bridge Seismic Retrofit Project, District of North Hilo, Island of Hawai'i. Prepared for Engineering Concepts, Inc.

______. 1998 b. A Reconnaissance Survey of Terrestrial Vertebrate Species for the Puainako Street Extension And Widening Project, South Hilo, Hawai'i. Prepared for Okahara and Associates and the County of Hawaii Department of Public Works.

______. 1998 c. A Reconnaissance Survey of Terrestrial Vertebrate Species for the Pahe'ehe'e Bridge Seismic Retrofit Project, District of North Hilo, Island of Hawai'i. Prepared for Engineering Concepts, Inc.

______. 1999 a. A Survey of Terrestrial Vertebrates on the Proposed New Hawai'i Island Correctional Facility Site, Waiakea, South Hilo, Island of Hawai'i. Prepared for Wilson Okamoto & Associates & the State of Hawai'i General Accounting Office.

______. 1999 b. A Survey of Terrestrial Vertebrate Species along the Proposed Improvement Corridor of Stainback Highway, Waiakea, Island of Hawai'i. Prepared for Wilson Okamoto & Associates & the State of Hawai'i General Accounting Office.

______. 2000. A Reconnaissance Survey of Avian and Mammalian Species at Three Sites Along the Kalapana Roadway Realignment and Resurfacing Project, Puna District, Island of Hawai'i, Hawai'i. Prepared for: SSFM International, Inc. and The Department of Public Works, County of Hawai'i.

______. 2001a. A Survey of Avian and Mammalian Species Hilo International Airport Improvement Project, South Hilo Disdtrict, Hawai'i. Prepared for Wilson Okamoto & Associates and the State of Hawai'I Department of transportation Airports Division (HDOT-A).

______. 2001b. Puainako Street Widening and Extension Project: Hawaiian Hawk nest survey. Prepared for Goodfellow Brothers, Inc.

Day, R. H., and B. Cooper, 1997. Patterns of Movement of Dark-rumped Petrels and Newell's Shearwaters on Kauai. The Condor, 97: 1011-1027.

Department of Land and Natural Resources (DLNR). 1986. Indigenous wildlife, endangered and threatened Wildlife and plants, and introduced wild birds. Department of Land and Natural Resources. State of Hawaii. Administrative Rule dated 28, August 1986.

### *Discussion:*

A one-time survey can not provide a total picture of the wildlife utilizing any given area. Certain species will not be detected for one reason or another. Seasonal variations in populations coupled with seasonal usage and availability of resources will cause different usage patterns throughout a year or, in fact, over a number of years.

The findings of the mammalian survey are consistent with the results of other surveys conducted within the lowland areas of South Hilo within the recent past (David 1996, 1998 a, 1998 b, 1998 c, 2001a). Although no Hawaiian hoary bats were recorded during the course of the survey, it is likely that bats do use resources within the site. Bats are regularly seen in and around Hilo, as well as along the coastline from Puna to North Hilo (David 1992, 1995, 1996, 1997, 1998 a, 1998 b, 1998 c, 1999 a, 1999 b, 2000; Cooper et al. 1995; Menard 2001).

Unlike nocturnally flying seabirds, which often collide with man-made structures, bats are uniquely adapted to avoid collision with obstacles, man-made and natural. They navigate and locate their prey using ultrasonic echolocation, which is sensitive enough to allow them to locate and capture small volent insects at night.

Although no rodents were detected during the course of this survey, it is likely that roof rats (*Rattus r. rattus*), Norway rats (*Rattus norvegicus*), European house mice (*Mus domesticus*) and possibly Polynesian rats (*Rattus exulans hawaiiensis*) use various resources found within the project site. Without conducting a trapping program, it is difficult to assess the population densities of these often hard-to-see mammals.

The findings of the avian survey are consistent with the findings of other recent surveys conducted within the lowland areas of South Hilo (David 1996, 1998a, 1998b, 1998c, 2001a, 2001b). The eight alien avian species detected during station counts are species that one would expect to record within disturbed lowland areas in the South Hilo District.

It is also possible that small numbers of the endangered endemic Hawaiian subspecies of the Dark-rumped Petrel (*Pterodroma phaeopygia sandwichensis*), or *ua'u*, and the threatened Newell's Shearwater (*Puffinus auricularis newelli*), or *'a'o*, overfly the project site between the months of May and October (Banko 1980a, 1980b; Harrison 1990).

Dark-rumped Petrels were formerly common on the Island of Hawai'i (Wilson and 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 at the mid to high elevations of Mount Hualalai. It has, within recent historic times, been reduced to relict breeding colonies located at high elevations on Mauna Loa and, possibly, Mount Hualalai (Banko 1980; Cooper and David 1995; Cooper et al. 1995; David, Unpublished Field Notes 1986–1995, 1999; Harrison 1990; Banko et al. 2001).



Newell's Shearwaters were formerly common on the Island of Hawai'i (Wilson and Evans 1890–1899). This species breeds on Kaua'i, Hawai'i and Moloka'i in extremely small numbers. Newell's Shearwater populations have dropped precipitously since the 1880s (Banko 1980b, Day and Cooper, in press). This pelagic species nests high in the mountains in burrows excavated under thick vegetation, especially *'uluhe* fern. There are numerous records of this species having been seen, heard, or collected in and close to Hilo (Banko 1980a; Conant 1980; David. pers. obs.; Kepler et al. 1979)

The primary cause of mortality in both these species is thought to be predation by alien mammalian species at the nesting colonies (Cooper and Day 1995; Day and Cooper 1998; Ainley et al. 2001). Collision with utility structures is considered to be the second most significant cause of mortality of these seabird species in Hawai'i. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds often collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Ainley et al. 1995, 1997, 2001; Cooper and Day 1995, 1998; Day and Cooper 1997).

The principal potential impact that development of the project site poses to Dark-rumped Petrels and Newell's Shearwaters is the increased threat that birds will be downed after becoming disoriented by exterior lighting that may be required in conjunction with the planned development.

### *Recommendations:*

To reduce the potential for interactions between nocturnally flying Dark-rumped Petrels and Newell's Shearwaters with external lights and man-made structures, it is recommended that any external lighting planned within the proposed USDA facility be shielded (Reed *et al.* 1985). This mitigation would serve the dual purpose of minimizing the threat of disorientation and downing of Dark-rumped Petrels, and Newell's Shearwaters, while at the same time complying with the County of Hawai'i's current planning policy which recommends the shielding of exterior lights, so as to lower the ambient glare caused by unshielded lighting to the astronomical observatories located on Mauna Kea.

numerous bulldozed tracks which crisscross the site which were created for topographic survey work.

### *Mammalian Survey Methods:*

All observations of mammalian species were of an incidental nature. With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or *'ope'ape'a*, as it is known in Hawaiian, all terrestrial mammals found on the island of Hawai'i are alien species. Most are ubiquitous; no trapping program was proposed or undertaken to quantify the use of the study site by alien mammalian species. The survey of mammals was limited to visual and auditory detection, and by searching for animal tracks and sign. Additionally, visual scans were made for bats on one evening, and one morning during crepuscular periods.

### *Avian Survey Methods:*

Ten count stations were established within the project site (Figure 1). Eight-minute unlimited distance counts were made at each station (Reynolds et al. 1980). Counts were conducted once at each station. Field observations were made with the aid of Leitz 10 X 42 binoculars and by listening for vocalizations. Counts were concentrated during the morning hours, the peak of daily bird activity. An additional two hours were spent on site on the evening of the 19th and two hours in the early morning of the 20th of December 2001, in an attempt to detect nocturnally flying seabirds and owls overflying the area. Time not spent counting was used to search the site and the surrounding area for species and habitats not detected during count sessions.

### *Mammalian Survey Results:*

Three mammalian species were detected on site, all of which are alien to Hawaiian Islands. Two small Indian mongooses (*Herpestes a. auropunctatus*) were seen in the lower section of the site, close to Komohana Street. Numerous domestic dogs (*Canis f. familiaris*) were heard barking from subdivisions located to the north and west of the site, and both dog and cat (*Felis catus*) sign and scat were encountered within the site. One pig (*Sus scrofa*) was encountered near the western boundary of the site. There is extensive recent pig damage present within the areas that have been bulldozed, as well as in areas immediately adjacent to the cleared paths. There are numerous well established pig trails transecting the currently undisturbed parts of the site. All mammalian species detected are deleterious to native avian and plant communities.

### *Avian Survey Results:*

Eight avian species, representing seven separate families were recorded during station counts (Table 1). All species recorded are alien to Hawai'i. No species listed as



endangered, threatened, proposed, or as a candidate for listing under either the U.S. Fish and Wildlife Service (USFWS) or the State of Hawai'i 's endangered species programs was recorded within the proposed project site (DLNR 1986; Federal Register 1999a, 1999b, 2001).

Avian diversity and densities were relatively low. Two species, Japanese White-eye (*Zosterops japonicus*) and House Finch (*Carpodacus mexicanus frontalis*) accounted for 83% of the total number of all birds recorded during station counts. An average of 29 birds were recorded per station count.

***Table 1***

**Avian Species Detected During Station Counts**
**USDA Pacific Basin Agricultural Research Center**

| *Common Name* | *Scientific Name* | *ST* | *RA* |
|---|---|---|---|
| PHEASANTS & ALLIES – *Phasianidae* | | | |
| Ring-necked Phesant | *Phasianus colchicus* | A | 0.10 |
| PIGEONS & DOVES - Columbidae | | | |
| Spotted Dove. | *Streptopelia chinensis.* | A | 0.50 |
| Zebra Dove. | *Geopelia striata.* | A | 0.50 |
| BABBLERS - Timaliidae | | | |
| Hwamei | *Garrulax canorus* | A | 1.50 |
| SILVEREYES - Zosteropidae | | | |
| Japanese White-Eye. | *Zosterops japonicus* | A | 15.00 |
| STARLINGS - Sturnidae | | | |
| Common Myna. | *Acridotheres tristis.* | A | 0.10 |
| CARDULINE FINCHES & ALLIES - Fringillidae | | | |
| House Finch. | *Carpodacus mexicanus frontalis* | A | 9.30 |
| SALTATORS, CARDINALS & ALLIES – Cardinalidae | | | |
| Northern Cardinal. | *Cardinalis cardinalis.* | A | 2.20 |

***KEY TO TABLE 1***

ST Status
A Alien Species
RA Relative Abundance = number of birds detected divided by number of stations counted (10)

## *Introduction:*

This report summarizes the findings of a one and a half day ornithological and mammalian survey of a 30 ± acre site (TMK: (3) -2-4-01 & 122, Lot 2) on which it is proposed that the U.S. Department of Agriculture, Pacific Basin Agricultural Research Center be developed. The site is located on the south-western edge of downtown Hilo, near the existing University of Hawai'i at Hilo campus. The site is currently undeveloped and is located at the southwest corner of the existing Komohana Street, and the future Nowelo Street extension (Figure 1). Fieldwork was conducted on December 19th and 20th, 2001.

The primary purpose of the survey was to determine if there were any federally listed endangered, threatened, proposed, or candidate avian or mammalian species on, or in the immediate vicinity of, the proposed project site. In addition, we were asked to assess the probability of any use of the site by listed species, given the habitat the site currently supports.

Avian phylogenetic order and nomenclature follows *The American Ornithologists' Union Check-list of North American Birds*, 7th Edition (American Ornithologists' Union 1998), and the 42nd supplement to *Check-list of North American Birds* (American Ornithologists' Union 2000). Scientific names for mammals follow *Mammals in Hawaii* (Tomich 1986). Plant names follow *Manual of the Flowering Plants of Hawai'i* (Wagner et al. 1990). Place names follow *Place Names of Hawaii* (Pukui et al. 1974).

## *Project and Site Description:*

The project site encompasses approximately 30 acres located in the Waiakea *ahupua'a*, South Hilo District, Island of Hawai'i. The area surveyed slopes gently from west to east, from an elevation of approximately 370 feet above mean sea level (ASL), to approximately 310 feet ASL (USGS 1981). The site abuts the western edge of Komohana Street, and is located up-slope from the University of Hawai'i-Hilo (UH-Hilo) University Park (Figure 1). The terrain within the project site is composed of a mix of pahoehoe and a'a lava flows formed by Mauna Loa during the late Holocene Epoch. The flows were deposited between 750 and 1,500 years ago (USGS 1981; Wolfe and Morris 1996).

The vegetation on the site is a mix of scrub *'ohi'a* (*Metrosideros polymorpha*) with a *'uluhe* (*Dicranopteris linearis*) ground cover, interspersed with numerous alien (introduced to Hawai'i by humans) species including; strawberry guava (*Psidium cattleianum*), Christmasberry (*Schinus terebinthifolius*), octopus tree (*Schefflera actinophylla*), moluccan albizia (*Paraserianthes falcataria*), ironwood (*Casuarina equisetifolia*), pandanus, or *hala* (*Pandanus tectorius*), candlenut, or *kukui* (*Aleurites moluccana*) and numerous alien weedy and grass species. Vegetation was quite dense on the site, with free movement possible only along the paved water tank access road and



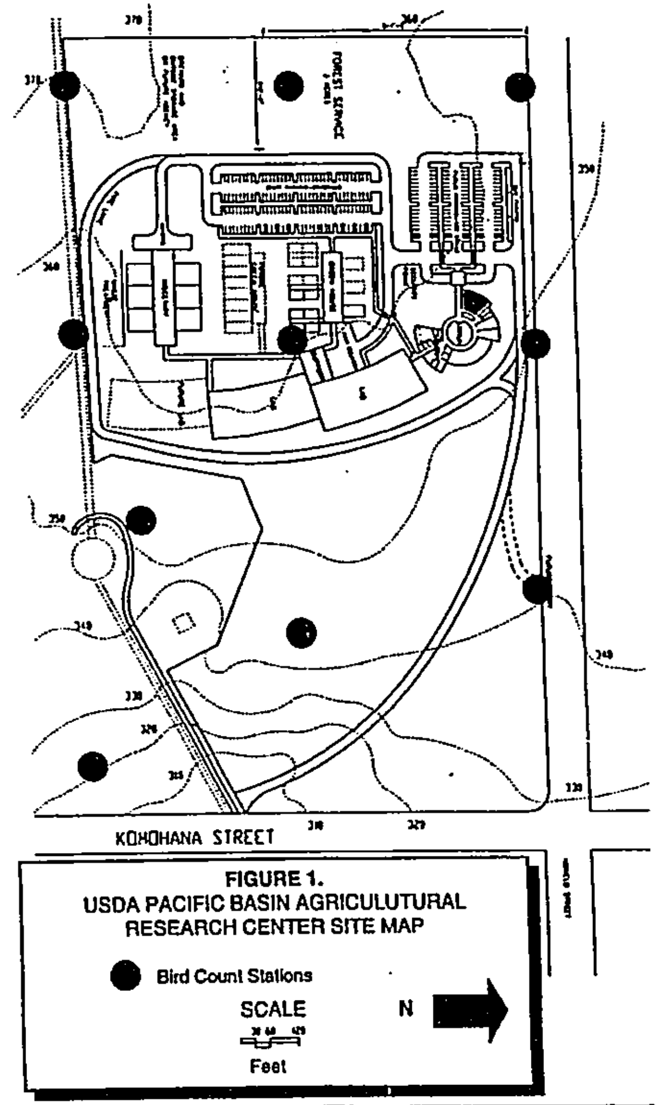



FIGURE 1.
USDA PACIFIC BASIN AGRICULUTURAL RESEARCH CENTER SITE MAP

# A Survey of Avian and Terrestrial Mammalian Species of the USDA Pacific Basin Agricultural Research Center Site, South Hilo District, Hawai'i.

Prepared by:

Reginald E. David
Rana Productions, Ltd.
P.O. Box 1371
Kailua-Kona, Hawai'i 96745

Prepared for:

SSFM International, Inc
501 Sumner Street, Suite 502
Honolulu, Hawai'i 96817

December 2001



*Table of Contents*



*Figures*



*Tables*

# Appendix F

## *Air Quality Study*

Prepared By:
B.D. Neal & Associates (April 2002)

# AIR QUALITY STUDY

# FOR THE PROPOSED

# USDA PACIFIC BASIC AGRICULTURAL RESEARCH CENTER

HILO, HAWAII

Prepared for:

SSFM International, Inc.

April 2002

**B.D. NEAL & ASSOCIATES**

*Applied Meteorology • Air Quality • Computer Science*

P.O. BOX 1808 • KAILUA-KONA, HAWAII 96745 • TELEPHONE (808) 329-1627 • FAX (808) 331-8428

EMAIL: bdneal@kona.net

CONTENTS



FIGURES



TABLES

TABLES (cont.)





## 1.0 SUMMARY

The U.S. Department of Agriculture is proposing to develop the Pacific Basin Agricultural Research Center near the University of Hawaii at Hilo. The project site is located west of Komohana Street between Puainako Street and Nowelo Street. The proposed development will consist of office buildings, laboratory space and related facilities. Development of the project is expected to occur some time after 2002. This study examines the potential short- and long-term air quality impacts that could occur as a result of construction and use of the proposed facilities and suggests mitigative measures to reduce any potential air quality impacts where possible and appropriate.

Both federal and state standards have been established to maintain ambient air quality. At the present time, seven parameters are regulated including: particulate matter, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, ozone and lead. Hawaii air quality standards are more stringent than the comparable national standards except for those pertaining to sulfur dioxide and particulate matter.

Regional and local climate together with the amount and type of human activity generally dictate the air quality of a given location. The climate of the Hilo area is very much affected by its windward and coastal situation. Daytime winds are predominantly trade winds from easterly to northerly directions, while nighttime winds are mostly mountain drainage winds from the southwest. Wind speeds typically are relatively light varying between about 5 and 10 miles per hour. Temperatures in the Hilo area are very moderate with average daily minimum and maximum temperatures ranging from 66°F to 82°F. Rainfall is substantial with an average of 129 inches per year.

Except for occasional impacts from nearby volcanic emissions and possibly occasional localized impacts from traffic congestion, the present air quality of the project area is believed to be relatively good. The limited air quality data that are available for the area from the Hawaii Department of Health indicate that concentrations are well within state and federal air quality standards.

If the proposed project is given the necessary approvals to proceed, it may be inevitable that some short- and/or long-term impacts on air quality will occur either directly or indirectly as a consequence of project construction and use. Short-term impacts from fugitive dust will likely occur during the project construction phase. To a lesser extent, exhaust emissions from stationary and mobile construction equipment, from the disruption of traffic, and from workers' vehicles may also affect air quality during the period of construction. State air pollution control regulations require that there be no visible fugitive dust emissions at the property line. Hence, an effective dust control plan must be implemented to ensure compliance with state regulations. Fugitive dust emissions can be controlled to a large extent by watering of active work areas, using wind screens, keeping adjacent paved roads clean, and by covering of open-bodied trucks. Other dust control measures could include limiting the area that can be disturbed at any given time and/or mulching or chemically stabilizing inactive areas that have been worked. Paving and landscaping of project areas early in the construction schedule will also reduce dust emissions. Monitoring dust at the project boundary during the period of construction could be considered as



a means to evaluate the effectiveness of the project dust control program. Exhaust emissions can be mitigated by moving construction equipment and workers to and from the project site during off-peak traffic hours.

After construction, motor vehicles coming to and from the proposed development will result in a long-term increase in air pollution emissions in the project area. To assess the impact of emissions from these vehicles, an air quality modeling study was undertaken to estimate current ambient concentrations of carbon monoxide at two intersections in the project vicinity and to predict future levels both with and without the proposed project. During worst-case conditions, model results indicated that present 1-hour and 8-hour carbon monoxide concentrations are probably well within both the national and the state ambient air quality standards in the project area.

In the year 2010 without the project, carbon monoxide concentrations were predicted to increase due to higher traffic volumes and the assumed installation of traffic signals, but they should remain within the national and the state ambient air quality standards. With the project in the year 2010, worst-case carbon monoxide concentration levels within the project area were predicted to remain virtually unchanged compared to the without project case. Implementing any air quality mitigation measures for long-term traffic-related impacts from the proposed project is probably unnecessary and unwarranted.

Depending on the demand levels, long-term impacts on air quality are also possible due to indirect emissions associated with a development's electrical power and solid waste disposal requirements. Quantitative estimates of these potential impacts were not made, but based on the nature and size of the project, any related impacts will likely be negligible.

## 2.0 INTRODUCTION

The U.S. Department of Agriculture (USDA) is proposing to develop the Pacific Basin Agricultural Research Center (PBARC) on approximately 30 acres of undeveloped land leased from the the State of Hawaii Department of Land and Natural Resources (DLNR). As indicated in Figure 1, the site is located along the west side of Komohana Street between Puainako Street and Nowelo Street. The proposed development will consist of about 122,575 square feet of gross floor area for office, administration, visitor's center, laboratory uses, greenhouses and insectary facilities. In addition to these facilities, 30,000 square feet of floor area will be constructed to provide offices and other facilities for the U.S. Forestry Service, Institute of Pacific Island Forestry. Interim access to the project will be provided by the existing watertank/substation access road off Komohana Street. Ultimately, an access road for the project will connect with the planned Nowelo Street extension west of Komohana Street. Development of the project will be completed some time after 2002.

The purpose of this study is to describe existing air quality in the project area and to assess the potential short-term and long-term direct and indirect air quality impacts that could result from construction and use of the proposed facilities. Measures to mitigate these impacts are suggested where possible and appropriate.



## 3.0 AMBIENT AIR QUALITY STANDARDS

Ambient concentrations of air pollution are regulated by both national and state ambient air quality standards (AAQS). National AAQS are specified in Section 40, Part 50 of the Code of Federal Regulations (CFR), while State of Hawaii AAQS are defined in Chapter 11-59 of the Hawaii Administrative Rules. Table 1 summarizes both the national and the state AAQS that are specified in the cited documents. As indicated in the table, national and state AAQS have been established for particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone and lead. The state has also set a standard for hydrogen sulfide. National AAQS are stated in terms of both primary and secondary standards for most of the regulated air pollutants. National primary standards are designed to protect the public health with an "adequate margin of safety". National secondary standards, on the other hand, define levels of air quality necessary to protect the public welfare from "any known or anticipated adverse effects of a pollutant". Secondary public welfare impacts may include such effects as decreased visibility, diminished comfort levels, or other potential injury to the natural or man-made environment, e.g., soiling of materials, damage to vegetation or other economic damage. In contrast to the national AAQS, Hawaii State AAQS are given in terms of a single standard that is designed "to protect public health and welfare and to prevent the significant deterioration of air quality".

Each of the regulated air pollutants has the potential to create or exacerbate some form of adverse health effect or to produce environmental degradation when present in sufficiently high concentration for prolonged periods of time. The AAQS specify a maximum allowable concentration for a given air pollutant for one or more averaging times to prevent harmful effects. Averaging times vary from one hour to one year depending on the pollutant and type of exposure necessary to cause adverse effects. In the case of the short-term (i.e., 1- to 24-hour) AAQS, both national and state standards allow a specified number of exceedances each year.

The Hawaii AAQS are in some cases considerably more stringent than the comparable national AAQS. In particular, the Hawaii 1-hour AAQS for carbon monoxide is four times more stringent than the comparable national limit, and the state 1-hour limit for ozone is more than two times as stringent as the national 1-hour standard. The national 1-hour ozone standard will be phased out (pending court appeal) the next few years in favor of the new (and more stringent) 8-hour standard.

The Hawaii AAQS for sulfur dioxide were relaxed in 1986 to make the state standards essentially the same as the national limits. In 1993, the state also revised its particulate standards to follow those set by the federal government. During 1997, the federal government again revised its standards for particulate, but the new standards have been challenged in federal court. To date, the Hawaii Department of Health has not updated the state particulate standards.

## 4.0 REGIONAL AND LOCAL CLIMATOLOGY

Regional and local climatology significantly affect the air quality of a given location. Climatological parameters that influence air quality include: wind, temperature, atmospheric turbulence, mixing height and rainfall. Although the climate of



Hawaii is relatively moderate throughout most of the state, significant differences in these parameters may occur from one location to another. Most differences in regional and local climates within the state are caused by the mountainous topography.

The entire state of Hawaii lies well within the belt of northeasterly trade winds generated by the semi-permanent Pacific high pressure cell to the north and east of the islands. Areas along the eastern coasts of the islands are particularly affected by the trade winds and are usually well-ventilated nearly year round. Although Hilo is situated along the eastern coast of Hawaii Island, the high mountains of Mauna Loa and Mauna Kea significantly modify the trade wind influence. The nearest long-term wind data available for the project area are collected at the Hilo Airport located about 1 mile to the east. These data are probably reasonably representative of the project corridor. Mean annual wind speed at the airport is about 8 mph, which is lower than many windward locations in the state, and wind directions are bimodal showing either a northeast or southwest preference [1]. Northeast trade winds typically occur during the daytime, while winds from the southwest typically occur during the nighttime due to cold air drainage from the mountains. Winds from the south or southwest also occur occasionally in association with winter storms.

Air pollution emissions from motor vehicles, the formation of photochemical smog and smoke plume rise all depend in part on air temperature. Colder temperatures tend to result in higher emissions of contaminants from automobiles but lower concentrations of photochemical smog and ground-level concentrations of air pollution from stack sources. In Hawaii, the annual and daily variation of temperature depends to a large degree on elevation above sea level, distance inland and exposure to the trade winds. Average temperatures at locations near sea level generally are warmer than those at higher elevations. Areas exposed to the trade winds tend to have the least temperature variation, while inland and leeward areas often have the most. At nearby Hilo Airport, average annual daily minimum and maximum temperatures are 66°F and 82°F, respectively. The extreme minimum temperature on record is 53°F, and the extreme maximum is 94°F [2]. Temperatures along the lower portions of the project corridor are probably very similar, while those along the higher elevations are probably slightly cooler.

Small scale, random motions in the atmosphere (turbulence) cause air pollutants to be dispersed as a function of distance or time from the point of emission. Turbulence is caused by both mechanical and thermal forces in the atmosphere. It is often measured and described in terms of Pasquill-Gifford stability class. Stability class 1 is the most turbulent and class 6 the least. Thus, air pollution dissipates the best during stability class 1 conditions and the worst when stability class 6 prevails. In the Hilo area, stability classes 5 or 6 occasionally occur, developing during clear, calm nighttime or early morning hours when temperature inversions form due to radiational cooling or to drainage flow from the mountainous interior of the island. Stability classes 1 through 4 occur during the daytime, depending mainly on the amount of cloud cover and incoming solar radiation and the onset and extent of the sea breeze.

Mixing height is defined as the height above the surface through which relatively vigorous vertical mixing occurs. Low mixing



heights can result in high ground-level air pollution concentrations because contaminants emitted from or near the surface can become trapped within the mixing layer. In Hawaii, minimum mixing heights tend to be high because of mechanical mixing caused by the trade winds and because of the temperature moderating effect of the surrounding ocean. Low mixing heights may sometimes occur, however, at inland locations and even at times along coastal areas early in the morning following a clear, cool, windless night. Coastal areas also may experience low mixing levels during sea breeze conditions when cooler ocean air rushes in over warmer land. Mixing heights in Hawaii typically are above 3000 feet (1000 meters).

Rainfall can have a beneficial affect on the air quality of an area in that it helps to suppress fugitive dust emissions, and it also may "washout" gaseous contaminants that are water soluble. Rainfall in Hawaii is highly variable depending on elevation and on location with respect to the trade wind. The Hilo area has a wet climate. Normal annual rainfall for Hilo Airport is about 129 inches [2]. This is distributed fairly evenly throughout the year, although the summer months are slightly drier.

## 5.0 PRESENT AIR QUALITY

Air quality in the vicinity of the proposed project is currently mostly affected by emissions from motor vehicles, industry and natural sources. Table 2 presents an air pollutant emission summary for the island of Hawaii for calendar year 1993. The emission rates shown in the table pertain to manmade emissions only, i.e., emissions from natural sources are not included. As suggested in the table, much of the manmade particulate emissions on Hawaii originate from area sources, such as the mineral products industry and agriculture. Manmade sulfur oxides are emitted almost exclusively by point sources, such as power plants and other fuel-burning industries. Nitrogen oxides emissions emanate predominantly from area sources (mostly motor vehicle traffic), although industrial point sources contribute a significant share. The majority of carbon monoxide emissions occur from area sources (motor vehicle traffic), while hydrocarbons are emitted mainly from point sources.

Perhaps the dominant air quality factor in the Hilo area for the past several years has been the volcanic emissions from Kilauea Volcano, although the prevailing winds carry emissions away from the Hilo area much of the time. Most of these emissions occur as sulfur dioxide and then subsequently convert into particulate sulfate, which causes a volcanic haze (vog) to blanket the area during kona wind conditions. The major industrial sources in the area are oil-burning power plants, which primarily emit sulfur dioxide, nitrogen oxides and particulate matter. Motor vehicles emit carbon monoxide, nitrogen oxides, hydrocarbons (an ozone precursor) and smaller amounts of other pollutants.

The State Department of Health (DOH) operates a network of air quality monitoring stations at various locations around the state. Each station, however, typically does not monitor the full complement of air quality parameters. Only very limited data are available for the Hilo area. DOH has operated an air quality monitoring station on the grounds of the Adult Rehabilitation Center of Hilo at 1099 Waianuenue Avenue since March 1995, but data for the station have only been reported in annual summaries to date for the years 1999 and 2000. The published data for this station are shown in Table 3 and discussed below.



Measurements of sulfur dioxide concentrations at the Hilo monitoring station during 1999 and 2000 were generally low with an annual average concentration of only 2 to 4 $\mu g/m^3$. This represents about 4 percent of the state and national standard. Occasional elevated short-term concentrations were measured at the site, which are probably volcanic related. The highest second-highest 3-hour and 24-hour concentrations (which are most relevant to the standards) for the two years were 402 and 88 $\mu g/m^3$, respectively; these are about 25 to 30 percent of the applicable standards. No exceedances of the state/national 3-hour and 24-hour AAQS for sulfur dioxide were recorded during 1999 and 2000.

The annual average particulate concentrations for 1999 and 2000 were each 11 $\mu g/m^3$, which equates to about 20 percent of the state/national standard. The annual second-highest 24-hour concentration of particulate matter was 19 $\mu g/m^3$ in 1999 and 16 $\mu g/m^3$ in 2000. These concentrations are about 11 to 13 percent of the state/national standard, and there were no violations of the state/national AAQS during the two-year monitoring period.

At this time, there are no reported measurements of lead, ozone, nitrogen dioxide or carbon monoxide in the project vicinity. These are primarily motor vehicle related air pollutants. Lead, ozone and nitrogen dioxide typically are regional scale problems; concentrations of these contaminants generally have not been found to exceed AAQS elsewhere in the state. Carbon monoxide air pollution, on the other hand, typically is a microscale problem caused by congested motor vehicular traffic. In traffic congested areas such as urban Honolulu, carbon monoxide concentrations have been found to occasionally exceed the state AAQS. Present concentrations of carbon monoxide in the project area are estimated later in this study based on computer modeling of motor vehicle emissions.

## 6.0 SHORT-TERM IMPACTS OF PROJECT

Short-term direct and indirect impacts on air quality could potentially occur due to project construction. For a project of this nature, there are two potential types of air pollution emissions that could directly result in short-term air quality impacts during project construction: (1) fugitive dust from vehicle movement and soil excavation; and (2) exhaust emissions from on-site construction equipment. Indirectly, there also could be short-term impacts related to slow-moving construction equipment traveling to and from the project site and from a temporary increase in local traffic caused by commuting construction workers.

Fugitive dust emissions may arise from the grading and dirt-moving activities associated with site clearing and preparation work. The emission rate for fugitive dust emissions from construction activities is difficult to estimate accurately. This is because of its elusive nature of emission and because the potential for its generation varies greatly depending upon the type of soil at the construction site, the amount and type of dirt-disturbing activity taking place, the moisture content of exposed soil in work areas, and the wind speed. The EPA [3] has provided a rough estimate for uncontrolled fugitive dust emissions from construction activity of 1.2 tons per acre per month under conditions of "medium" activity, moderate soil silt content (30%),



and precipitation/evaporation (P/E) index of 50. Uncontrolled fugitive dust emissions in the project area would likely be somewhere near that level, or possibly lower due to the high amount of rainfall that occurs. In any case, State of Hawaii Air Pollution Control Regulations [4] prohibit visible emissions of fugitive dust from construction activities at the property line. Thus, an effective dust control plan for the project construction phase is essential.

Adequate fugitive dust control can usually be accomplished by the establishment of a frequent watering program to keep bare-dirt surfaces in construction areas from becoming significant sources of dust. In dust-prone or dust-sensitive areas, other control measures such as limiting the area that can be disturbed at any given time, applying chemical soil stabilizers, mulching and/or using wind screens may be necessary. Control regulations further stipulate that open-bodied trucks be covered at all times when in motion if they are transporting materials that could be blown away. Haul trucks tracking dirt onto paved streets from unpaved areas is often a significant source of dust in construction areas. Some means to alleviate this problem, such as road cleaning or tire washing, may be appropriate. Paving of parking areas and/or establishment of landscaping as early in the construction schedule as possible can also lower the potential for fugitive dust emissions. Monitoring dust at the project property line could be considered to quantify and document the effectiveness of dust control measures.

On-site mobile and stationary construction equipment also will emit air pollutants from engine exhausts. The largest of this equipment is usually diesel-powered. Nitrogen oxides emissions from diesel engines can be relatively high compared to gasoline-powered equipment, but the standard for nitrogen dioxide is set on an annual basis and is not likely to be violated by short-term construction equipment emissions. Carbon monoxide emissions from diesel engines, on the other hand, are low and should be relatively insignificant compared to vehicular emissions on nearby roadways.

Slow-moving construction vehicles traveling on roadways leading to and from the project site could obstruct the normal flow of traffic to such an extent that overall vehicular emissions are increased, but this impact can be mitigated by moving heavy construction equipment during periods of low traffic volume. Likewise, the schedules of commuting construction workers can be adjusted to avoid peak hours in the project vicinity. Thus, most potential short-term air quality impacts from project construction can be mitigated.

## 7.0 LONG-TERM IMPACTS OF PROJECT

### 7.1 Roadway Traffic

After construction is completed, use of the proposed facilities will result in increased motor vehicle traffic on nearby roadways, potentially causing long-term impacts on ambient air quality in the project vicinity. Motor vehicles with gasoline-powered engines are significant sources of carbon monoxide. They also emit nitrogen oxides and other contaminates.

Federal air pollution control regulations require that new motor vehicles be equipped with emission control devices that reduce emissions significantly compared to a few years ago. In 1990, the



President signed into law the Clean Air Act Amendments. This legislation requires further emission reductions, which have been phased in since 1994. More recently, additional restrictions were signed into law during the Clinton administration, which will begin to take effect during the next decade. The added restrictions on emissions from new motor vehicles will lower average emissions each year as more and more older vehicles leave the state's roadways. Carbon monoxide emissions, for example, will go down by an average of about 10 percent per vehicle during the next 10 years due to the replacement of older vehicles with newer models.

To evaluate the potential long-term indirect ambient air quality impact of the roadway traffic associated with a project such as this, computerized emission and atmospheric dispersion models can be used to estimate ambient carbon monoxide concentrations along roadways leading to and from the project. Carbon monoxide is selected for modeling because it is both the most stable and the most abundant of the pollutants generated by motor vehicles. Furthermore, carbon monoxide air pollution is generally considered to be a microscale problem that can be addressed locally to some extent, whereas nitrogen oxides air pollution most often is a regional issue that cannot be addressed by a single new development.

For this project, three scenarios were selected for the carbon monoxide modeling study: (1) year 2001 with present conditions, (2) year 2010 without the project, and (3) year 2010 with the project. To begin the modeling study, critical receptor areas in the vicinity of the project were identified for analysis. Generally speaking, roadway intersections are the primary concern because of traffic congestion and because of the increase in vehicular emissions associated with traffic queuing. For this study, intersections identified by the project traffic engineers as being impacted by the project were selected for air quality analysis. These included the following two intersections: Puainako Street at Komohana Street and Nowelo Street at Komohana Street. Intersection configurations and traffic conditions at each of these two locations are detailed in the traffic impact report for the project [5]. It should be noted that the air quality analysis for the future with-project scenario focused on the case identified as Scenario 2 in the traffic study. This is the case where the project access road is connected with the future planned extension of Nowelo Street.

The main objective of the modeling study was to estimate maximum 1-hour average carbon monoxide concentrations for each of the three scenarios studied. To evaluate the significance of the estimated concentrations, a comparison of the predicted values for each scenario can be made. Comparison of the estimated values to the national and state AAQS was also used to provide another measure of significance.

Maximum carbon monoxide concentrations typically coincide with peak traffic periods. The traffic impact assessment report evaluated morning and afternoon peak traffic periods. These same periods were evaluated in the air quality impact assessment.

The EPA computer model MOBILE5A [6] was used to calculate vehicular carbon monoxide emissions for each year studied. One of the key inputs to MOBILE5A is vehicle mix. Unless very detailed information is available, national average values are typically assumed, which is what was used for the present study. Based on



national average vehicle mix figures, the present vehicle mix in the project area was estimated to be 61.3% light-duty gasoline-powered automobiles, 27.8% light-duty gasoline-powered trucks and vans, 3.1% heavy-duty gasoline-powered vehicles, 0.3% light-duty diesel-powered vehicles, 6.9% heavy-duty diesel-powered trucks and buses, and 0.6% motorcycles. For the future scenarios studied, the vehicle mix was estimated to change only slightly with fewer light-duty gasoline-powered automobiles and more light-duty gasoline-powered trucks and vans.

Other key inputs to the MOBILE5A emission model are the cold/hot start fractions. Motor vehicles operating in a cold- or hot-start mode emit excess air pollution. Typically, motor vehicles reach stabilized operating temperatures after about 4 miles of driving. For traffic operating on roadways within the project area, it was assumed that about 21 percent of all vehicles would be operating in the cold-start mode and that about 27 percent would be operating in the hot-start mode. These are typical default (national average) values.

Ambient temperatures of 59 and 68 degrees F were used for morning and afternoon peak-hour emission computations, respectively. These are conservative assumptions since morning/afternoon ambient temperatures will generally be warmer than this, and emission estimates given by MOBILE5A are inversely proportional to the ambient temperature.

After computing vehicular carbon monoxide emissions through the use of MOBILE5A, these data were then input to an atmospheric dispersion model. EPA air quality modeling guidelines [7] currently recommend that the computer model CAL3QHC [8] be used to assess carbon monoxide concentrations at roadway intersections, or in areas where its use has previously been established, CALINE4 (9) may be used. Until a few years ago, CALINE4 was used extensively in Hawaii to assess air quality impacts at roadway intersections. In December 1997, the California Department of Transportation recommended that the intersection mode of CALINE4 no longer be used because it was thought the model has become outdated. Studies have shown that CALINE4 may tend to over-predict maximum concentrations in some situations. Therefore, CAL3QHC was used for the subject analysis.

CAL3QHC was developed for the U.S. EPA to simulate vehicular movement, vehicle queuing and atmospheric dispersion of vehicular emissions near roadway intersections. It is designed to predict 1-hour average pollutant concentrations near roadway intersections based on input traffic and emission data, roadway/receptor geometry and meteorological conditions.

Although CAL3QHC is intended primarily for use in assessing atmospheric dispersion near signalized roadway intersections, it can also be used to evaluate unsignalized intersections. This is accomplished by manually estimating queue lengths and then applying the same techniques used by the model for signalized intersections. Currently, neither of the two study intersections along Komohana Street is signalized. In the future, in accordance with the traffic report, both the Puainako Street and the Nowelo Street intersections with Komohana Street were assumed to be signalized.



Input peak-hour traffic data were obtained from the traffic study cited previously. This included vehicle approach volumes, saturation capacity estimates, intersection laneage and signal timings (where applicable). All emission factors that were input to CAL3QHC for free-flow traffic on roadways were obtained from MOBILE5A based on assumed free-flow vehicle speeds corresponding to the posted speed limits (25 to 45 mph depending on location).

Model roadways were set up to reflect roadway geometry, physical dimensions and operating characteristics. Concentrations predicted by air quality models generally are not considered valid within the roadway-mixing zone. The roadway-mixing zone is usually taken to include 3 meters on either side of the traveled portion of the roadway and the turbulent area within 10 meters of a cross street. Model receptor sites were thus located at the edges of the mixing zones near all intersections that were studied. This implies that pedestrian sidewalks either do exist or are assumed to exist in the future. All receptor heights were placed at 1.5 meters above ground to simulate levels within the normal human breathing zone.

Input meteorological conditions for this study were defined to provide "worst-case" results. One of the key meteorological inputs is atmospheric stability category. For these analyses, atmospheric stability category 5 was assumed for the morning cases, while atmospheric stability category 4 was assumed for the afternoon cases. These are the most conservative stability categories that are generally used for estimating worst-case pollutant dispersion within suburban areas for these periods. A surface roughness length of 100 cm and a mixing height of 1000 meters were used in all cases. Worst-case wind conditions were defined as a wind speed of 1 meter per second with a wind direction resulting in the highest predicted concentration. Concentration estimates were calculated at wind directions of every 5 degrees.

Existing background concentrations of carbon monoxide in the project vicinity are believed to be at low levels. Thus, background contributions of carbon monoxide from sources or roadways not directly considered in the analysis were accounted for by adding a background concentration of 0.5 ppm to all predicted concentrations for 2001. Although increased traffic is expected to occur within the project area within the next several years with or without the project, background carbon monoxide concentrations may not change significantly since individual emissions from motor vehicles are forecast to decrease with time. Hence, a background value of 0.5 ppm was assumed to persist for the future scenarios studied.

Predicted Worst-Case 1-Hour Concentrations

Table 4 summarizes the final results of the modeling study in the form of the estimated worst-case 1-hour morning and afternoon ambient carbon monoxide concentrations. These results can be compared directly to the state and the national AAQS. Estimated worst-case carbon monoxide concentrations are presented in the table for three scenarios: year 2001 with existing traffic, year 2010 without the project and year 2010 with the project. The locations of these estimated worst-case 1-hour concentrations all occurred at or very near the indicated intersections.

As indicated in the table, the highest estimated 1-hour concentration within the project vicinity for the present (2001) case was



5.5 $mg/m^3$. This was projected to occur during the afternoon peak traffic hour near the intersection of Puainako Street and Komohana Street. Concentrations at other locations and times studied were 5.3 $mg/m^3$ or lower. All predicted worst-case 1-hour concentrations for the 2001 scenario were well within both the national AAQS of 40 $mg/m^3$ and the state standard of 10 $mg/m^3$.

In the year 2010 without the proposed project, a worst-case 1-hour concentration of 8.7 $mg/m^3$ was predicted to occur during the morning peak-traffic hour near the intersection of Nowelo Street and Komohana Street. Peak-hour worst-case values at the other locations and times studied for the 2010 without project scenario ranged between about 6 and 8 $mg/m^3$. Although the predicted concentrations increased substantially compared to the existing case, especially at the Nowelo Street intersection, the concentrations remained within the standards. The projected increase was due both to higher traffic volumes and the assumed installation of traffic signals.

Predicted 1-hour worst-case concentrations for the 2010 with project scenario were essentially unchanged compared to the 2010 without project scenario, with the project showing virtually no impact. All predicted worst-case 1-hour concentrations for the 2010 with project scenario were within both the national and the state AAQS.

Predicted Worst-Case 8-Hour Concentrations

Worst-case 8-hour carbon monoxide concentrations were estimated by multiplying the worst-case 1-hour values by a persistence factor of 0.5. This accounts for two factors: (1) traffic volumes averaged over eight hours are lower than peak 1-hour values, and (2) meteorological conditions are more variable (and hence more favorable for dispersion) over an 8-hour period than they are for a single hour. Based on monitoring data, 1-hour to 8-hour persistence factors for most locations generally vary from 0.4 to 0.8 with 0.6 being the most typical. One recent study based on modeling [10] concluded that 1-hour to 8-hour persistence factors could typically be expected to range from 0.4 to 0.5. EPA guidelines [11] recommend using a value of 0.7 unless a locally derived persistence factor is available. Recent monitoring data for locations on Oahu reported by the Department of Health [12] suggest that this factor may range between about 0.2 and 0.6 depending on location and traffic variability. Considering the location of the project and the traffic pattern for the area, a 1-hour to 8-hour persistence factor of 0.5 will likely yield reasonable estimates of worst-case 8-hour concentrations.

The resulting estimated worst-case 8-hour concentrations are indicated in Table 5. For the 2001 scenario, the estimated worst-case 8-hour carbon monoxide concentrations for the two locations studied ranged from 1.3 $mg/m^3$ at the Nowelo Street intersection to 2.8 $mg/m^3$ at the Puainako Street intersection. The estimated worst-case concentrations were well within both the state standard of 5 $mg/m^3$ and the national limit of 10 $mg/m^3$.

For the year 2010 without project scenario, worst-case concentrations ranged between 3.9 and 4.4 $mg/m^3$, increasing substantially compared to the existing concentrations but remaining within the standards. The projected increase was due both to higher traffic volumes and the assumed installation of traffic signals.



For the 2010 with project scenario, worst-case concentrations remained unchanged compared to the without project case, indicating no project impact. All predicted 8-hour concentrations for this scenario were within both the national and the state AAQS.

Conservativeness of Estimates

The results of this study reflect several assumptions that were made concerning both traffic movement and worst-case meteorological conditions. One such assumption concerning worst-case meteorological conditions is that a wind speed of 1 meter per second with a steady direction for 1 hour will occur. A steady wind of 1 meter per second blowing from a single direction for an hour is extremely unlikely and may occur only once a year or less. With wind speeds of 2 meters per second, for example, computed carbon monoxide concentrations would be only about half the values given above. The 8-hour estimates are also conservative in that it is unlikely that anyone would occupy the assumed receptor sites (within 3 m of the roadways) for a period of 8 hours.

### 7.2 Electrical Demand

The proposed project also will cause indirect air pollution emissions from power generating facilities as a consequence of electrical power usage. Electrical power for the project will most probably be provided mainly by oil-fired generating facilities located in Hilo, but some of the project power could also come from geothermal power plants or other sources. In order to meet the electrical power needs of the proposed project, it is probable that power generating facilities will be required to burn more fuel and hence more air pollution will be emitted at fuel-burning power generation facilities.

Estimates of project electrical demand were not available, but it is anticipated that for a project of this nature and size that any related impacts on air quality will be negligible.

### 7.3 Solid Waste Disposal Demand

Currently, all solid waste on the island is buried at solid waste landfills. Thus, assuming this continues to be the method for solid waste disposal, the only associated air pollution emissions that will occur from solid waste disposal will be from trucking the waste to the landfill and burying it. Estimates of project solid waste disposal demand were not available, but it is anticipated that for a project of this nature and size that any related impacts on air quality will be negligible.

## 8.0 CONCLUSIONS AND RECOMMENDATIONS

The major potential short-term air quality impact of the project will occur from the emission of fugitive dust during construction. Uncontrolled fugitive dust emissions from construction activities are estimated to amount to about 1.2 tons per acre per month, depending on rainfall. To control dust, active work areas and any temporary unpaved work roads should be watered at least twice daily on days without rainfall. Use of windscreens and/or limiting the area that is disturbed at any given time will also help to contain fugitive dust emissions. Wind erosion of inactive areas of the site that have been disturbed could be controlled by mulching or by the use of chemical soil stabilizers. Dirt-hauling



trucks should be covered when traveling on roadways to prevent windage. A routine road cleaning and/or tire washing program will also help to reduce fugitive dust emissions that may occur as a result of trucks tracking dirt onto paved roadways in the project area. Paving of parking areas and establishment of landscaping early in the construction schedule will also help to control dust. Monitoring dust at the project boundary during the period of construction could be considered as a means to evaluate the effectiveness of the project dust control program and to adjust the program if necessary.

During construction phases, emissions from engine exhausts (primarily consisting of carbon monoxide and nitrogen oxides) will also occur both from on-site construction equipment and from vehicles used by construction workers and from trucks traveling to and from the project. Increased vehicular emissions due to disruption of traffic by construction equipment and/or commuting construction workers can be alleviated by moving equipment and personnel to the site during off-peak traffic hours.

After the proposed project is completed, any long-term impacts on air quality in the project area due to emissions from project-related motor vehicle traffic will be negligible. Worst-case concentrations of carbon monoxide should remain well within both the state and the national ambient air quality standards. Implementing any air quality mitigation measures for long-term traffic-related impacts is probably unnecessary and unwarranted.

Quantitative estimates of the project's electrical and solid waste demands were not available, but given the project's nature and size, it can be anticipated that any related indirect impacts on air quality will be negligible.



## REFERENCES


1. Atlas of Hawaii, Second Edition, Department of Geography, University of Hawaii, University of Hawaii Press, Honolulu, 1983.

2. "Local Climatological Data, Annual Summary With Comparative Data, Hilo, Hawaii, 1993", U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service, National Climatic Center, Asheville, NC.

3. Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Fifth Edition, AP-42, U.S. Environmental Protection Agency, Research Triangle Park, NC, January 1995.

4. State of Hawaii. Hawaii Administrative Rules, Chapter 11-60, Air Pollution Control.

5. Phillip Rowell and Associates, Traffic Impact Assessment for U.S. Department of Agriculture Pacific Basin Agricultural Research Center, Draft, January 7, 2002.

6. User's Guide to MOBILE5A (Mobile Source Emission Factor Model), U.S. Environmental Protection Agency, Office of Air and Radiation, Office of Mobile Sources, Emission Control Technology Division, Test and Evaluation Branch, Ann Arbor, Michigan, May 1994.

7. Guideline on Air Quality Models (Revised), Including Supplements A and B, EPA-450/2-78-027R, U.S. Environmental Protection Agency, Research Triangle Park, NC, July 1986.

8. User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections, U.S. Environmental Protection Agency, November 1992.

9. CALINE4 - A Dispersion Model for Predicting Air Pollutant Concentrations Near Roadways, FHWA/CA/TL-84/15, California State Department of Transportation, November 1984 with June 1989 Revisions.

10. "Persistence Factors for Mobile Source (Roadway) Carbon Monoxide Modeling", C. David Cooper, Journal of the Air & Waste Management Association, Volume 39, Number 5, May 1989.

11. Guideline for Modeling Carbon Monoxide from Roadway Intersections, U.S. Environmental Protection Agency, EPA-454/R-92-005, November 1992.

12. Hawaii Air Quality Data for the Period of January 1996 to December 2000, State of Hawaii Department of Health.



Figure 1 - Project Location Map

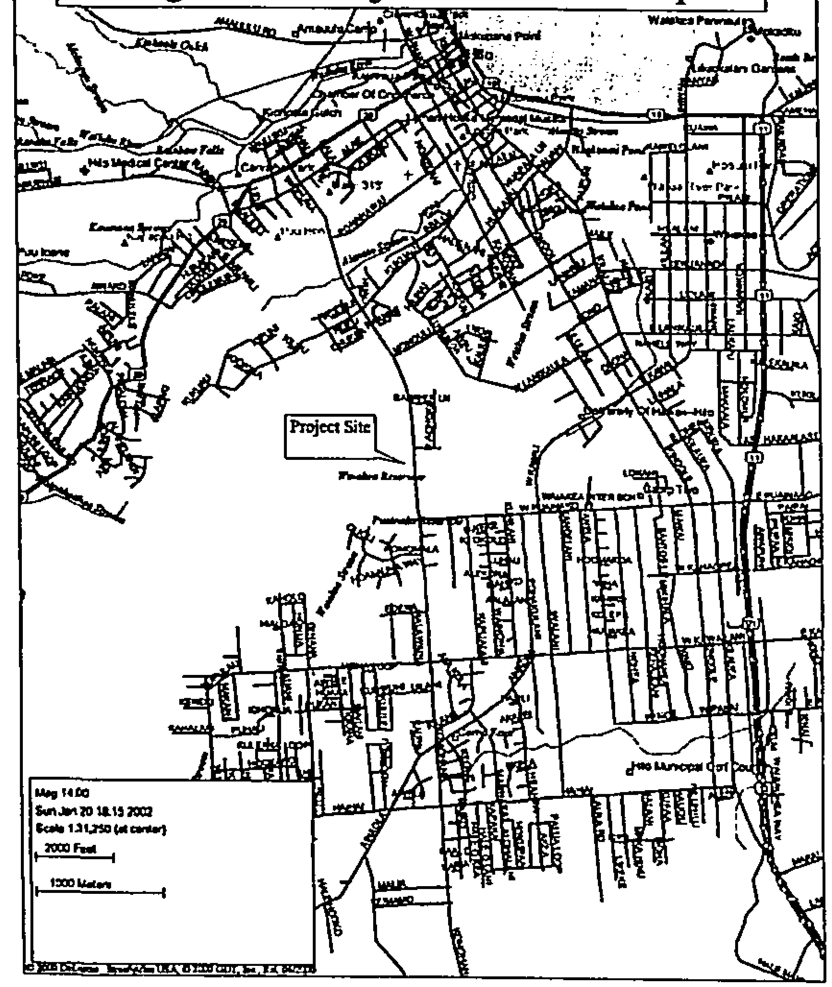


**Table 1**

**SUMMARY OF STATE OF HAWAII AND NATIONAL AMBIENT AIR QUALITY STANDARDS**

| Pollutant | Units | Averaging Time | Maximum Allowable Concentration | | |
|---|---|---|---|---|---|
| | | | National Primary | National Secondary | State of Hawaii |
| Particulate Matter (<10 microns) | µg/m³ | Annual<br>24 Hours | $50^{a}$<br>$150^{b}$ | $50^{a}$<br>$150^{b}$ | 50<br>$150^{c}$ |
| Particulate Matter (<2.5 microns) | µg/m³ | Annual<br>24 Hours | $15^{a}$<br>$65^{d}$ | $15^{a}$<br>$65^{d}$ | -<br>- |
| Sulfur Dioxide | µg/m³ | Annual<br>24 Hours<br>3 Hours | 80<br>$365^{c}$<br>- | -<br>-<br>$1300^{c}$ | 80<br>$365^{c}$<br>$1300^{c}$ |
| Nitrogen Dioxide | µg/m³ | Annual | 100 | 100 | 70 |
| Carbon Monoxide | mg/m³ | 8 Hours<br>1 Hour | $10^{c}$<br>$40^{c}$ | -<br>- | $5^{c}$<br>$10^{c}$ |
| Ozone | µg/m³ | 8 Hours<br>1 Hour | $157^{e}$<br>$235^{f}$ | $157^{e}$<br>$235^{f}$ | -<br>$100^{c}$ |
| Lead | µg/m³ | Calendar Quarter | 1.5 | 1.5 | 1.5 |
| Hydrogen Sulfide | µg/m³ | 1 Hour | - | - | $35^{c}$ |

[a] Three-year average of annual arithmetic mean.
[b] 99th percentile value averaged over three years.
[c] Not to be exceeded more than once per year.
[d] 98th percentile value averaged over three years.
[e] Three-year average of fourth-highest daily 8-hour maximum.
[f] Standard is attained when the expected number of exceedances is less than or equal to 1.

Note: Standards for particulate matter (<2.5 microns) and for 8-hour ozone are subject to court appeal.

**Table 2**

**AIR POLLUTION EMISSIONS INVENTORY FOR ISLAND OF HAWAII, 1993**

| Air Pollutant | Point Sources (tons/year) | Area Sources (tons/year) | Total (tons/year) |
|---|---|---|---|
| Particulate | 30,311 | 9,157 | 39,468 |
| Sulfur Oxides | 9,345 | nil | 9,345 |
| Nitrogen Oxides | 4,054 | 8,858 | 12,912 |
| Carbon Monoxide | 3,357 | 23,934 | 27,291 |
| Hydrocarbons | 1,477 | 203 | 1,680 |

Source: Final Report, "Review, Revise and Update of the Hawaii Emissions Inventory Systems for the State of Hawaii", prepared for Hawaii Department of Health by J.L. Shoemaker & Associates, Inc., 1996

### Table 3

**ANNUAL SUMMARIES OF AIR QUALITY MEASUREMENTS FOR MONITORING STATIONS NEAREST USDA PBARC PROJECT**

| Parameter / Location | 1999 | 2000 |
|---|---|---|
| Sulfur Dioxide / Hilo | | |
| Period of Sampling (months) | 12 | 12 |
| 3-Hour Averaging Period: | | |
| No. of Samples | 2816 | 2277 |
| Highest Concentration (µg/m³) | 652 | 438 |
| 2nd Highest Concentration (µg/m³) | 402 | 301 |
| No. of State AAQS Exceedances | 0 | 0 |
| 24-Hour Averaging Period: | | |
| No. of Samples | 362 | 284 |
| Highest Concentration (µg/m³) | 111 | 94 |
| 2nd Highest Concentration (µg/m³) | 88 | 73 |
| No. of State AAQS Exceedances | 0 | 0 |
| Annual Average Concentration (µg/m³) | 2 | 4 |
| Particulate (PM-10) / Hilo | | |
| Period of Sampling (months) | 12 | 12 |
| 24-Hour Averaging Period: | | |
| No. of Samples | 42 | 41 |
| Highest Concentration (µg/m³) | 30 | 18 |
| 2nd Highest Concentration (µg/m³) | 19 | 16 |
| No. of State AAQS Exceedances | 0 | 0 |
| Annual Average Concentration (µg/m³) | 11 | 11 |

Source: State of Hawaii Department of Health, "Annual Summary, Hawaii Air Quality Data, 1999 and 2000"

### Table 4

**ESTIMATED WORST-CASE 1-HOUR CARBON MONOXIDE CONCENTRATIONS AT SELECTED INTERSECTIONS NEAR USDA PACIFIC BASIN AGRICULTURAL RESEARCH CENTER PROJECT (milligrams per cubic meter)**

| Roadway Intersection | Year/Scenario | | | | | |
|---|---|---|---|---|---|---|
| | 2001/Present | | 2010/Without Project | | 2010/With Project | |
| | AM | PM | AM | PM | AM | PM |
| Puainako Street at Komohana Street | 5.3 | 5.5 | 7.8 | 7.8 | 7.9 | 7.9 |
| Nowelo Street at Komohana Street | 2.6 | 1.8 | 8.7 | 6.3 | 8.7 | 6.3 |

Hawaii State AAQS: 10
National AAQS: 40

**Table 5**

**ESTIMATED WORST-CASE 8-HOUR CARBON MONOXIDE CONCENTRATIONS AT SELECTED INTERSECTIONS NEAR USDA PACIFIC BASIN AGRICULTURAL RESEARCH CENTER PROJECT (milligrams per cubic meter)**

| Roadway Intersection | Year/Scenario | | |
|---|---|---|---|
| | 2001/Present | 2010/Without Project | 2010/With Project |
| Puainako Street at Komohana Street | 2.8 | 3.9 | 3.9 |
| Nowelo Street at Komohana Street | 1.3 | 4.4 | 4.4 |

Hawaii State AAQS: 5
National AAQS: 10

# APPENDIX G

## *Environmental Noise Assessment Study*

Prepared By:
D.L. Adams Associates, Ltd. (March 2002)

Project No. 00-24

# ENVIRONMENTAL NOISE ASSESSMENT STUDY
# USDA PACIFIC BASIN AGRICULTURAL CENTER
# HILO, HAWAII

March 21, 2002

Prepared for
SSFM International, Inc.
Honolulu, Hawaii

## CONTENTS

## 1.0 SUMMARY

1.1 The project site is currently exposed to daytime equivalent sound levels, Leq, ranging from 29 to 52 dBA with the dominant noise sources being distant traffic noise and birds.

1.2 Existing noise sensitive areas include residential areas and several schools.

1.3 The dominant noise sources during project construction will probably be earthmoving equipment such as bulldozers and diesel-powered trucks, assuming pile driving equipment will not be required. Noise from construction activities should be short term, occur only during daytime hours, and must comply with Hawaii Department of Health noise regulations.

1.4 The main noise source following the completion of the project will be due to vehicular traffic entering and exiting the research center. The noise emanating from these vehicles could impact nearby noise sensitive areas along the surrounding roadways.

1.5 Predicted traffic noise level increases along local roadways in the vicinity of the project were determined to be less than 1 dBA, which is below the threshold of perceptible change in noise level for most people and is not considered significant.

## 2.0 PROJECT DESCRIPTION

The project involves construction of an agricultural research facility. The project site is 30 acres of undeveloped land located on the southwestern edge of downtown Hilo, at the southwest corner of existing Komohana Street and future Nowelo Street extension, and near the University of Hawaii at Hilo (UHH) campus as shown on Figure 1. The current design, shown in Figure 2, for the facility includes three buildings, one for the Entry, Arboretum, Administration, and Laboratories, a second for a Green House, and a third for an Insectary. The design also calls for a visitor parking lot, a secured staff parking lot that allows for deliveries, a wastewater treatment plant, cooling towers and a chiller plant for central air conditioning, a generator for emergency back-up power, and about five acres allocated for a U.S. Forest Service facility. Entry into the research facility will connect to the future Nowelo Street extension.



## 3.0 NOISE GUIDELINES AND STANDARDS

Various local and federal agencies have established guidelines and standards for assessing environmental noise impacts and set noise limits as a function of land use. A brief description of common acoustic terminology used in these guidelines and standards is presented in Appendix A.

### 3.1 State Department of Health (DOH)

The State DOH defines three classes of zoning districts and specifies corresponding maximum permissible sound levels due to stationary noise sources such as air-conditioning units, exhaust systems, generators, compressors, pumps, etc., and equipment related agricultural, construction, and industrial activities [Reference 1]. These levels are enforced for any location at or beyond the property line and shall not be exceeded for more than 10% of the time during any 20-minute period. The specified noise limits which apply are a function of the zoning and time of day as shown in Figure 3. With respect to mixed zoning districts, DOH specifies the primary land use designation shall be used to determine the applicable zoning district class and the maximum permissible sound level.

### 3.2 U.S. Environmental Protection Agency (EPA)

The U.S. EPA has identified a range of yearly day-night equivalent sound levels, $L_{dn}$, sufficient to protect public health and welfare from the effects of environmental noise [Reference 2]. The EPA has established a goal to reduce exterior environmental noise to an $L_{dn}$ not exceeding 65 dBA and a future goal to further reduce exterior environmental noise to an $L_{dn}$ not exceeding 55 dBA. Additionally, the EPA states that these goals are not intended as regulations as it has no authority to regulate noise levels, but rather they are intended to be viewed as levels below which the general population will not be at risk from any of the identified effects of noise.

### 3.3 U.S. Federal Highway Administration (FHWA)

The FHWA defines four land use categories and assigns corresponding maximum hourly equivalent sound levels, $L_{eq}$, for traffic noise exposure [Reference 3]. For example, Category B, defined as picnic and recreation areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals, has a corresponding maximum exterior $L_{eq}$ of 67 dBA and a maximum interior $L_{eq}$ of 52 dBA. These limits are viewed as design goals, and all projects meeting these limits are deemed in conformance with FHWA noise standards.

### 3.4 Hawaii Department of Transportation (HDOT)

The State HDOT has adopted FHWA's design goals for traffic noise exposure in its noise analysis and abatement policy [Reference 4]. According to the policy, a traffic noise impact occurs when the predicted traffic noise levels "approach" or exceed FHWA's design goals or when the predicted traffic noise levels "substantially exceed the existing noise levels." The policy also states that "approach" means at least 1 dB less than FHWA's design goals and "substantially exceed the existing noise levels" means an increase of at least 15 dB.

## 4.0 EXISTING ACOUSTICAL ENVIRONMENT

Noise level measurements were conducted on September 21, 2001 to assess the existing acoustical environment in and around the project site. The measurements were obtained at Locations 1 through 4 as shown in Figure 4, using Larson-Davis Laboratories, Models 800 and 824, sound level meters. The following results expressed in terms of equivalent sound levels, $L_{eq}$, and in units of A-weighted decibels were obtained.

| Measurement Location | Date/Time of Measurement | Duration of Measurement | Sound Pressure Levels (dBA) |
|---|---|---|---|
| 1 - Future Facility Site | 9/21/01 - 9:30 AM | 10 min | 43.4 |
| 2 - 18' from Komohana Street | 9/21/01 - 9:54 AM | 15 min | 75.1 |
| 3- 10' from Komohana Street | 9/21/01 -10:27 AM | 10 min | 69.4 |
| 4 - 10' from Puainako Street | 9/21/01 - 10:45 AM | 10 min | 73.1 |

Presently, the dominant noise sources at the above locations include traffic, wind, and occasional distant aircraft flybys. Traffic volumes and vehicle mix were also recorded during measurements at locations 2 through 4.

## 5.0 POTENTIAL NOISE IMPACT DUE TO THE PROJECT AND NOISE MITIGATION

### 5.1 Project Construction Noise

Development of the Pacific Basin Agricultural Research Center will involve excavation, grading, and construction of new buildings and infrastructure. The various construction phases of the project may generate significant amounts of noise, which may be audible at the nearest residential areas. However, the nearest residential area is approximately 1/4 mile from the project site. Therefore, noise impacts are not anticipated. The actual noise levels produced will be a function of the methods employed during each stage of the construction process. Typical ranges



of construction equipment noise are shown in Figure 5. Earthmoving equipment, e.g., bulldozers and diesel-powered trucks, will probably be the loudest equipment used during construction, assuming that pile driving will not be required.

In cases where construction noise exceeds, or is expected to exceed the DOH's "maximum permissible" property line noise levels [Reference 1], a permit must be obtained from the DOH to allow the operation of vehicles, construction equipment, power tools, etc., which emit noise levels in excess of "maximum permissible" levels. Specific permit restrictions for construction activities are:

"No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels...before 7:00 a.m. and after 6:00 p.m. of the same day, Monday through Friday."

"No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels...before 9:00 a.m. and after 6:00 p.m. on Saturday."

"No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels on Sundays and on holidays."

### 5.2 Project Generated Traffic Noise

Measured traffic noise levels along with the traffic volume and vehicle mix counts obtained during the measurements were used to calibrate the FHWA's Traffic Noise Prediction Model [Reference 5]. The noise model together with the traffic data [Reference 6] was then used to calculate the peak hour traffic noise levels with and without the project. The results are presented in Table 1.

**Table 1**
**Existing and Projected Future Peak Hour Traffic Noise Levels ($L_{eq}$ in dBA)**

| With or Without Proposed Project | Year | Location 2 - 18' from Komohana Street | | Location 3 - 10' from Komohana Street | | Location 4 - 10' from Puainako Street | |
|---|---|---|---|---|---|---|---|
| | | AM | PM | AM | PM | AM | PM |
| Without Proposed Project | existing | 77.5 | 77.2 | 72.7 | 73.1 | 72.2 | 73.2 |
| | 2010 | 79.6 | 79.8 | 75.6 | 73.9 | 76.5 | 78.5 |
| With Proposed Project | 2010 | 79.8 | 79.8 | 75.7 | 74.0 | 76.6 | 78.5 |

From the results of Table 1, traffic noise level increases due to the proposed project were calculated and are presented in Table 2. As can be seen, the predicted maximum traffic noise level increase along the assessed roadways due to the project is 0.2 dB. The change in noise level due to the project is below the threshold of change in noise level that is perceptible to most people with normal hearing. This threshold is ±3dB.

**Table 2**
**Change in Traffic Noise Levels With and Without the Proposed Project ($L_{eq}$ in dBA)**

| | Location 2 - 18' from Komohana Street | | Location 3 - 10' from Komohana Street | | Location 4 - 10' from Puainako Street | |
|---|---|---|---|---|---|---|
| | AM | PM | AM | PM | AM | PM |
| Increase Due to Project - 2010 | 0.2 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 |

FHWA, HDOT, and EPA noise standards and design goals are not applicable to this project. However, the noise levels of these standards and regulations are commonly used as guidelines when assessing environmental noise impacts.

### 5.3 Noise from On-Site Equipment

Noise from pumps, AHU's, compressors, condensing units, and other on-site equipment must be addressed during the design phase of the project. The DOH maximum permissible sound limit for on-site equipment is 70 dBA or less at the property line for property zoned Agriculture, as is the project site. If on-site equipment exceeds this limit, mitigation in the form of barriers, enclosures, silencers, etc. should be included in the design. It should be noted that the closest residential areas are located approximately 1/4 mile away and on-site equipment noise is not expected to adversely impact those residents.



**REFERENCES:**


1. Chapter 46, *Community Noise Control*, Department of Health, State of Hawaii, Administrative Rules, Title 11, September 23, 1996.

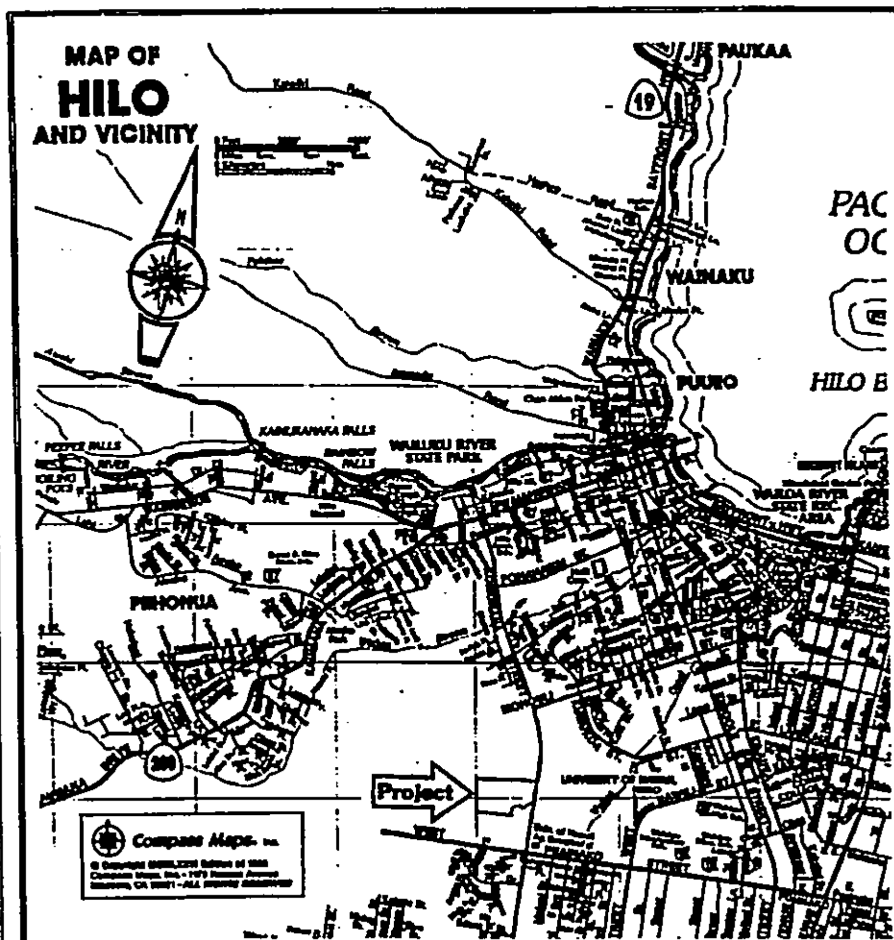
2. *Toward a National Strategy for Noise Control*, U.S. Environmental Protection Agency, April 1977.

3. *Department of Transportation, Federal Highway Administration Procedures for Abatement of Highway Traffic Noise*, Title 23, CFR, Chapter 1, Subchapter J, Part 772, 38 FR 15953, June 19, 1973; Revised at 47 FR 29654, July 8, 1982.

4. *Noise Analysis and Abatement Policy*, Department of Transportation, Highways Division, State of Hawaii, June 1977.

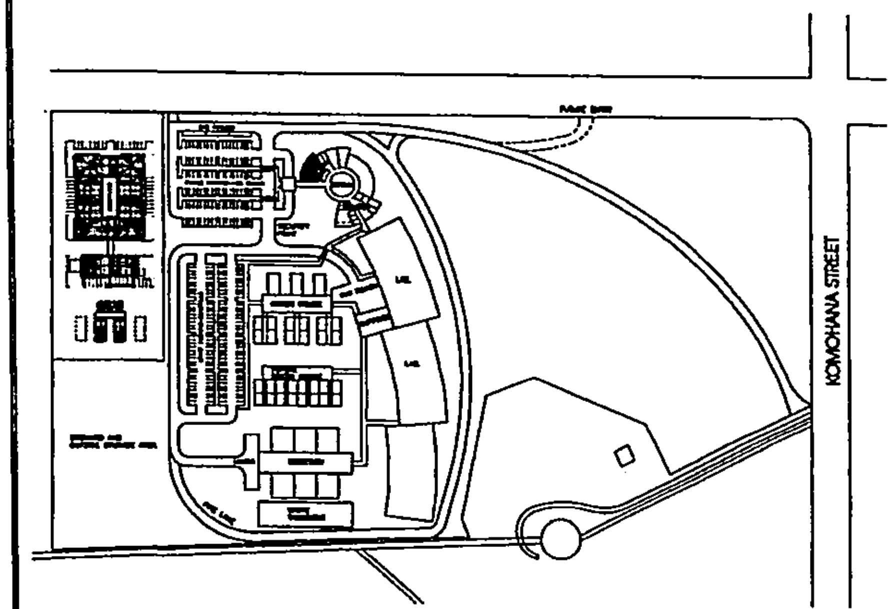
5. *FHWA Highway Traffic Noise Prediction Model*, FHWA-RD-77-108; U.S. Department of Transportation, December 1978.

6. Traffic Impact Assessment Report: U.S. Department of Agriculture Pacific Basin Agricultural Research Center, Phillip Rowell and Associates, January 2002.



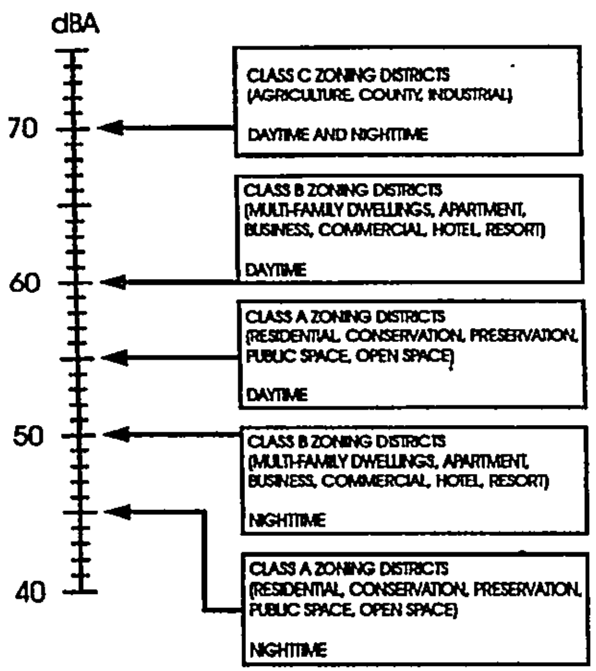

D. L. ADAMS ASSOCIATES, LTD.
ACOUSTICAL CONSULTANTS

FIGURE 1 - PROJECT LOCATION AND STUDY AREA




D. L. ADAMS ASSOCIATES, LTD.
ACOUSTICAL CONSULTANTS

FIGURE 2 - PROJECT SITE PLAN

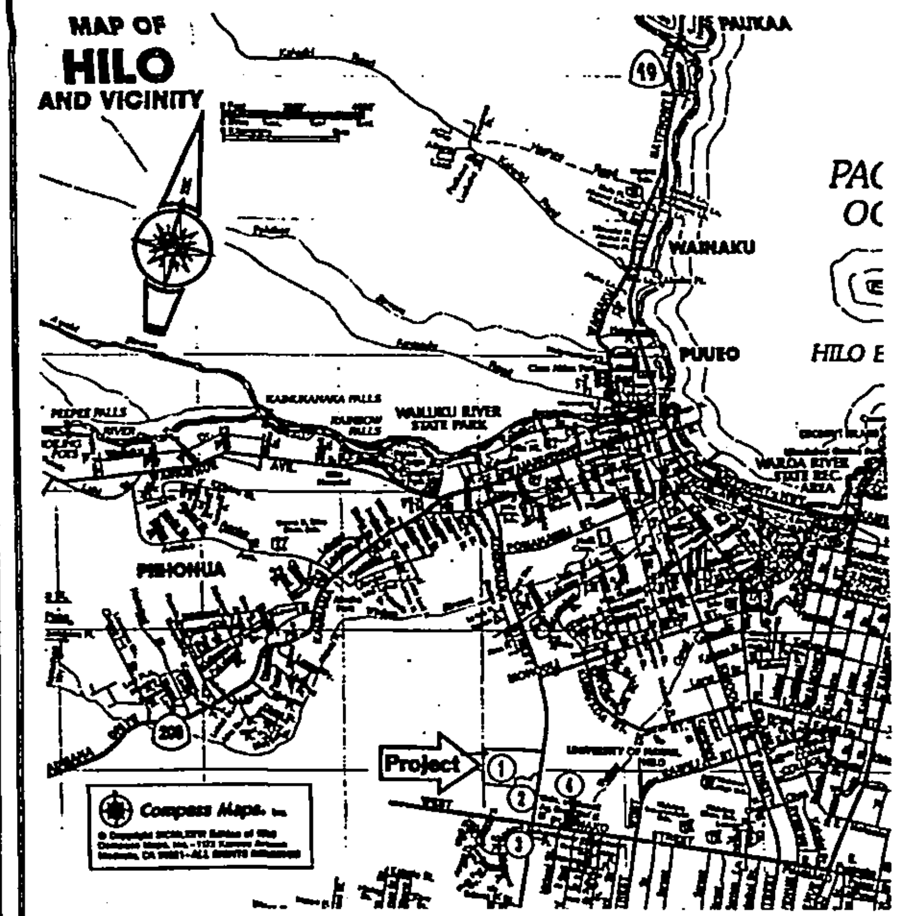



NOTE: SOUND LEVELS INDICATED BY ZONING DISTRICT ARE THE "MAXIMUM PERMISSIBLE" SOUND LEVELS DUE TO EXCESSIVE NOISE SOURCES SUCH AS STATIONARY MECHANICAL EQUIPMENT AND EQUIPMENT RELATED TO AGRICULTURAL, CONSTRUCTION AND INDUSTRIAL ACTIVITIES THAT SHALL NOT BE EXCEEDED FOR MORE THAN 10% OF THE TIME WITHIN ANY 20-MINUTE PERIOD DURING THE TIME PERIOD SHOWN.

(DAYTIME: 7:00 A.M. TO 10:00 P.M., NIGHTTIME: 10:00 P.M. TO 7:00 A.M.)

D. L. ADAMS ASSOCIATES, LTD.
ACOUSTICAL CONSULTANTS

FIGURE 3 - DOH MAXIMUM PERMISSIBLE SOUND LEVELS FOR VARIOUS ZONING DISTRICTS




① Measurement Location

D. L. ADAMS ASSOCIATES, LTD.
ACOUSTICAL CONSULTANTS

FIGURE 4 - LOCATIONS OF NOISE MEASUREMENTS

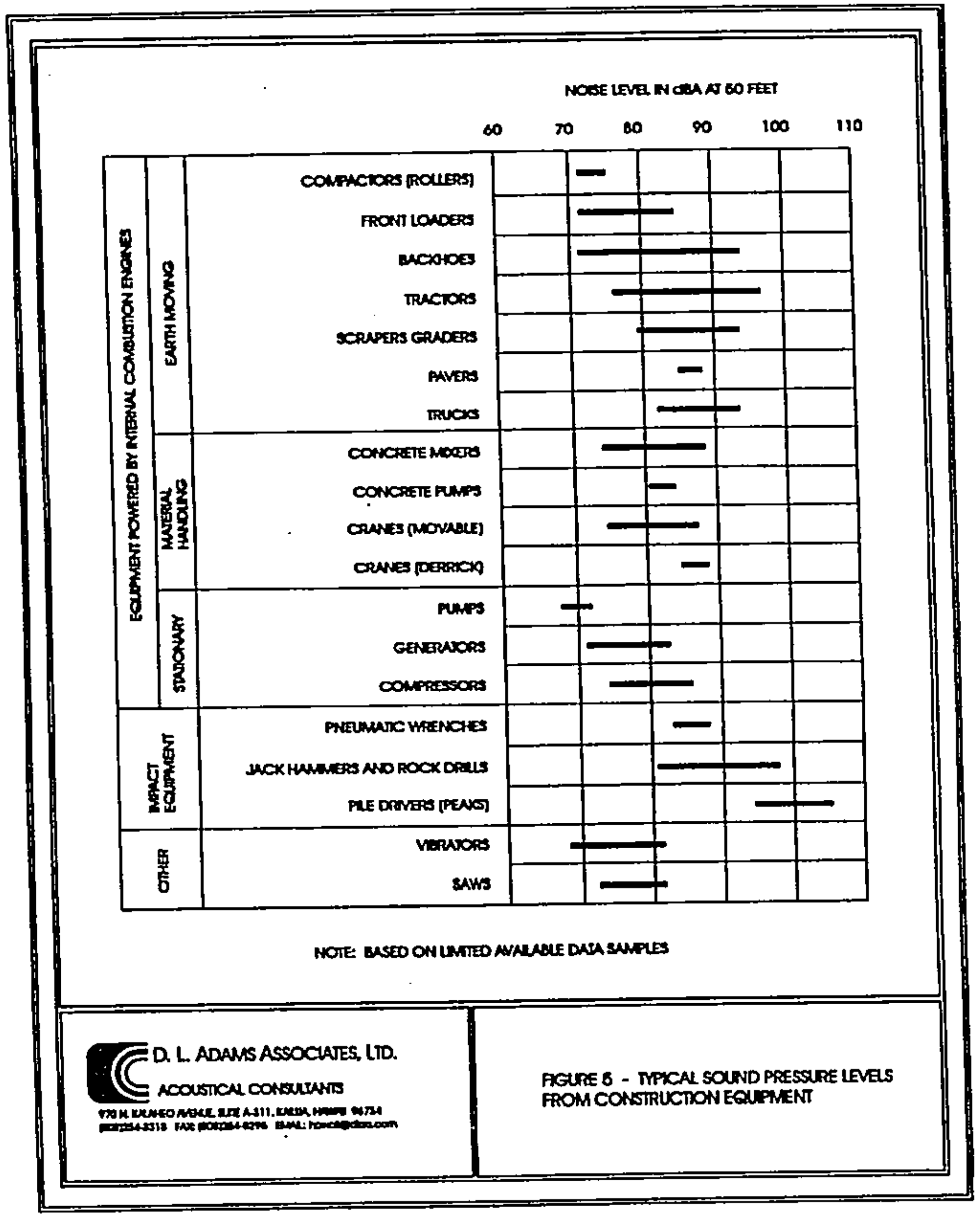



FIGURE 5 - TYPICAL SOUND PRESSURE LEVELS FROM CONSTRUCTION EQUIPMENT

# APPENDIX A

## ACOUSTICAL TERMINOLOGY

### Sound Pressure Level

Sound or noise consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. It is measured in terms of decibels (dB) using precision instruments known as sound level meters. Noise is defined as "unwanted" sound.

Technically, sound pressure level (SPL) is defined as:

$$SPL = 20 \log (P/Pref) \text{ dB}$$

where P is the sound pressure fluctuation (above or below atmospheric pressure) and Pref is the reference pressure, 20 micropascals, which is approximately the lowest sound pressure that can be detected by the human ear. For example, if P is 20 micropascals, then SPL = 0 dB, or if P is 200 micropascals, then SPL = 20 dB. The relation between sound pressure in micropascals and sound pressure level in decibels (dB) is shown in Figure A-1.

The sound pressure level that results from a combination of noise sources is not the arithmetic sum of the individual sound levels, but rather the logarithmic sum. For example, two sound levels of 50 dB produce a combined level of 53 dB, not 100 dB; two sound levels of 40 and 50 dB produce a combined level of 50.4 dB.

Human sensitivity to changes in sound pressure level is highly individualized. Sensitivity to sound depends on frequency content, time of occurrence, duration, and psychological factors such as emotions and expectations. However, in general, a change of 1 or 2 dB in the level of a sound is difficult for most people to detect. A 3 dB change is commonly taken as the smallest perceptible change and a 5 dB change corresponds to a noticeable change in loudness. A 10 dB increase or decrease in sound level corresponds to an approximate doubling or halving of loudness, respectively.

### A-Weighted Sound Level

The human ear is more sensitive to sound in the frequency range of 250 Hertz (Hz) and higher, than in frequencies below 250 Hz. Due to this type of frequency response, a frequency weighting system, was developed to emulate the frequency response of the human ear. This system expresses sound levels in units of A-weighted decibels (dBA). A-weighted sound levels de-emphasizes the low frequency portion of the spectrum of a signal. The A-weighted level of a sound is a good measure of the loudness of that sound. Different sounds having the same A-weighted sound level are perceived as being about equally loud. Typical values of the A-weighted sound level of various noise sources are shown in Figure A-1.

Statistical Sound Levels

The sound levels of long-term noise producing activities, such as traffic movement, aircraft operations, etc., can vary considerably with time. In order to obtain a single number rating of such a noise source, a statistically-based method of expressing sound or noise levels developed. It is known as the Exceedence Level, $L_n$. The Exceedence Level, $L_n$, represents the sound level which is exceeded for n% of the measurement time period. For example, $L_{10}$ = 60 dBA indicates that for the duration at the measurement period, the sound level exceeded 60 dBA 10% of the time. Commonly used Exceedence Levels include $L_1$, $L_{10}$, $L_{50}$, and $L_{90}$, which are widely used to assess community and environmental noise. Figure A-2 illustrates the relationship between selected statistical noise levels.

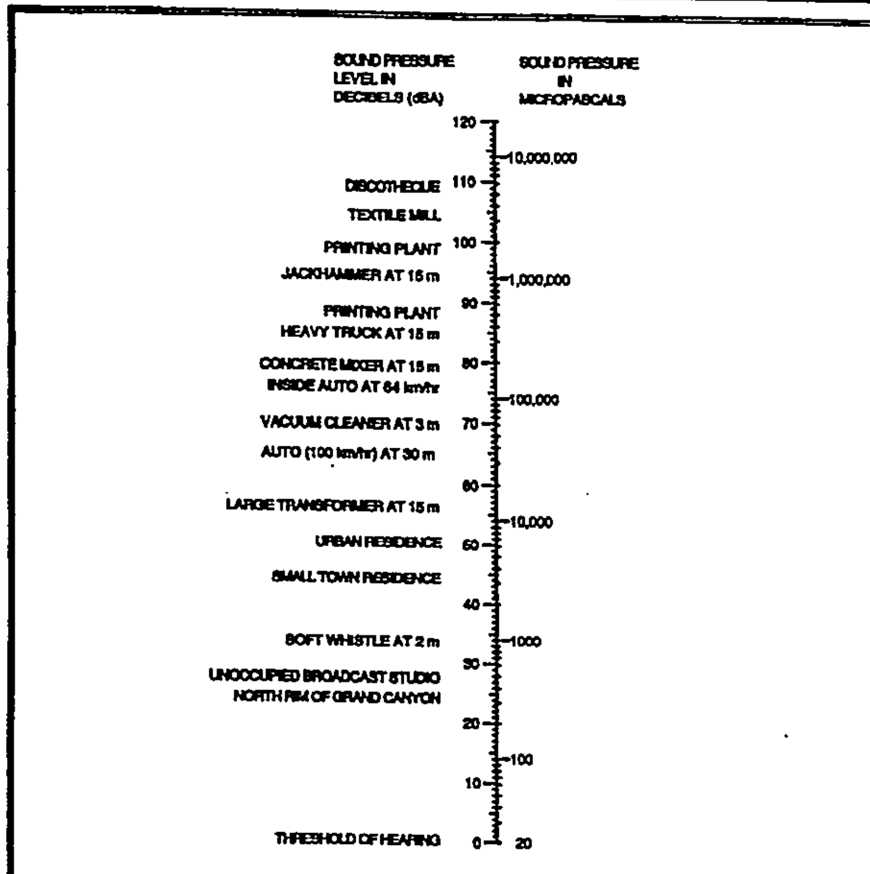
Equivalent Sound Level

The Equivalent Sound Level, $L_{eq}$, represents a constant level of sound having the same total acoustic energy as that contained in the actual time-varying sound being measured over a specific time period. $L_{eq}$ is commonly used to describe community noise, traffic noise, and hearing damage potential. It has units of dBA and is illustrated in Figure A-2.

Day-Night Equivalent Sound Level

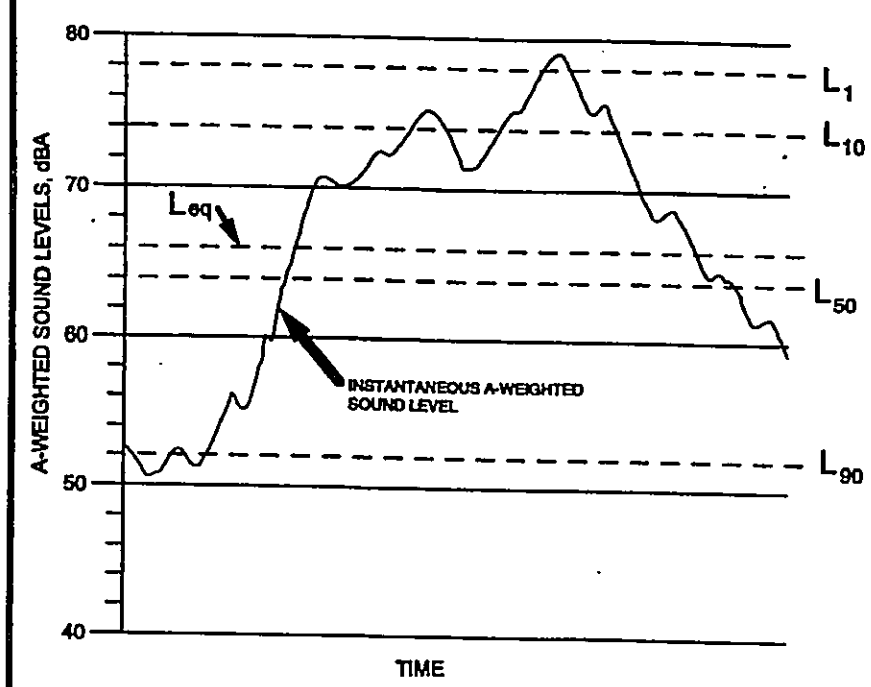
The Day-Night Equivalent Sound Level, $L_{dn}$, is the Equivalent Sound Level, $L_{eq}$, measured over a 24-hour period. However, a 10 dB penalty is added to the noise levels recorded between 10 pm and 7 am to account for people's higher sensitivity to noise at night when the background noise level is typically lower. The $L_{dn}$ is a commonly used noise descriptor in assessing land use compatibility, and is widely used by federal and local agencies and standards organizations. Qualitative descriptions, as well as local examples of $L_{dn}$, are shown in Figure A-3.





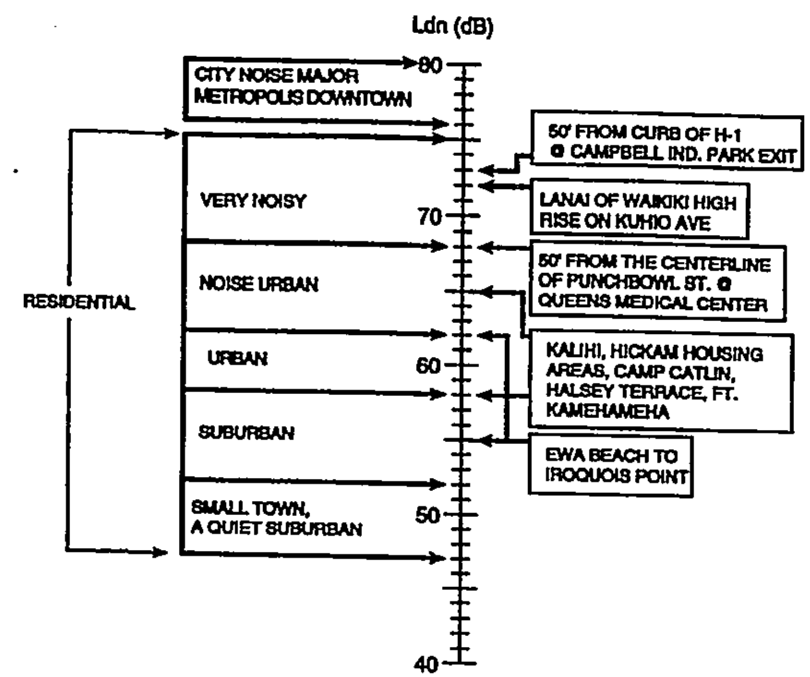

D. L. ADAMS ASSOCIATES, LTD.
ACOUSTICAL CONSULTANTS
970 N. KALAHEO AVENUE, SUITE A-311, KAILUA, HAWAII 96734
(808)254-3318 FAX (808)254-8295 EMAIL: hawaii@dlaa.com

FIGURE A-1 - THE RELATION BETWEEN SOUND PRESSURE, P, AND SOUND PRESSURE LEVEL, SPL. ALSO SHOWN ARE TYPICAL VALUES OF A-WEIGHTED SOUND LEVELS OF VARIOUS NOISE SOURCES.




D. L. ADAMS ASSOCIATES, LTD.
ACOUSTICAL CONSULTANTS
970 N. KALAHEO AVENUE, SUITE A-311, KAILUA, HAWAII 96734
(808)254-3318 FAX: (808)254-8295 EMAIL: hawaii@dlaa.com

FIGURE A-2 - COMPARISON OF AN INSTANTANEOUS SOUND LEVEL AND THE CORRESPONDING STATISTICAL SOUND LEVELS




D. L. ADAMS ASSOCIATES, LTD.
ACOUSTICAL CONSULTANTS
970 N. KALAHEO AVENUE, SUITE A-311, KAILUA, HAWAII 96734
(808)254-3318 FAX: (808)254-8295 EMAIL: hawaii@dlaa.com

FIGURE A-3 - QUALITATIVE DESCRIPTION OF THE DAY-NIGHT EQUIVALENT SOUND LEVELS (Ldn) AND EXAMPLE Ldn's AT SELECTED LOCATIONS ON OAHU

# APPENDIX H

## *Archaeological Inventory Survey*
## *&*
## *Addendum To Archaeological Inventory Survey*

Prepared By:
Cultural Surveys Hawaii, Inc. (July 2000 & March 2001)

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

GILBERT S. COLOMA-AGARAN, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DEPUTIES
JANET E. KAWELO
LINNEL NISHIOKA

SSFM INTERNATIONAL INC
RECEIVED
MAY
VRAS

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS

May 16, 2001

Mr. Ronald A. Sato
SSFM International
501 Summer Street, Suite 502
Honolulu, HI 96817

FILE ~~LOG NO~~: 27484
DOC NO: 0105PM08

Dear Mr. Sato:

**SUBJECT: "Addendum to Archaeological Inventory Survey of an Approximately 20-Acre Parcel Proposed for the USDA Pacific Basin Agricultural Research Center, Located Near the Intersection of Komohana and Puainako Streets, South Hilo, Hawai'i Island (TMK 2-4-01:Por. 122)" (Bush, McDermott, and Hammatt 2000)**

Thank you for your letter of April 6, 2001, and the opportunity to review and comment on the subject report. The report presents the results of an archaeological inventory survey of a 10-acre parcel located adjacent to an approximately 20-acre area that was initially surveyed by Cultural Surveys Hawaii for the proposed USDA facility at the above referenced location. The report on the first survey was reviewed and approved by our office in October, 2000.

We believe that the survey of the additional 10-acre area was adequate, finding two new sites. Site 50-10-35-22734 is a roughly square platform located on a pahoehoe lava flow. The site is thought to be either a planting feature or possibly a platform for a small structure or tank. It is believed to be of historic age. Site 50-10-35-22735 is a stacked stone causeway that appears to have been part of a unimproved roadway. It appears to date the early 20$^{th}$ century and related to agricultural, dairy or ranching activity.

We agree with the significance evaluations for both sites. They are solely significant for their information content (Criterion D).

We concur with the recommendations made in this study. The two sites have been adequately documented. No further archaeological work is required at either site.

In summary, the proposed USDA facility project area will now cover approximately 30 acres. Within this area there are three significant historic properties, the two described in the present report and a burial site (50-10-35-22080) identified in the

Mr. Ronald A. Sato
Page Two

earlier survey. It is our understanding that the burial site will be preserved in place and maintained by the University of Hawaii at Hilo. With the preservation of the burial and its exclusion from the USDA facility, we believe that the proposed facility will have "no adverse effect" on significant historic sites.

If you should have any further questions about this project please contact our Hawaii Island archaeologist, Patrick McCoy (692-8029).

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

PM:jk

c. Hal Hammatt, Cultural Surveys Hawaii

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

TIMOTHY E. JOHNS, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DEPUTIES
JANET E. KAWELO
LINNEL NISHIOKA

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

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

LOG NO: 26293 ✓
DOC NO: 0010RC03

October 4, 2000

Ronald Sato, Project Planner
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

Mr. Ronald Sato:

**SUBJECT:** **Review of Archaeological Inventory Survey for USDA Pacific Basin Agricultural Research Center**
**Waiakea, South Hilo, Hawaii**
**TMK: 2-4-01: por. 122**

This letter reviews this survey report which was submitted August 8, 2000 (Bush et al. 2000. Archaeological Inventory Survey of an Approximately 20-Acre Parcel Proposed for the USDA Pacific Basin Agricultural Research Center ... Cultural Surveys Hawaii ms.).

We believe that the survey adequately covered the project area, finding one historic site (22,080). The background section adequately covers the settlement context for the project area, indicating the low likelihood for pre-European contact habitation and farming sites and the low likelihood of late 1800s sugarcane sites. The one site found is acceptably described and interpreted. This site is a lava sinkhole with rockshelter overhangs and a human femur under one overhang. It is argued that this femur was likely intentionally placed in the overhang by native Hawaiians in pre-European contact or early 1800s times, making the probable ethnicity Hawaiian. We agree with this conclusion.

We also agree with the significance evaluation for this site, significant for its information content and culturally significant to native Hawaiians.

The report indicates that it was agreed with our Burials Program to preserve this site, and that details of the preservation plan were agreed to.

In sum, the report is acceptable. As long as the burial site is avoided, we have no objections to any land alteration in this project area. We understand that the Research Center has been moved to include some adjacent lands, and that archaeological survey will be done of the additional lands.

We look forward to the survey findings before concluding Section 106 compliance review for this project.

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

RC:an

c: Dr. H. Hammatt, Cultural Surveys Hawaii
SHPD Burials Program
Chair, Hawaii Island Burial Council

✓RS

# Archaeological Inventory Survey of an Approximately 20-Acre Parcel Proposed for the USDA Pacific Basin Agricultural Research Center located near the intersection of Komohana and Puainako Streets, South Hilo, Hawai'i Island (TMK 2-4-01: por 122)

by

Anthony R. Bush, B. Ed.
Matt McDermott, B. A.
and
Hallett H. Hammatt, Ph.D.

for

SSFM International, Inc.

by

Cultural Surveys Hawai'i, Inc.
July 2000


## ABSTRACT

Cultural Surveys Hawai'i, Inc. (CSH) conducted a preliminary reconnaissance and, subsequently, an archaeological inventory survey within an approximately 20-acre parcel (TMK 2-4-01: por 122) located *mauka* (east) of the University of Hawai'i at Hilo, near the intersection of Komohana and Puainako Streets, in the *ahupua'a* of Waiākea, South Hilo. This work was done for SSFM International, Inc. The 20-acre parcel is being considered for the construction of the United States Department of Agriculture (USDA) Pacific Basin Agricultural Research Center.

Fieldwork was carried out on May 8, 9 and 15-17, 2000. The project area was subjected to 100% pedestrian survey coverage by two CSH archaeologists. Vegetation within the project area is a dense mix of *'uluhe* fern and strawberry guava. During the course of the preliminary reconnaissance, a single historic property was located and documented. This most likely prehistoric feature consists of a lava sinkhole with an associated human burial (one single human femur). The lava sink feature was designated State site # 50-10-35-22,080. The site is considered significant under State and National Register of Historic Places Criterion D, for its information content regarding Native Hawaiian mortuary practices, and Criterion E, for its traditional significance to Native Hawaiians.

It is recommended that a buffer zone of 50 feet be established around State site # 50-10-35-22,080. This area should be preserved through the establishment of a burial preserve area. Once the preserve area is established the development of the 20-acre parcel will most likely have no adverse effect on significant historic properties.

Following the completion of the inventory survey field work, in consultation with SSFM International, USDA, University of Hawaii--Hilo, and the State Historic Preservation Division, it was determined that the project area under consideration for the USDA Research Center would be re-aligned. The newly proposed project area is located slightly to the west of the current project area, but includes some of the same acreage. The new project area excludes the burial site (State site # 50-10-35-22,080). The mitigation of the burial site, including the establishment of the burial preserve area, would be carried out between the land owner (University of Hawaii--Hilo) and the State Historic Preservation Division. Additional archaeological inventory survey is to be carried out on the portions of the new project area that were not surveyed during this inventory survey.

## TABLE OF CONTENTS





## LIST OF FIGURES



## LIST OF TABLES

# I. INTRODUCTION

Cultural Surveys Hawai'i, Inc. (CSH) conducted a preliminary reconnaissance and, subsequently, an archaeological inventory survey of an approximately 20-acre parcel in the *ahupua'a of* Waiākea, South Hilo, Hawai'i (TMK 2-4-01:122)--see Figures 1 and 2. Field work was conducted on May 8, 9, and 15-17, 2000. This work was done for SSFM International, Inc. The 20-acre parcel is being considered as a site for the United States Department of Agriculture (USDA) Pacific Basin Agricultural Research Center.

## A. Project Area Description

The project area is located approximately 3 kilometers inland of Hilo Harbor. The 20-acre parcel is bordered by Komohana Street to the east, an existing access road to an electrical power station and the Waiākea Reservoir site to the south, and Waiākea State Land to the west and north. The landowner is the University of Hawaii, Hilo. The USDA is considering obtaining a lease for the property to construct the Research Center. No previous archaeological studies of any kind have been conducted within the confines of the project area.

## B. Scope of Work

The Scope of Work for this project was composed to satisfy Federal, State and County requirements for an archaeological inventory survey level and included the following typical procedures:

1. A complete ground survey of the entire project area for the purpose of site inventory. All sites were located, described, and mapped with evaluation of function, interrelationships, and significance. Documentation included photographs and scale drawings of sites and complexes. All sites were assigned State site numbers.

2. If warranted, limited subsurface testing to determine depth and quantity of cultural materials within archaeological sites and to obtain datable samples for chronological information if none is available for sites in the immediate area from previous studies.

3. Research on historic and archaeological background, including search of historic maps, written records, and Land Commission Award documents. This research focused on the specific area with general background on the *ahupua'a* and district and emphasized settlement patterns.

4. Preparation of this survey report which includes the following:

   a. A topographic map, if available, of the survey area showing all archaeological sites and site areas;

   b. Description of all archaeological sites with selected photographs, scale drawings, and discussions of function;




Figure 1 Portion of USGS Topographical Map, 7.5 Minute Series, Hilo Quadrangle, showing project area.

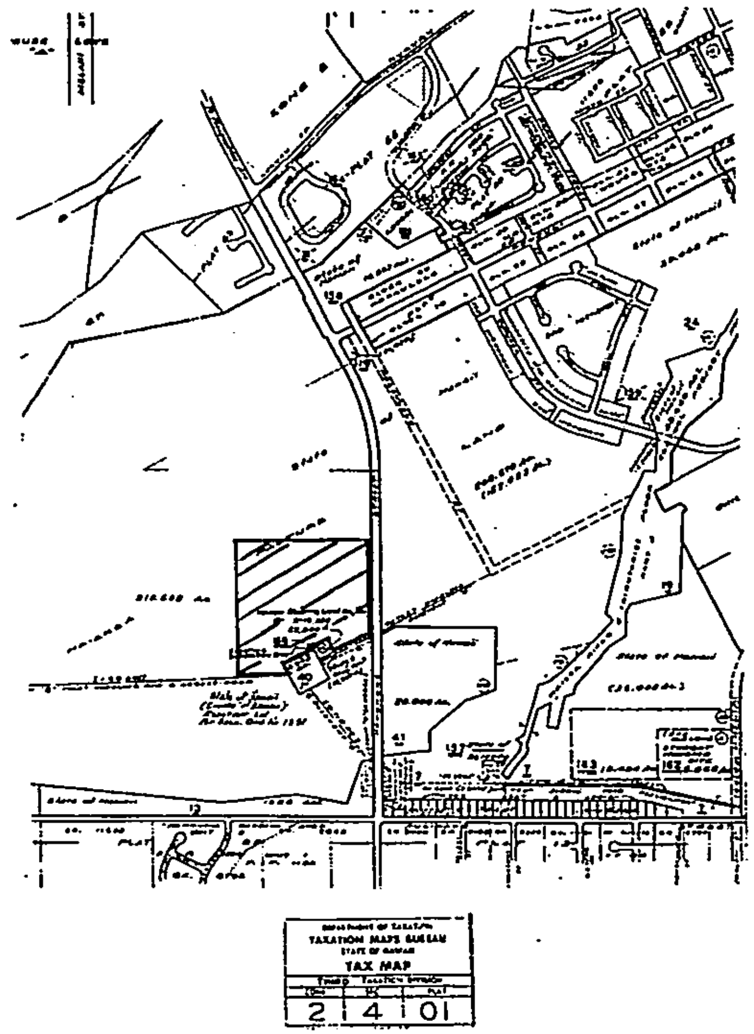



Figure 2 Tax Map 2-4-01:122; showing location of project area.



c. Historical and archaeological background sections summarizing prehistoric and historic land use as they relate to the archaeological features;

d. A summary of site categories, their significance in an archaeological and historic context;

e. Recommendations based on all information generated which will specify what steps should be taken to mitigate impact of development on archaeological resources - such as data recovery (excavation) and preservation of specific areas. These recommendations will be developed in consultation with the client and the State agencies.

### C. Methods

The fieldwork was completed in two steps, first a preliminary reconnaissance followed by the more intensive inventory survey. The preliminary reconnaissance was completed on May 8 and 9 by CSH archaeologists Matt McDermott, B.A. and Tony Bush, B. Ed. The subsequent archaeological inventory survey was completed between May 15-17, 2000, by Matt McDermott and Brian Colin, B. A. All field work was done under the overall guidance of Dr. Hallett H. Hammatt. Methods of pedestrian inspection for the reconnaissance and the inventory survey were the same. Maps of the project area and maps of Hilo-area lava flows were analyzed in light of the results of previous archaeological studies in the area. This was done prior to the ground survey to ascertain what cultural feature-types might be present. The project area was inspected through a series of north-south oriented pedestrian sweeps with the interval between archaeologists maintained at 5 to 10 m. Ground visibility was limited in most areas by dense *uluhe* (*Dicranopteris linearis*) fern. One historic property, State Site #50-10-35-22080 (sinkhole and associated human burial), was encountered during the preliminary reconnaissance. This feature was mapped in detail and placed on the overall project map. Photographs of the site were taken, a tape and compass plan view map was prepared, and a written description was recorded.

## II. NATURAL SETTING

Elevation of the project area ranges from 300-360 ft. above mean sea level. Rainfall averages 150-200 inches per year (Kelly et al. 1981). Waiākea Stream, located approximately 400 meters southeast of the southeast corner of the project area, is the only fresh water source in the immediate area. Other than the ubiquitous native ʻ*uluhe* fern (*Dicranopteris linearis*) and some scattered *ohia* trees (*Metrosideros polymorpha*), the project area vegetation predominately consists of exotic (introduced) plants, including strawberry guava (*Psidium Cattleianum*), various grasses, several scattered large Albizia trees (*Paraserianthes falcataria*), and a moderately sized mango tree (see Figures 10 through 15 for typical project area vegetation).

Project area soils include Pana'ewa very rocky, silty clay loam and exposed *pahoehoe* lava flow (Sato *et al.*, 1973). Typically, soil is scant, existing in intermittent pockets throughout the *pahoehoe* flow. Topography is undulating, with a gradual slope *makai* (to the east). Intermittent lava sinkhole features exist throughout the project area, ranging in diameter from 1 - 6 m. The 1881 lava flow is to the north of the current project area. According to the lava flow age maps included in Smith (1991) the project area substrate consists of 750-1500 year old lava flow. Similar ages for the lava flow substrate for the project area are given in Hunt and McDermott (1993:6--citing Lockwood and Buchanan-Banks 1991), who identify the Kulaloa flow dating to 1,100 to 1,400 BP.

A north-south oriented former unimproved road alignment, with associated bulldozer push piles and berms was noted through the approximate center of the project area (see Figures 14 and 15 in Appendix A). Although completely overgrown with vegetation, parallel tire tracks are still visible in some areas. Based on vegetative overgrowth and modern garbage scattered along the road, it appears this road alignment is not older than 50 years, and may have been utilized as recently as 20 years ago. The rusted out remains of a car, model indistinguishable, was found along this road alignment. The road alignment is not considered an historic property. Along Komohana Street there is a stockpile of "armor rocks" (huge boulders), most likely related to construction and excavation associated with Komohana Street. Modern rubbish was found throughout much of the project area, with concentrations along the overgrown, unimproved road alignment (see Figure 13). This road alignment is thought to be associated with the use of the project area for "pasturage"--see discussion below.

## III. HISTORIC BACKGROUND

The *ahupua'a* of Waiākea, South Hilo, is large, encompassing some 95,000 acres. It extends from the coast to approximately the 6,000 foot elevation on the windward slope of Mauna Loa (Figure 3). 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 (McEldowney 1979). The current project area exists entirely within Zone II, or the Upland Agricultural zone. As such, only this zone is described in depth here.

Zone II is defined as ranging from 50 - 1,500 ft 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" (McEldowney 1979).

The present study area is situated within the lower elevations of 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 cited in McEldowney 1979:21). The reasons for what appeared to the



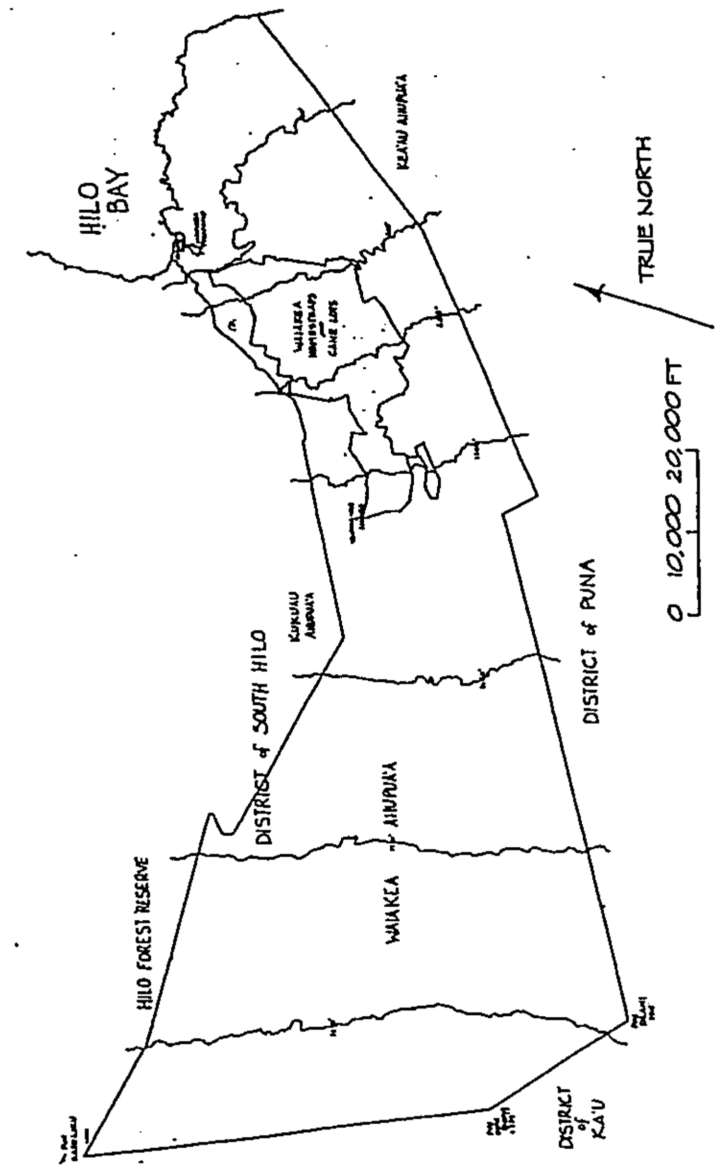



Figure 3 *Ahupua'a* of Waiākea (after USGS Topographic Map).

early visitors as a "lack of more extensive planting" (McEldowney 1979:21) 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 included 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" (McEldowney 1979: 18-19) but no descriptions of village complexes like those along the coast.

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.

## B. 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" (Kelly, Nakamura, Barrère 1981: 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 focused 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 land use of the Forest and Sub-Alpine Zones was changing. The more traditional land use activities in the upper zones, such as the procurement of timber products and bird feathers (McEldowney 1979:35), was replaced by the hunting of cattle, goats, and sheep 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*" (McEldowney 1979:36).



## C. 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. AMSL) 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" (McEldowney 1979:37).

The coastal zone still contained the vast majority of the population. Houses and stores were concentrated in the northern half of Hilo bay, somewhat removed from Waiākea, because at the time the main pier for Hilo was at the mouth of the 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 (Figure 4).

## D. 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 (see Figure 5).

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. As shown in Figure 5, the current project area is outside the land cultivated for sugar, there are no historic residence camps in immediate vicinity of the project area, and railroad features do not cross through the project area. The current project area is within the land described as "Waiākea Pasture

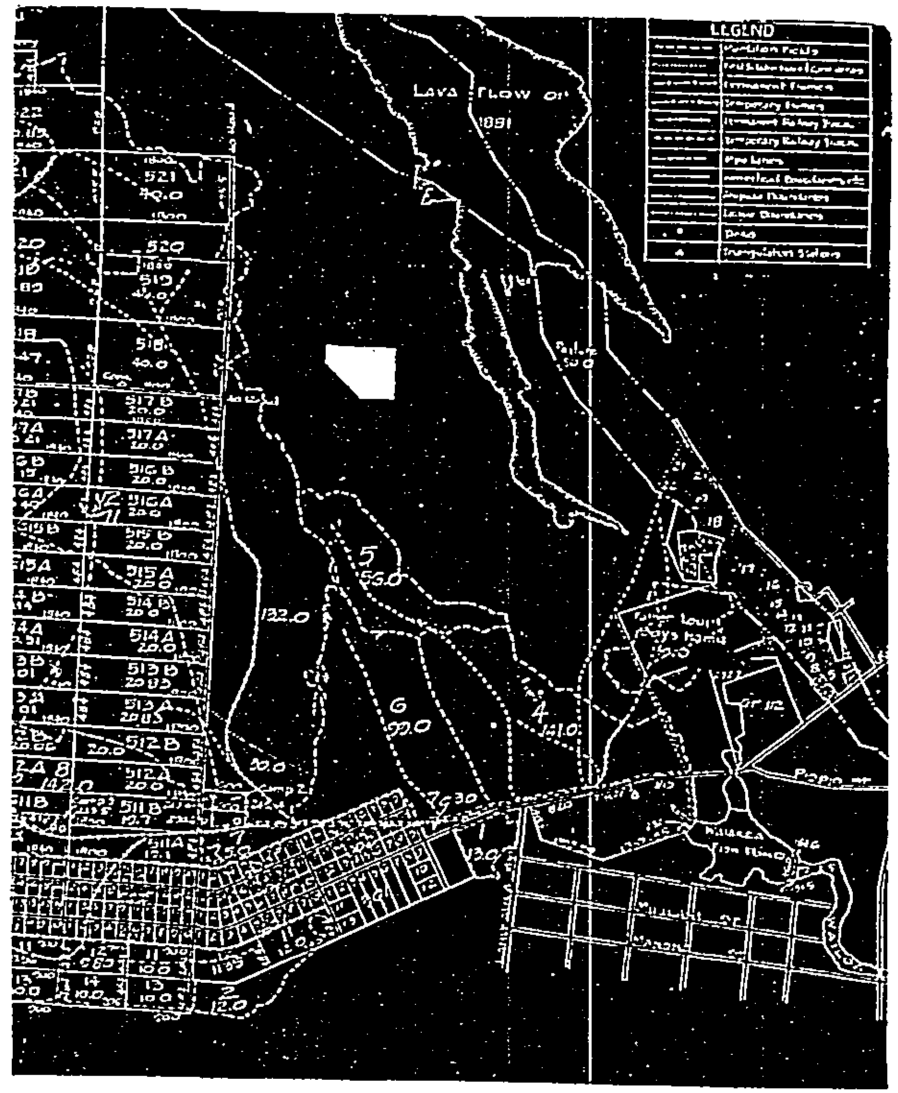



Figure 5 Waiākea Mill Co. Map (c. 1930), showing the project area.

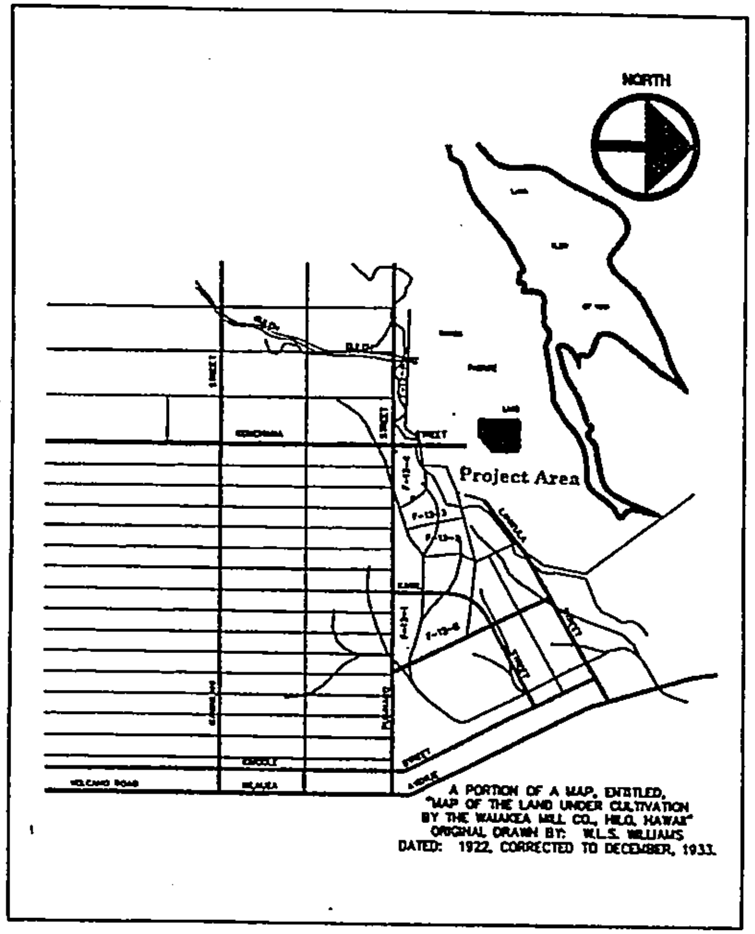



Figure 6 Waikea Mill Co. Map (c. 1930), showing the project area within the area labeled "Waiākea Pasture Land".



Land" (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 (perhaps the Waiākea Pasture Land shown on Figure 6), and scattered vegetable gardens" (McEldowney 1979:39).

## E. 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" (McEldowney 1979:41). 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 entirely 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" (McEldowney 1979:41).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" (Kelly, Nakamura, Barrère 1981:121).

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" (McEldowney 1979:42). Clearly, sugar was the dominate economic factor during this period including the formation of settlements (i.e. camps).

## F. 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. Based on available historic maps, the project area was never used for large-scale sugar cane cultivation.

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 most likely ceased to be utilized for pasturage in the 1960s. Since that time a portion of the lot has been used to construct the County of Hawai'i reservoir and associated pipeline (Exec. Ord. No. 1391) and the Hawaiian Electric Light Co. Inc. electric transformers. An access road, partially paved extends to these utilities from Komohana Street, to the east.

## G. Summary

The present project lies within the *ahupua'a* of Waiākea. It is contained within Zone II, or the Upland Agricultural Zone, according to McEldowney's (1979) zones of land use and associated resources. This is defined as the 50 - 1,500 ft. elevation, an area of "open parkland gently sloping to the base of the woods,..." (McEldowney 1979). Some permanent habitation occurred in this region, but the majority of habitation was of a temporary nature (*i.e.* "scattered huts" as opposed to the village complexes near the coast).

Chiefly associations with the *ahupua'a* of Waiākea began early, with chiefly residences being documented as early as ca. 1650 (Kelly, Nakamura, Barrère 1981), mainly due to the rich resources of the area (*i.e.* fishponds, crops, sandalwood, bird feathers, and later the whaling industry). Kamehameha I retained Waiākea after conquering the island, and later gave the *ili* of Pi'opi'o to his favorite wife Ka'ahumanu.

In the early 1800s, with the coming of the sandalwood trade, the arrival of the ABCFM station in Hilo, and the whaling industry descending on the Hilo area came the shift from a subsistence-based to a more market-based economy. Land use still remained essentially the same, but was starting to evolve, as elements such as cattle, timber and whaling became more intensive.



In the mid- 1800s, the Māhele brought with it the end of traditional land tenure, issuing in the age of privatization of land. Twenty-six Land Commission Awards (LCAs) were granted within Waiākea, all but two being in the coastal zone, and the remaining two being within the first 100 ft AMSL of the upland agricultural zone (not close to the current project area). Cattle ranching was at the forefront in interior land areas, while Hilo Town was being transformed into an entirely wooden-framed "New Bedford-type Whaling Town" (McEldowney 1979). Though the coastal zone still contained a vast majority of the population, the construction of houses and stores started to shift out of Waiākea and to the north, as the main pier for Hilo was located at the mouth of the Wailuku River. This is a significant shift from traditional coastal settlement.

The late 1800s brought with it the advent of sugarcane and the Waiākea Mill Company. Plantations developed in the 1860s, and by the 1888 the Waiākea Mill had procured all of the *ahupua'a* of Waiākea. Immigrant labor lived in "camps", near existing sugar cane railroad lines.

With the 1900s came the expansion of sugar cane production in the area, but also brought in the Parker and Shipman ranches for pasture in areas too rocky for sugar cane. "A substantial amount of grazing land adjacent to Hilo or to sugarcane fields supported dairy cows for Hilo's several dairies" (McEldowney, 1979). Homesteading was tried but declared a failure two years later. In the 1920s several large tracts of the remaining forest lands in Waiākea were designated as a forest reserve (McEldowney 1979).

In the late 1900s, major construction projects were completed in the Hilo area (*i.e.* Hilo Bay, wharfs, breakwater, and bridges, the Hilo Airport, and construction of the Saddle Road). After statehood, and with the closing of the sugar mill and canec plant, tourism was focused on. U.H. Hilo's campus was constructed and continues to be developed.

# IV. PREVIOUS ARCHAEOLOGICAL RESEARCH

Below is a table summarizing previous archaeological investigations in the *ahupua'a* of Waiākea. Figure 7 shows the locations of this previous research in relation to the current project area.

TABLE 1: Previous archaeological investigations in the *ahupua'a* of Waiākea, in the vicinity of the current project area.

| | | |
|---|---|---|
| Thrum 1907 | *Ahupua'a* of Waiākea heiau sites | No heiau located near the present project parcel. |
| Thrum 1908 | *Ahupua'a* of Waiākea | An inventory/description of Heiau throughout Hawaii. Identifies 3 heiau within the *ahupua'a* of Waiākea. |

| | | |
|---|---|---|
| Hudson 1930 | East Hawaii | Site Survey. |
| McEldowney 1979 | Hilo Bay area | Zonal Characteristics--Land-use study. |
| Kelly, Nakamura, and Barrère 1981 | | History of Hilo Bay area; nothing specifically pertaining to current project area. |
| Smith 1991 | Waiākea, South Hilo, Hawaii Island TMK: 3-2-4-01:7 | Sites exist on the >4000 year old flow; one site on the 1500 - 750 year old flow; inventory survey recommended. |
| Smith 1992 | Waiākea Cane Lots, Waiākea, South Hilo, Hawaii Island TMK: 3-2-4-56:1 | Several stacked stone walls, mounds, a large rectangular enclosure, and several "C"-shapes. |
| Moniz 1992 | *Ahupua'a* of Waiākea, Hilo, Hawai'i | A listing of 1979-1992 inventory surveys within Waiākea, including walls, platforms, and a burial cave. |
| Hunt 1992 | Lands of Waiākea, Kukuau 1& 2, and Ponahawai, South Hilo District, Hawai'i (Puainako Street Extension project) | Interim report of inventory survey field inspection findings--31 features identified within the project boundaries, including walls, mounds, platforms, and faced terraces. |
| Spear 1993 | Piihonua *Ahupua'a*, South Hilo TMK:2-3-32:4 | Inventory survey of 5-acre parcel. Two historic features located and documented--an oven and a trash dump. No further work recommended. |
| Borthwick, Collins, Folk and Hammatt 1993 | *Ahupua'a* of Waiākea TMK: 2-4-01:7 and 41 | Inventory survey-163 acres immediately across Komohana Street from the present project area. Four sites found--all thought to be related to historic agriculture (sugar cane). No further work recommended beyond the documentation of the inventory survey |
| Hunt and McDermott 1994 | Lands of Waiākea, Kukuau 1 and 2, and Ponahawai, South Hilo (Puainako Street Extension project) | Inventory survey (final report of Hunt 1992). Historical, oral interview, and archaeological data combine to demonstrate the numerous stack stone features in the project area, comprising 13 sites, are all related to historic sugar cane agriculture. |



| | | |
|---|---|---|
| Maly, Walker, and Rosendahl 1994 | Land of Waiākea, South Hilo, TMK:2-4-57:01 | Inventory survey of 4.5 Waiākea Cane lots parcel. Four sites, comprising 47 features (C-shape and L-shape walls, mounds terraces and walls). These features were thought similar in appearance to the historic features reported by Hunt and McDermott. One radiocarbon date and recovered artifacts may indicate prehistoric land-use of the parcel. Data recovery recommended. |
| Spear 1995 | Land of Waiākea, South Hilo, TMK:2-4-57:01 | Data recovery of the Maly *et al.* (1994) parcel. Following excavation, all features in the project area are considered historic, a few temporary habitations, but the majority related to historic sugar cane agricultural. No additional archaeological work is recommended. |
| Robins and Spear 1996 | Lands of Waiākea, Kukuau 1& 2, and Ponahawai, South Hilo District, Hawai'i (Puainako Street Extension project) | Inventory survey of same alignments, but wider corridor, of the same Puainako Street Extension project inventoried by Hunt and McDermott (1994)--additional historic sugar cane agricultural features were located. |

Several of the above listed reports are particularly helpful regarding the types of sites and their distribution that can be expected within the current project area. These include Smith (1991; 1992), Borthwick *et al.* (1993), and the series of reports related to the Pu'ainako Street Extension/Realignment project, including Hunt (1992), Hunt and McDermott (1994) and Robins and Spear (1996).

Marc Smith conducted three separate field checks on 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 1991). Smith also noted similar features in another project area, bounded by Ululani, Kawili, and Kapiolani Streets, and located within the former "Waiākea Cane Lots, during the field inspection further makai of the current project area (Smith 1992). In both cases, based on the findings of subsequent investigations in the vicinity and within the specific project areas themselves (Borthwick *et al.* 1993; Maly *et al.* 1994; Hunt and McDermott 1994; Spears 1995), these features were demonstrated to be the result of historic sugar cane agriculture, see discussion below.

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

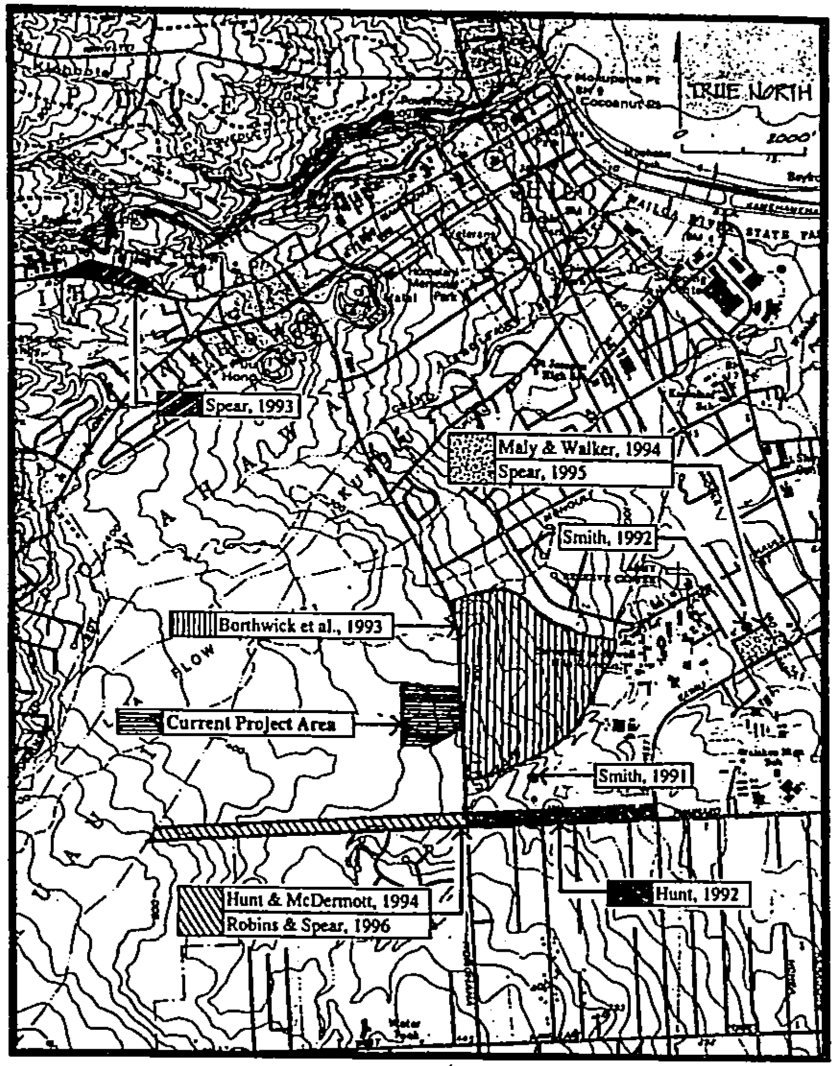



Figure 7 Portion of USGS Topographic Map, Hilo Quadrangle, showing previous archaeology with the vicinity of the current project area.



">4,0 KA (greater than 4,000 B.P.)" (Smith 1991). The lava-flow age determinations are based on work by Lovelace as referenced in Marc Smith's letter. According to Smith, 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 1991). Clearly sites are much more common on the older, more weathered lava flows that have significantly greater soil development.

The survey for the proposed Puainako Street Extension (Hunt 1992; Hunt and McDermott 1994; Robins and Spear 1996) covered various road corridor alignments from the 200 - 1500 ft elevation, through multiple *ahupua'a* including Waiākea, Kukuau 1 and 2, and a small part of Ponohawai. A total of 13 sites were observed and recorded. Site types included stacked stone walls, mounds, platforms, modified outcrops, and faced terraces. Also documented were railroad related features such as berms, sections of track, and cross-ties. The historical research and oral interviews with knowledgeable local residents provided ample evidence that all of these features were historic and related to the development of commercial sugar cane agriculture in this portion of Hilo after 1870s. The stacked stone structures are predominantly related to field clearance. The stony soil yielded large quantities of basalt cobbles and boulders that had to be stored in an efficient manor to maximize the arable land. The limited evidence of prehistoric land-use within the Pu'ainako Street Extension project clearly predated the construction of the numerous stacked stone features (Hunt and McDermott 1994).

The work of Borthwick *et al.* (1993) in the U. H. Hilo parcel directly across Komohana Street from the current project area is relevant. Similar types of stacked stone structures, like those found in the Pu'ainako Street Extension project area, were found. These features, which included some historic walled fields with plow-furrows still visible on the land surface, were shown to date to historic sugar cane agriculture, circa post-1870. The distribution of the features was found to follow the distribution of the three lava flows that crossed through the project area. Sites were clustered on the oldest flow (c. greater than 4,000 B.P.) and along the margin where the greater than 4,000 B.P. flow met the younger 1,500 to 750 B. P. flow (Borthwick, personal communication, 2000). This substantiates the observations made by Smith (1991).

## V. PREDICTIVE MODEL

The current project area is located on the 1,500 to 750 B. P. lava flow (Smith 1991). Previous archaeological research in the Hilo area (Borthwick *et al.* 1993; Smith 1991) has demonstrated that lava flow age maps are useful tools for predictions of site densities and distributions. In the vicinity of the current project area, archaeological research has shown that historic properties are concentrated on the older lava flows. The 1,500 to 750 B. P. lava flow and the recent 1881 flow contain drastically fewer sites. This is related to soil distribution and historic agriculture. Within the vicinity of the current project area the most common site types are related to historic sugar cane agriculture. Accordingly it is not surprising that site distributions clearly mirror the distributions of older lava flows where soil development, and hence agricultural productivity, is greater. Based on the archaeological information summarized above, it is unlikely that the historic sugar cane related clearing mounds, walls, and railroad features, noted in nearby project areas on older lava flows, will be found in the current project area.

Historic maps confirm this conclusion. All historic maps show the current project area outside the bounds of the sugar cane agricultural lands. On historic maps the project area is listed as pasture. It is possible that historic features related to this land use will be found, including fence lines and possibly water troughs and/or tanks.

Evidence for Traditional-Hawaiian land-use within the current project area is lacking. As part of McEldowney's (1979) upland agricultural zone, this 'unwooded grassland' area is generalized to contain the following traditional site types: scattered habitations with adjacent garden and tree plots, modified lava tubes and sinks, and dryland agriculture on the older lava flows and in ash deposits. In light of the poor soils and exposed lava flows within the project area it is unlikely that intensive agriculture took place there in the prehistoric period. There is the possibility that opportunistic dryland agriculture took place, however this is unlikely. The remnants of traditional trails, with associated trail markers, or *ahu*, are a possible site type that may be found in the project area. Sinks and lava tubes modified for temporary habitation or agriculture are another possibility.

## VI. RESULTS OF FIELDWORK

Pedestrian inspection of the project area was done on May 8th, 9th, 15th, 16th, and 17th, 2000. The first two days of field work were carried out as a preliminary reconnaissance of the project area to determine the types and density of different site types within the project area. Based on the findings of this reconnaissance, additional field work the following week was done to complete the 100 % coverage of the project area that is required for an archaeological inventory survey. Pedestrian inspection methods were the same during all field work. Systematic north-south oriented sweeps were done through the project area with an interval between archaeologists of 5 to 10 meters. Project area vegetation consists of a dense mix of *'uluhe* and strawberry guava. There is little soil development and pahoehoe is commonly exposed on the surface. Topography is undulating, with a gradual slope *makai* (to the east). Numerous small lava-sink features are located in the project area. Pigs are common in the area, and although only one pig was seen in the project area, the ubiquitous pig trails and rooting areas facilitated traverse of the dense vegetation.

During the course of fieldwork, several features related to past land use were noted and described, see Figure 8. A north-south oriented former unimproved road alignment was noted near the center of the project area. This alignment is overgrown with vegetation but parallel tire markings are still discernable, as are the parallel berms which make up the road margins. Judging by the modern garbage scattered along the margins of the road, this road alignment is not older than 50 years--and may have been in use as recently as 20-30 years ago based on the age of the overgrowth. The rusted out remains of a car were found along this road alignment. The road alignment is not considered a historic property. There are bulldozer push-piles along the margin of the water tank and electrical facility access road that mark the southern end of the project area. Along Komohana Street there is a stockpile of "armor rock" --boulders greater than 1 meter in diameter most likely related to the construction and excavation associated with Komohana Street. Modern garbage



(bottles, canned-food refuse, plastic etc.) is lightly scattered through most of the project area. Several well-tended marijuana plants were also noted.

Historic maps related to the Waiākea Sugar lands indicate that at the turn of the century the project area was considered pasture. These maps do not indicate habitation in the area. There is no evidence of agricultural activity in the parcel. A single medium-sized mango tree just outside the north project area boundary on the margin of the road alignment (discussed above), and the unimproved road alignment itself, are the only indications of 20th century land use predating the last 30 years.

On Tuesday May 9th, 2000 human skeletal remains were found during the preliminary reconnaissance of the project area. The remains consist of a single, left femur found in a lava sink feature. No other remains or cultural material were located in the sink. Based on the eroded appearance of the bone and the general context, the remains are thought to be traditional Native Hawaiian--most likely prehistoric or early historic--although this cannot be conclusively demonstrated. Mr. Kalaau Wahilani (State Historic Preservation Division--Burials Program) was notified immediately of the find, as was Mr. Marc Smith (State Historic Preservation Division--archaeology branch). Mr. Smith visited the project area on May 9th and was appraised of the project findings to date, but did not visit the burial sink.

Following the initial preliminary reconnaissance of the project area a more intensive archaeological inventory survey was conducted. With the completion of the pedestrian inspection during the inventory survey, 100% of the project area was inspected. During the inventory survey, in the vicinity of the burial sink, several additional sinks were located. Careful examination of the these features found no evidence of burial interment or other cultural modification. Although vegetation was dense, confidence is high that all historic properties in the project area were located during the survey.

Only a single historic property was recorded. This site, State Site 50-10-35-22080, found and documented during the preliminary reconnaissance, is described at length below:

| | |
|---|---|
| **State Site #** | 50-10-35-22080 |
| **Site Type:** | Sinkhole and associated caves/ overhangs |
| **Function:** | Burial Cave |
| **Features (#):** | 1 |
| **Dimensions:** | 3.5 m X 10 m |

**Description:** Site -22080 consisted of one large sinkhole and its 6 associated shallow, caves, or overhangs. The sinkhole appears abruptly in a relatively flat region, just northwest of the only bamboo patch within the project area (see Figure 8 for the site location). The dimensions of the sinkhole are approximately 10 m (E/W) x 3.5 m (N/S) and 2.7 m deep at its deepest point.

The edges of the sinkhole have collapsed and many large, loose boulders are piled around the interior circumference of the sink, forming a slight talus slope. The upper surface of this boulder-collapse deposit is between 70 - 130 cm below the edge of the sinkhole. These boulders, along with existing overhanging areas of the sinkhole interior lip, form six openings / caves along the edges of the sinkhole (Figure 9).

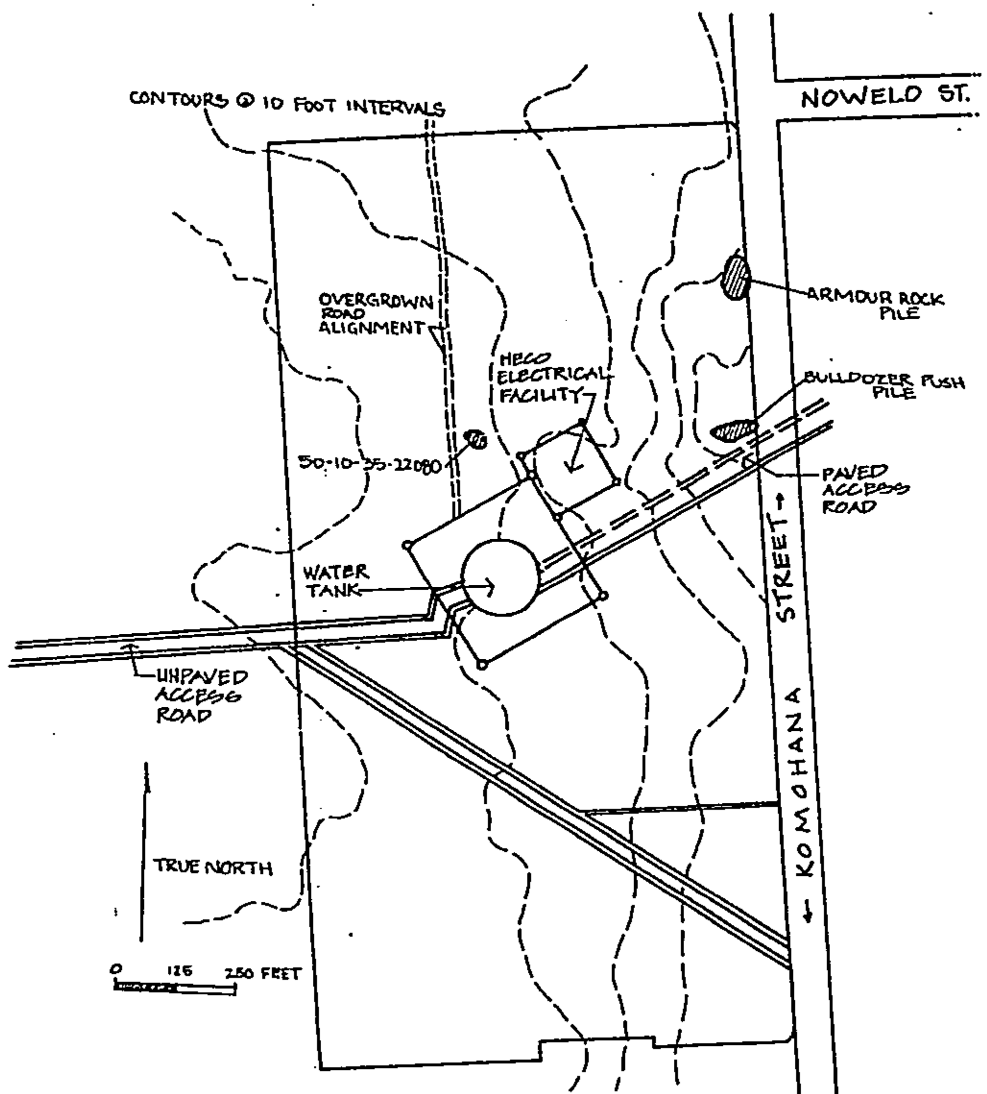



Figure 8 Study Area, showing existing overgrown road alignment, powerline easement and other pertinent details.



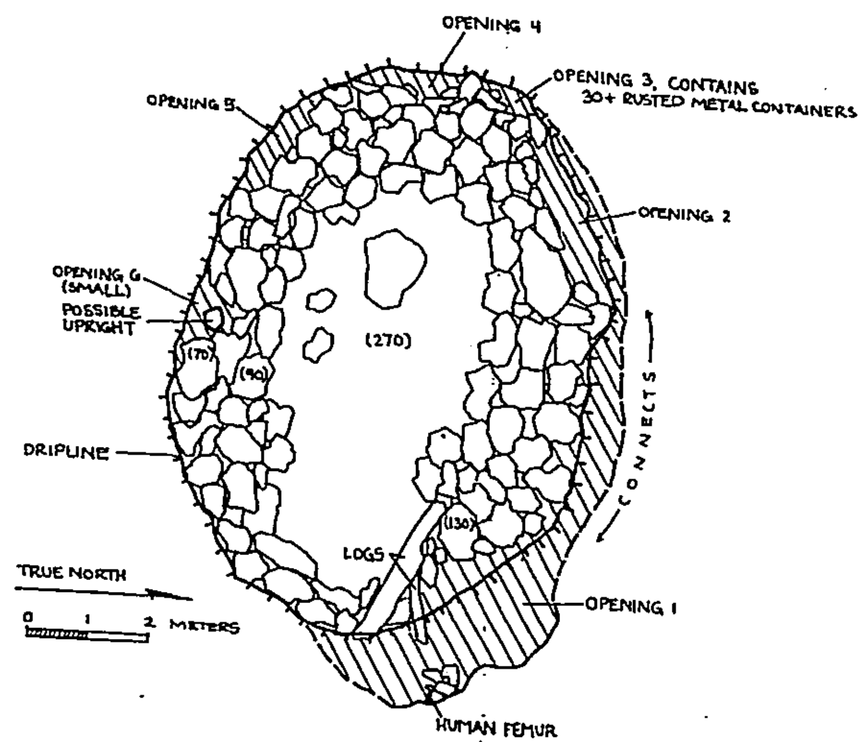



Figure 9 State Site 50-10-35-22080, showing location of Openings 1 - 6 and of the human remains.

Opening 1 was the largest of the six, with the entrance extending approximately 2.9 m (SE/NW), it was 1.2 m tall, and extends 2.1 m (NE) from the lip to the back. A rotting log and some of the collapsed boulders partially blocked the entrance. The interior of the cave was large enough to crawl into, but ceiling heights are low, c. 40-75 cm. A single left human femur was found at the back/southern end of Opening 1. No teeth or other skeletal remains were present. Numerous small bone fragments were present near the femur. These were pieces of the femur itself, which is deteriorating due to exposure to the elements. The bone lies on the cave surface amid several basalt boulders. No other cultural material was found in association with the femur. Upon further examination, it became apparent that Openings 1 and 2 were actually the same overhang, but collapsed boulders have separated them into two distinct "openings" or caves.

Opening 2, found to connect with Opening 1 to the east, had an entrance width of 2.8 m (E/W), it was 1.0 m tall, and extended 0.5 m (N) from the lip to the back. Upon inspection, opening 2 contained no cultural material.

Opening 3, the smallest of the six, just south of Opening 2, had an entrance width of 0.7 m, an entrance height of 0.8 m, and extended in a downward / west direction, approximately 0.8 m. It contains 30 or more rusted and/or tarnished, cylindrical metal containers, which appear to be "tin cans" from canned food.

Opening 4, 5, and 6 had entrance widths ranging from 0.4 - 0.9 m, all three openings being approximately 0.6 m tall, and each extending no more than 0.2 m back from the lip, but all three opening in a downward direction approximately 0.8 m. Upon inspection, Openings 4, 5, and 6 were found to be empty of any cultural evidence. Outside the entrance to the opening 6 an elongated, upright basalt boulder was noted. It was not possible to determine if this was an intentionally placed "upright", or merely the natural resting posture of fallen boulder.

The age, ethnicity, and function (or reason for deposition) of the single human femur within Site 50-10-35-22080 is a matter of speculation. Possible scenarios for the deposition of the isolated bone include: 1) deposition by Native Hawaiians as a discarded keep-sake; 2) deposition by Native Hawaiians as the secreted remains of a grave robbed for bone to be used as raw material for fish hook manufacture; 3) deposition by some other ethnic group as part of a mortuary practice; and 4) deposition by an animal, such as a dog or pig, from a disturbed burial.

It is a possibility that the human femur is the result of grave vandalism and/or the search for human bone raw material for the fish hook manufacture. These types of vandalized burials are discussed by Bowen (1974:144-146), in the context of the sand dune burials of Mokapu Peninsula, O'ahu. However, the long bones of these vandalized burials were cut and/or shattered to obtain the tabular fragments of human bone that were used for fish hook manufacture. The femur in Site 50-10-35-22080 is decomposing from exposure, but it is not cut or shattered. It seems less likely that this isolated femur was associated with the search for fish hook raw material.

The various non-Hawaiian ethnic groups that lived in the vicinity of the project area during the historic period included various European nationalities, including Portuguese, and Chinese, Japanese, and Filipino. It is less likely that these ethnic groups would have



an established mortuary practice involving the deposition of an isolated human bone in a cave feature.

An animal, such as a dog or pig, could possibly have been responsible for the deposition of the femur, but this seems unlikely. There was no evidence that the sink had been used as a "den". No other bone fragments were observed in the sink feature indicating this was not a location of an animal hoard. Also, the low ceiling height (c. 40 cm) at the location where the bone was deposited would have been difficult for most animals to negotiate. This may seem a counter-intuitive argument, that because the femur was found in a difficult spot for animals to reach, it was therefore was most likely deposited by humans. The explanation lies in the difficult crawl from the sink opening to the location of the femur. One must worm over boulders beneath a low ceiling height. The feeling is the bone was intentionally hidden away in a rather difficult to reach location rather than carried in easily by an animal to an often utilized location.

There is a fair amount of ethnographic information and archaeological data documenting the common Native Hawaiian mortuary practice of curation of skeletal material or other body parts as keep-sakes from deceased loved-ones. Based on this information, the most likely scenario is number 1--that the femur is Native Hawaiian, of prehistoric or early historic age, and was deposited as a discarded keepsake. It should be understood, however, that this cannot be demonstrated conclusively.

The following is brief summary of the ethnographic and archaeological discussion of Native Hawaiian secondary burial deposition and body part keep-sake curation.

David Malo (1996: English Translation 202), speaking of traditional Hawaiian burial practices and writing in the mid 19th century, lists the following under the heading "Concerning the Dead [Corpses]":

> 15. And another corpse could be buried and hidden if the person was beloved by her husband or his wife. Then, he or she would secretly go and take four bones (*nā iwi iho* in the original manuscript [Emerson,1971;98]), and the skull, washing all of the rotten flesh off in fresh water.
>
> 16. Then, the bones were put into his or her pillow bundle and he or she slept with this bundle (*pū 'ā iwi*) every night. There were many corpse treated in this beloved way
>
> 17. If the bones were not taken, then perhaps a hand or palm was cut off and dried in the sun, so one would sleep with this part of the body; or if not a palm of the hand or perhaps the person's hair; or if not hair, then a person's finger nails (*niho hāhā*) or toenails.
>
> 18. These were the body parts that were taken by those who greatly loved [the deceased], and they were well taken care of until the time one's love for the deceased ended, then these parts or the corpse were abandoned.

Several archaeological reports dealing with mortuary practices indicate that the retention of human remains was a common way for traditional Native Hawaiians to mourn their love ones. For example:

> Secondary burials were keepsakes in ancient times, and included bones of both sexes and all age groups. Secondary burials imply a two-part preparation process involving defleshing and dismemberment followed by interment. (Han et al. 1986:67).

and,

> A 1957 Mokapu sand burial seems to represent an example of a neglected keepsake. In this disposal (C16), a femur and tibia of one individual had been placed with both femora and one tibia of another. The five bones lay parallel to each other, as if they had been placed in a bundle. The bones may have been returned by a grave robber who had a twinge of conscience, but more likely represent mementos kept with loved ones for a period of time which were buried in the dunes after affection subsided.
> . . . How many disarticulated skeletal parts found in disposal sites fall into keepsake category is a mater of conjecture. From Malo's (1951:93--quoted above) description, the custom seems to have been popular and it is probably safe to assume that many isolated skeletal parts fall into this category. (Bowen 1961:185).

The sink feature (Site 50-10-35-22080) was discovered during the second day of field work, May 9th, during the reconnaissance phase of the field work. During the initial discussion with SHPD following the discovery of the site, there were questions regarding whether a single bone constitutes a burial site and, if it was a burial site, is it considered a previously recorded or an inadvertent burial find. The treatment of the burial site was the subject of a meeting between U. H. Hilo representatives (the landowner), SHPD (Mr. Kala'au Wahilani and Mr. Marc Smith), a representative of the Hawai'i Island Burial Council, a representative of SSFM International, Inc., and representatives of the USDA, on June 8th, 2000. Following the direction of Mr. Kala'au Wahilani, of the SHPD Burials Program, Site 50-10-35-22080 is considered a burial site, and, because it was found during the reconnaissance phase of the project, is to be treated as an inadvertent find. As an inadvertent find, the mitigation of the burial site falls under the jurisdiction of the SHPD Burials Program. At the June 8th meeting it was decided that the burial mitigation would be taken care of by the land owner, U. H. Hilo. U. H. Hilo would be responsible, through consultation with SHPD Burials Program, for the establishment of the burial preserve area, to include a 50' buffer area measuring from the rim of the burial sink. Also at this meeting it was proposed that the land area under consideration for the USDA Research Center be shifted to avoid the known burial site. In this way the known burial site would be excluded from the area under consideration for the USDA Research Center--see discussion below.



## VII. SIGNIFICANCE

One historic property was located and documented during the preliminary reconnaissance of the current project area. The following significance evaluation is based on the criteria of the Hawai'i State and National Registers of Historic places (HRS 6E-10 and 6E-5.5), which defines five broad criteria for defining a cultural site as significant.

- A. Site reflects major trends or events in the *prehistory* or *history of the state or nation.*
- B. Site is associated with the lives of persons significant in our past.
- C. Site is an excellent example of a site type.
- D. Site has yielded or is likely to yield information important to prehistory or history.
- E. Site has traditional cultural significance to an ethnic group.

Site 50-10-35-22080 is significant under Criterion D, for its information content regarding Traditional Hawaiian mortuary practices, and Criterion E, for its cultural significance to Native Hawaiians.

## VIII. RECOMMENDATIONS

It is recommended that the single significant site in the project area be preserved in perpetuity through the establishment of a burial preserve area. This burial preserve area should include the entire lava sink feature that makes up Site 50-10-35-22080 as well as a buffer that measures at least 50' from the rim of the sink. The boundaries of this preserve area should be recorded by land surveyors and placed on all project area maps. No construction, grading, or other land alteration should take place within this preserve area. A preservation plan for site 50-10-35-22080 should be written and approved by SHPD/DLNR.

Because no other historic properties are located within the project area, development of the parcel will have no adverse affect on significant historic properties once the burial preserve area is established and maintained.

A meeting was held on July 27, 2000 to discuss the treatment of burial site 50-10-35-22080 and the Section 106 Historic Preservation consultation process for the USDA Research Center project. At the meeting, among others, were representatives from U. H. Hilo (the landowner), SHPD (Mr. Kala'au Wahilani (Burials Program) and Mr. Marc Smith (Archaeology Branch)), a representative of the Hawai'i Island Burial Council, a representative of SSFM International, Inc., and representatives of the USDA. In discussion regarding the treatment of the burial site Mr. Wahilani detailed the steps that would be required of U. H. Hilo to establish the burial preserve area. He confirmed the need for a 50' buffer area, measured from the sink edge, around the sink feature. This area was to be preserved in-place in perpetuity, and delineated with appropriate Native Hawaiian vegetation. There is to be no public access to the site. Mr. Wahilani said the burial preserve area, including the buffer zone, should be recorded with the State Bureau of Conveyance as a preserve dedicated permanently for protection of the site.

A second important point of discussion at the July 27th meeting involved the change in the project area under consideration by U. H. Hilo and the USDA for the construction of the USDA Research Center. The prior project area under consideration by USDA, the area described in this document, had constraints due to considerable slopes and County easements that crossed through the area. The new project area includes some of the old project area, along with lands to the west of the original project area. The approximately 30-acre new project area is flatter and should be free of these County easement and slope constraints. This change in the project area under consideration by USDA excludes the known burial site (50-10-35-22080) from the project area. Additional archaeological inventory survey will be required to determine if historic properties are located within the portions of the new project area under consideration by U. H. Hilo and USDA that were not studied under the current inventory survey.



## IX. REFERENCES


Borthwick, Douglas, Joy Collins, William H. Folk, and Hallett H. Hammatt
1993 Archaeological Inventory 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). Prepared for Engineering Concepts, Ms. on file at the State Historic Preservation Division, Kapolei, Hawaii.

Bowen, Robert N.
1961 *Hawaiian Disposal of the Dead*: M. A. Thesis in Anthropology, University of Hawaii, Manoa.

Bowen, Robert N.
1974 Mokapu: Its Historical and Archaeological Past, Appendix A in *Early Hawaiians: An Initial Study of Skeletal Remains*: University Press of Kentucky, Lexington.

Cleghorn, June Noelani Johnson
1987 Hawaiian Burial Reconsidered: An Archaeological Analysis: M. A. Thesis in Anthropology, University of Hawaii, Manoa.

Condé, Jesse C. and Gerald M. Best
1973 *Sugar Trains: Narrow Gauge Rails of Hawai'i*, Glenwood Publishers, Felton Calif.

Han, Toni L., Sara L. Collins, Stephan D. Clark, and Anne Garland
1986 *Moe Kau a Ho'oilo, Hawaiian Mortuary Practices at Keopu, Kona, Hawaii*: Department of Anthropology, Bishop Museum, Honolulu.

Hudson, Alfred E.
1932 *Archaeology of East Hawaii*, Ms. in Department of Anthropology, Bishop Museum, Honolulu.

Hunt, Terry L.
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*,

Hunt, Terry L., and Matthew McDermott
1994 Archaeological Inventory Survey, Pu'ainako Street Extension Project, Lands of Waiākea, Kukuau 1 and 2, and Ponahawai, South Hilo District, Island of Hawaii, Prepared for Okahara & Associates, Engineering Consultants, Ms. on file at the State Historic Preservation Division, Kapolei, Hawaii.

Kelly, Marion, Barry Nakamura and Dorothy B. Barrère
1981 *Hilo Bay: A Chronological History, Land and Water Use in the Hilo Bay Area, Island of Hawai'i*, Bishop Museum, Honolulu.

Lockwood, J., and J. Buchanan-Banks
1991 Preliminary Geologic report for the Alenaio Stream Flood Damage Reduction Study area, Hilo, Hawaii. Open-file Report 81-791, U. S. Geological Survey.

Maly, Kepā, Alan T. Walker, and Paul H. Rosendahl
1994 Archaeological Inventory Survey, Waiākea Cane Lots, Portion of Parcel 6, Land of Waiākea, South Hilo District, Island of Hawai'i (TMK: 2-4-57-01). Prepared for Roy Takemoto, Ms. on file at the State Historic Preservation Division, Kapolei, Hawaii.

Malo David
1951 *Hawaiian Antiquities* Bernice P. Bishop Museum, special publication 2, second edition: Bishop Museum Press, Honolulu

1996 *Ka Moolelo Hawaii: Hawaiian Traditions*: First People's Productions, Honolulu.

Moniz, Jadelyn J.
1992 "Summary of Prior Archaeological Work" *Historical and Archaeological Synthesis of Land Use and Settlement Patterns Waiākea Ahupua'a, Hilo Hawaii*, UH Anthropology 645: Historic Preservation, Fall 1992, Honolulu.

McEldowney, Holly
1979 *Archaeological and Historical Literature Search and Research Design: Lava Flow Control Study, Hilo, Hawaii*, Department of Anthropology, Bishop Museum, Prepared for the U. S. Army Engineer District, Pacific Ocean.

Robins, Jennifer, and Robert L. Spear
1996 An Inventory Survey of the Puainako Street Realignment/Extension Project Expanded Corridor, Waiākea, Kukuau 1 and 2, and Ponahawai, South Hilo District, Island of Hawaii. Prepared for Okahara and Associates, Ms. on file at the State Historic Preservation Division, Kapolei, Hawaii.

Sato, H. *et al.*
1973 *Soil Survey of the Island of Hawaii*, U.S. Department of Agriculture and Univ. of Hawaii Agricultural Experiment Station.

Smith, Marc
1991 *Site Inspection of the University of Hawaii - Hilo Perimeter Road Alignment, Research and Technology Park Phase I, Waiākea, South Hilo, Hawaii Island (TMK: 3-2-4-01:7)*, November 8, 1991, State Historic Preservation Division, Department of Land and Natural Resources, Honolulu.



Smith, Marc
1992 *Field Inspection for State Land Disposition of the Proposed Department of Water Supply Office Site in Hilo, Waiākea Cane Lots, Waiākea, South Hilo, Hawaii Island (TMK: 3-2-4-56:1)*, January 3, 1992, State Historic Preservation Division, Department of Land and Natural Resources, Honolulu.

Snow, Charles E.
1974 *Early Hawaiians: An Initial Study of Skeletal Remains*: University Press of Kentucky, Lexington.

Spear, Robert L.
1993 An Inventory Survey of the H.C.E.O.C. (Option II) Parcel, Piihonua *Ahupua'a*, South Hilo District, Hilo, Island of Hawai'i [TMK :2-3-32:4]. Prepared for Stuart/Erickson & Associates, Ms. on file at the State Historic Preservation Division, Kapolei, Hawaii.

Spear, Robert L.
1995 Data Recovery Excavations for Sites 50-10-35-19431, 19432, 19433, and 19434, Land of Waiākea, South Hilo District, Island of Hawai'i [TMK: 2-4-57:01]. Prepared for Roy Takemoto, Ms. on file at the State Historic Preservation Division, Kapolei, Hawaii.

Thrum, Thos., G.
1907 "Heiau and heiau sites throughout the Hawaiian Islands. *Hawaii Almanac and Annual for 1908.*

1908 *Hawaii Almanac and Annual for 1909*, Honolulu: [n.p.]

# APPENDIX A: PHOTOGRAPHS



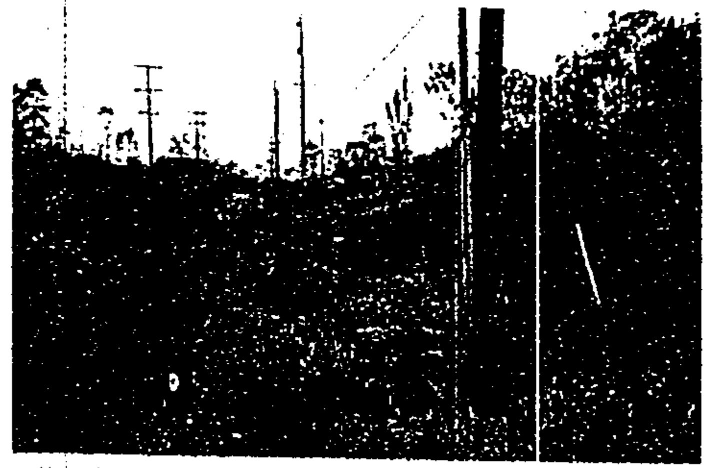
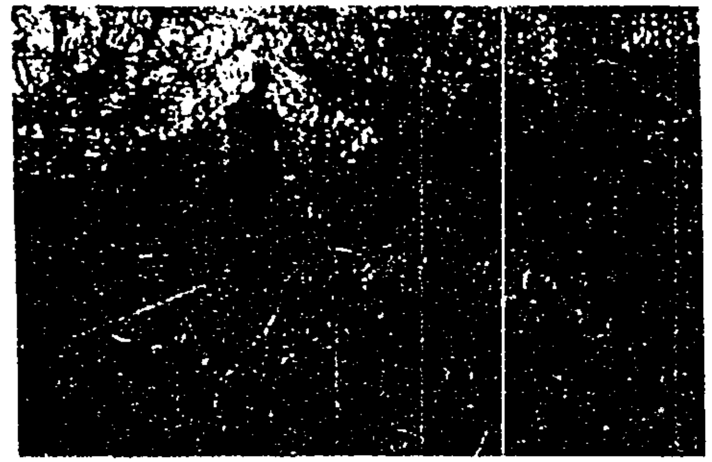
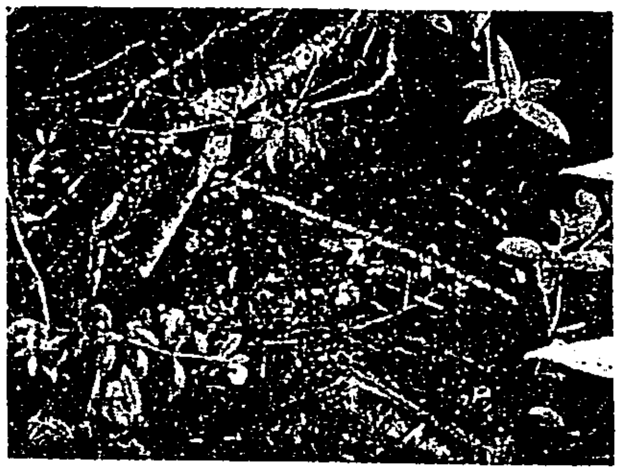


Figure 10 Access road to reservoir, showing telephone pole alignment and entrance gate, taken to west

Figure 11 Powerline easement, with project area on right side, taken to west





## Addendum To:

**Archaeological Inventory Survey**
**of an Approximately 20-Acre Parcel Proposed for the USDA Pacific Basin Agricultural Research Center,**
**Located Near the Intersection of Komohana and Puainako Streets, South Hilo, Hawai'i Island (TMK 2-4-01:por 122)**
**(Bush, McDermott, and Hammatt 2000)**

By

Matt McDermott, M.A.
and
Hallett H. Hammatt, Ph.D.

Prepared for

SSFM International, Inc.

Cultural Surveys Hawaii, Inc.
March 2001

## I. INTRODUCTION

This addendum documents the results of archaeological inventory survey investigations on an additional 10-acre parcel (TMK 2-4-01: por 122) located *mauka* (east) of the University of Hawai'i at Hilo, near the intersection of Komohana and Puainako Streets, in the *ahupua'a* of Waiākea, South Hilo. This work was done for SSFM International, Inc., as part of the overall inventory survey investigations of the proposed United States Department of Agriculture (USDA) Pacific Basin Agricultural Research Center. Previously the 20-acre parcel immediately to the east of the current parcel was the subject of inventory survey investigations. The report on this previous 20-acre parcel was reviewed and approved by the Department of Land and Natural Resources/State Historic Preservation Division (DLNR/SHPD) on October 4th, 2000 (LOG NO: 26293 DOC NO: 0010RC03). This addendum report is submitted as an appendix to the existing USDA Research Facility inventory survey report.

### A. Project Background

Cultural Surveys Hawai'i, Inc. (CSH) conducted a preliminary reconnaissance and, subsequently, an archaeological inventory survey within an approximately 20-acre parcel (TMK 2-4-01: por 122) located *mauka* (east) of the University of Hawai'i at Hilo, near the intersection of Komohana and Puainako Streets, in the *ahupua'a* of Waiākea, South Hilo (Bush, McDermott, and Hammatt 2000). This work was done for SSFM International, Inc. Fieldwork was carried out on May 8, 9 and 15-17, 2000. The project area was subjected to 100% pedestrian survey coverage by two CSH archaeologists. Vegetation within the project area is a dense mix of *'uluhe* fern and strawberry guava. During the course of the preliminary reconnaissance, a single historic property was located and documented. This most likely prehistoric feature consists of a lava sinkhole with an associated human burial (one single human femur). The lava sink feature was designated State site # 50-10-35-22,080. The site is considered significant under State and National Register of Historic Places Criterion D, for its information content regarding Native Hawaiian mortuary practices, and Criterion E, for its traditional significance to Native Hawaiians.

It was recommended that a buffer zone of 60 feet be established around State site # 50-10-35-22,080. This area is to be preserved through the establishment of a burial preserve area. It was determined that once the preserve area was established the development of the 20-acre parcel would most likely have no adverse effect on significant historic properties.

Following the completion of the initial 20-acre inventory survey field work, in consultation with SSFM International, USDA, University of Hawaii--Hilo, and the State Historic Preservation Division, it was determined that the project area under consideration for the USDA Research Center would be reconfigured. The newly proposed project area extends to the west of the original 20-acre project area, but includes most of the same original acreage. Approximately 10 additional acres were added to the west of the original 20-acre parcel. The new project area excludes the burial preserve area around State site # 50-10-35-22,080. This addendum report documents the results of the archaeological inventory survey that was carried out in the additional 10-acres of the new project area, see Figures 1 and 2. For discussion of traditional and historical background and previous archaeology, see the original inventory survey report (Bush, McDermott, and Hammatt 2000).

### B. Project Area Description

The project area is located approximately 3 kilometers inland of Hilo Harbor. The 10-acre parcel is bordered by the original 20-acre parcel to the east, an existing access road to the south, and Waiākea State Land to the west and north. The landowner is the University of Hawaii, Hilo. The USDA is considering obtaining a lease for the property to construct the Research Center. No previous archaeological studies of any kind have been conducted within the confines of the current 10-acre project area.

Vegetation is a dense mix of *'uluhe* ferns, strawberry guava, and other introduced plant species. The topography is undulating with shallow soils and exposed pahoehoe low knolls and ridges. Pahoehoe lava sink features and irregular depression are common. Project area conditions were nearly identical to the conditions found during the inventory survey of the adjacent 20-acres that took place last year, with one exception. Within the 10-acre parcel there were numerous land surveyor "line-of-sight" vegetation corridors cut through the vegetation. These had periodic survey stakes labeled "control point". These cleared corridors were used as access routes to different parts of the project area.

### C. Scope of Work

The scope of work for this project was composed to satisfy Federal, State and County requirements for an archaeological inventory survey and included the following procedures:

1. A complete ground survey of the entire project area for the purpose of site inventory. All sites were located, described, and mapped with evaluation of function, interrelationships, and significance. Documentation included photographs and scale drawings of sites and complexes. All sites were assigned State site numbers.

2. Limited subsurface testing to determine depth and quantity of cultural materials within archaeological sites and to obtain datable samples for chronological information if none is available for sites in the immediate area from previous studies.

3. Preparation of this addendum that documents all findings.



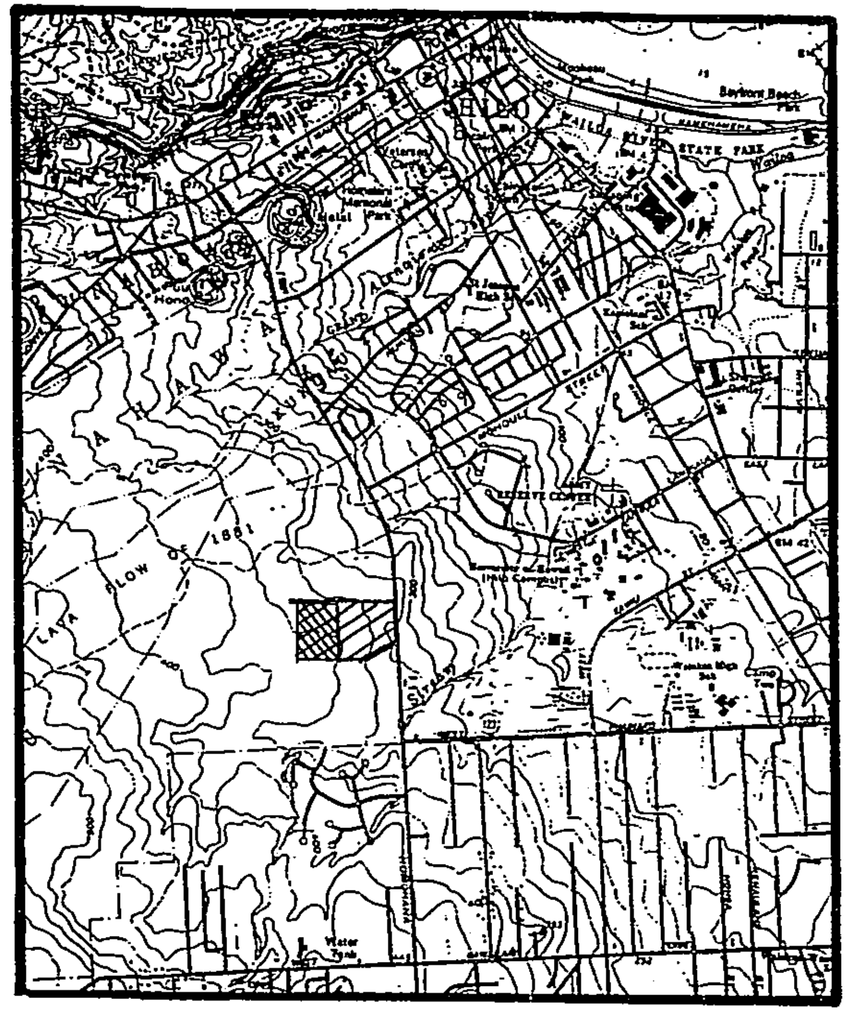



Figure 1 Portion of USGS Topographical Map, 7.5 Minute Series, Hilo Quadrangle, showing the current 10-acre project area (cross hatching) in relation to the initial approximately 20-acre parcel (hatching)

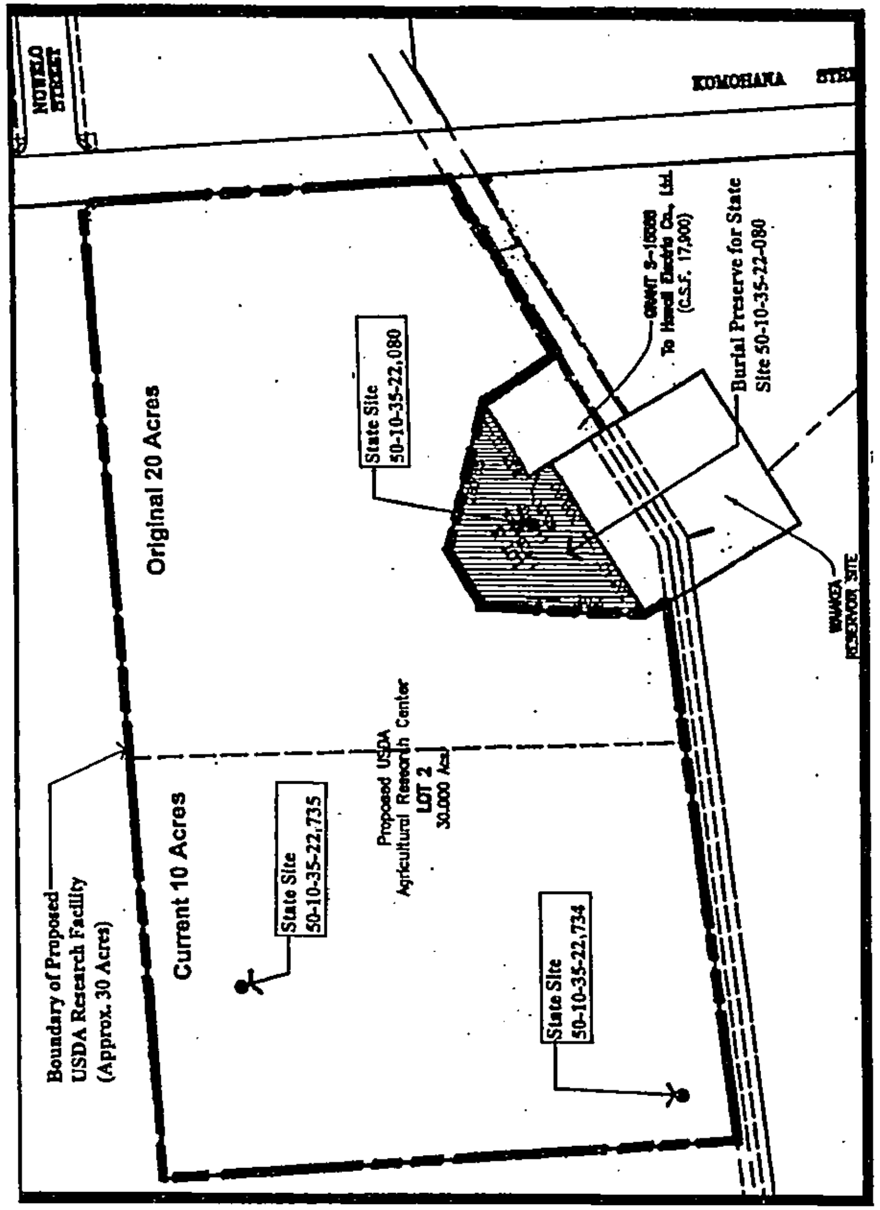



Figure 2 Project area map showing the locations of the two newly documented historic properties (-22,734 & -22,735)

D. Methods

The inventory survey field work was done on March 14th and 15th, 2001 by archaeologists Alika Anixt and Matt McDermott, M.A. All work was done under the overall guidance of Dr. Hallett H. Hammatt. Maps of the project area and maps of Hilo-area lava flows were analyzed in light of the results of previous archaeological studies in the area. This was done prior to the ground survey to ascertain what cultural feature-types might be present. The project area was inspected through a series of north-south oriented pedestrian sweeps with the interval between archaeologists maintained at 10 m. Ground visibility was limited in some areas by dense *'uluhe* (*Dicranopteris linearis*) fern.

Project area corners and identified historic properties were located with sub-meter accuracy using a Trimble PathfinderPro XR GPS unit based on the Lat./Long. coordinates supplied by ControlPoint Surveying, Inc.. These project area corner points each had land surveyors stakes and colored flagging and were labeled "LIMITS" with a point number on the stakes.

Two historic properties were located within the 10-acre parcel, see Figure 2. Based on all available evidence, both are thought to be historic and related to agricultural or ranching activites in the area during the first part of the 20th century. Both features were mapped and documented with photographs and written descriptions. Their locations were recorded using the PathfinderPro GPS unit. One feature was excavated to better determine its function and age of construction. Hand excavation recording procedures followed standard archaeological practices. Photographs, written sediment descriptions, and drawn excavation profiles recorded the excavation stratigraphy.

## II. SURVEY RESULTS

State site # 50-10-35-22,734 is located in the southeastern corner of the project area (Lat. = 19 degrees 41 minutes 48.77157 seconds/Long. = 155 degrees 05 minutes 43.35873 seconds), within dense stand of strawberry guava. It consists of the modified crest of a low pahoehoe knoll (see Figures 3 and 5). Pahoehoe boulders were used to form a roughly square platform that measures approximately 2.5 meters on a side. The feature is one to three courses high (30 to 55 cm). Facing is most evident along the southern portion of the feature. A shallow, narrow, natural fissure in the pahoehoe extends southeast from the feature. Two small, deeper natural cavities are located within this fissure near the southern corner of the platform. Approximately 15 meters to the southeast of the platform, within a natural pahoehoe depression, lies an old, rubber truck tire and badly rusted wheel rim. There was no other cultural material in the vicinity of the platform.

Based on surface observations and general context, two site interpretations were likely. First, the feature has the general appearance of a traditional Hawaiian burial platform. Because a burial was found in the adjacent 20-acre parcel to the east, it was not unreasonable that a traditional Hawaiian burial platform be found with the current 10-

acre parcel. Second, the platform is similar to features found within the extensive historic agricultural complexes documented along this portion of Waiakea. These historic features consist of modified outcrops, platforms, and terraces that were constructed during intensive sugarcane cultivation in the area in the early portion of the 20th century (see Hunt and McDermott 1994 and Borthwick *et al.* 1993). These features functioned as clearing mounds, stone ramps, loading platforms, and temporary track foundations. These features are generally found in groups, however, not in isolation like the current platform.

To better determine the structure's function and age of construction a test unit (0.75 by 1.25 m) was excavated within the platform's central portion (see Figures 4 and 6). The excavated sediment was not screened, as the gravelly sandy loam would not pass through 1/8th inch mesh. The sediment was carefully examined, however, as it was removed. No cultural material was found. The stratigraphy in the unit was as follows:

Stratum I (0-25 cmbs) = pahoehoe boulders used in the platform perimeter construction

Stratum II (0-35 cmbs) = (Dry) 7.5 YR 3/2 dark brown; slightly hard; cobbly, gravelly sandy loam; structureless; contains very abundant roots and rootlets from the surrounding guava vegetation; lower boundary is abrupt/wavy; a combination natural sediment and platform construction (cobbles).

Stratum III (below 35 cmbs) = decomposing pahoehoe bedrock.

Based on these results, it is unlikely that the platform is a burial. There was no indication of human skeletal remains, nor was there any indication of an internal crypt-like construction that is sometimes observed in burial platforms. Stratum II is a mix of the surrounding sediment and the locally available pahoehoe cobbles and boulders. It appears to be a fill material used to create the level surface of the platform itself, within the perimeter of stacked boulders.

Based on all available information, the feature is thought to be historic (older than 50 years), and to have functioned as perhaps a planting feature, or, possibly a foundation platform for some sort of small structure or tank. It is unclear why the feature is in apparent isolation. With the exception of its isolation, the site is very similar to structures described as historic plantation era features in inventory survey reports from adjacent parcels (again see Hunt and McDermott 1994 and Borthwick *et al.* 1993).



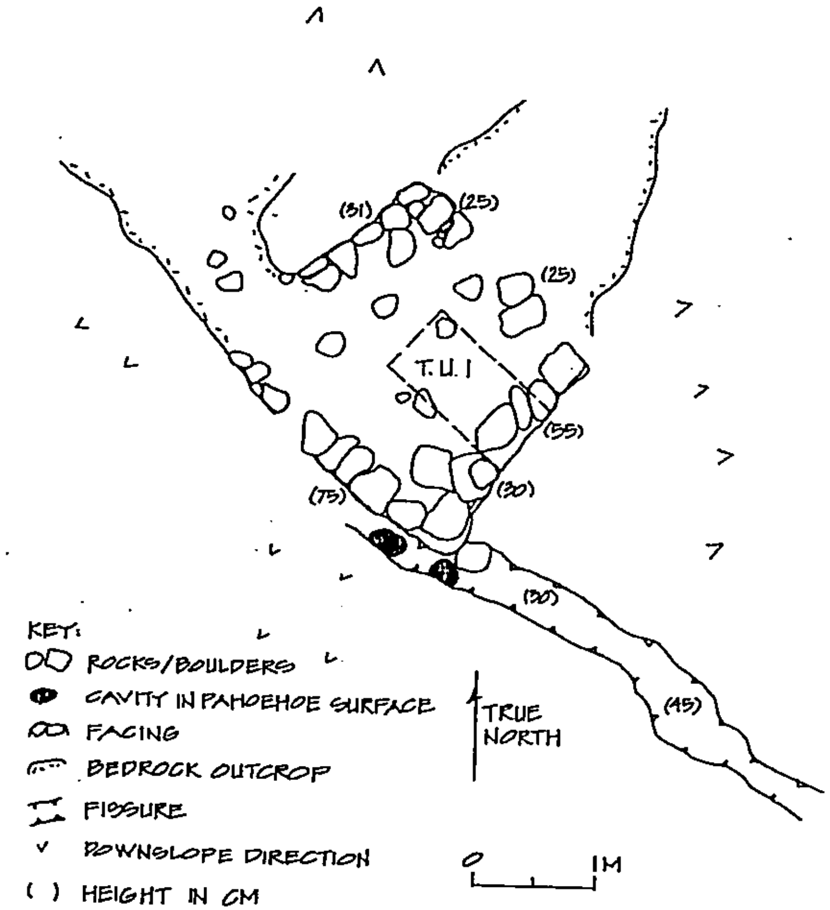



Figure 3 State site # 50-10-35-22,734, modified outcrop platform

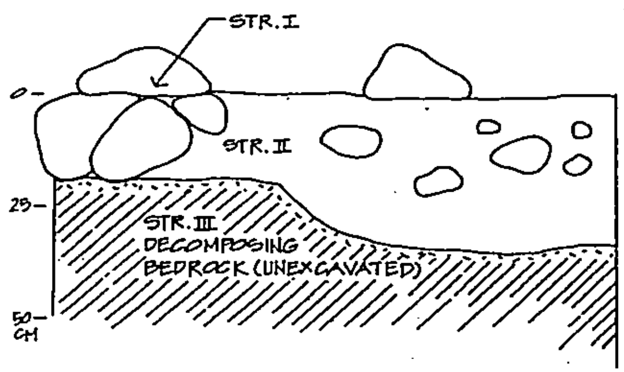



**Figure 4** Southwest profile of test unit #1 (75 x 125 cm) in State site # 50-10-35-22,734



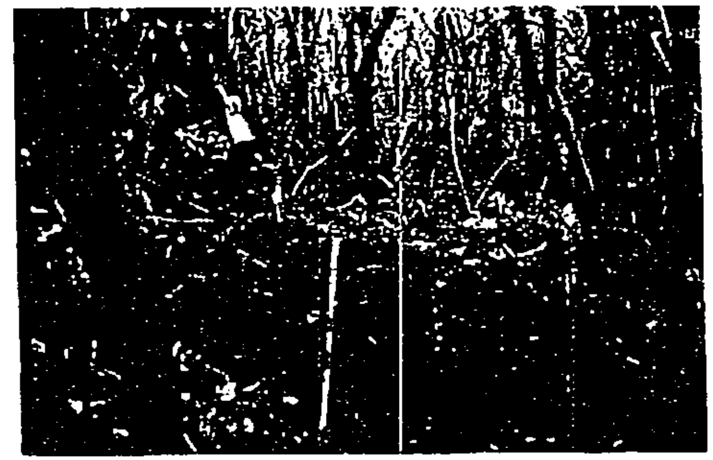


Figure 5 View north of State site # 50-10-35-22,734

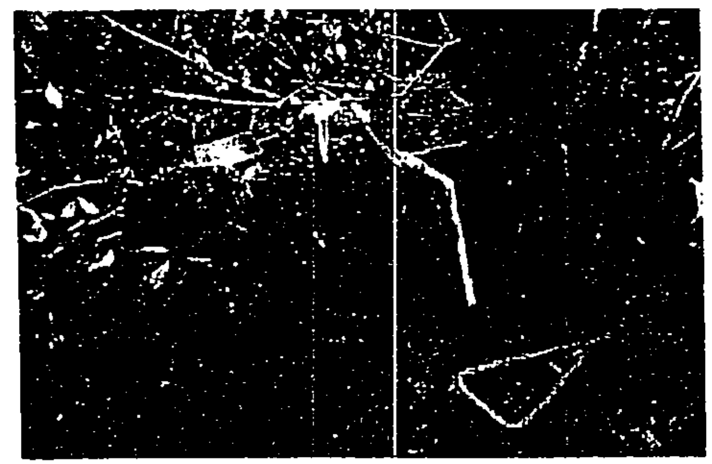


Figure 6 View west of southwest profile of test unit 1 of State site # 50-10-35-22,734

State site # 50-10-35-22,735 is located within the central northern portion of the project area (Lat.= 19 degrees, 41 minutes, 54.41084 seconds/Long. = 155 degrees, 05 minutes, 40.37324 seconds), within a disturbed area of introduced species and strawberry guava. There is a 8-12 meter tall mango tree, with historic garbage scattered underneath it, approximately 30 meters to the north-northwest of the site. This historic refuse material, including machine parts and glass jars and bottles, appears to date to the first half of the 20th century.

The site consists of a stacked stone causeway that was formerly part of an unimproved roadway that traversed through the project area (see Figures 7 and 8). Except at the location of the causeway, the roadway alignment is no longer discernable across the landscape. The causeway measures approximately 6 meters long and 4 meters wide and was constructed to fill in a natural low spot in the pahoehoe land surface. The two sides of the causeway are neatly stacked and faced with the locally available pahoehoe boulders and cobbles. The causeway surface is level and evenly paved primarily with pahoehoe cobbles. Along its western side the causeway has an alignment of single pahoehoe boulders that forms a curbing 25-30 cm above the level causeway surface. The causeway height is between 50 cm (south side) and 110 cm (north side) above the ground surface measured from within the natural depression. The east and west portions of the causeway are flush with the surrounding land surface. Two shallow parallel depressions, appropriately spaced to be wheel tracks, are still discernable on the causeway's surface. This feature is clearly a historic feature related to transportation within the project area.

Unlike the bulldozed roadway that traversed north/south through the adjacent 20-acre parcel (see Project Area Description Section in Bush, McDermott, and Hammatt 2000), this apparent historic roadway showed no signs of bulldozing (e.g., bulldozer push-piles or berms). It also did not have modern (e.g. less than 50 years old) garbage scattered along its margins and is no longer discernable as a cleared spot in the surrounding vegetation. Based on these indications, this causeway is thought to be older than the roadway within the adjacent 20-acre parcel. It most likely dates to the first half of the 20th century and is related to agricultural, dairy, or ranching activity within the project area.



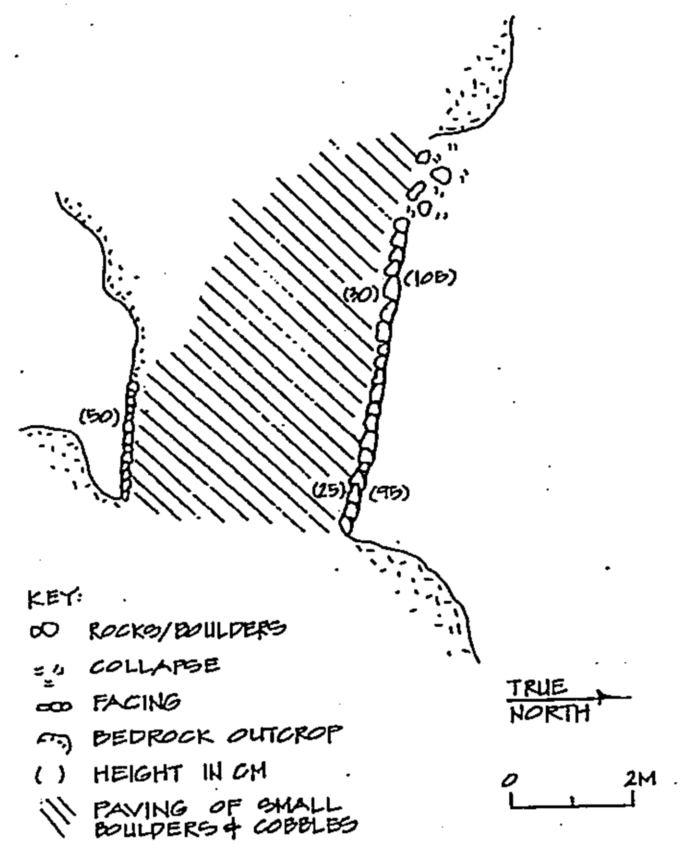



Figure 7 State site # 50-10-35-22,735, stacked stone causeway

Figure 4. View to the west along the northern portion of State site # 50-10-35-22,735



## III. SIGNIFICANCE

The two historic properties in the project area are both considered significant under Criterion D (for their information content) of the State and National Register of Historic Places. Their documentation during the current inventory survey field work has collected the available information from these sites. This information has been collected in the form of photographs, written descriptions, tape and compass maps, sub-surface testing, and accurate locations with GPS technology.

## IV. RECOMMENDATIONS

No further historic preservation work is recommended for the project area. The development of the 10 acres can proceed without adverse impact to significant historic properties.

In total, this addendum report and the original archaeological inventory survey of the 20-acre parcel immediately to the east comprise an area of approximately 30 acres. This 30-acre parcel contains three significant historic properties. State site # 50-10-35-22,080, the burial sink found during the original 20-acre inventory survey, will be preserved in perpetuity through the establishment of a burial preserve area, see Figure 2. This preserve area is to be excluded from the overall acreage of the proposed USDA Research Facility. The implementation and maintenance of the burial preserve area will fall to the land owner, the University of Hawaii at Hilo. The two remaining historic properties, State site #s 50-10-35-22,734 and -22,735, are historic structures. The information available from these sites has been adequately recorded during the current investigations and no further historic preservation work is recommended. Therefore, with the exclusion of the burial preserve area for State site # 50-10-35-22,080, the entire approximately 30-acre parcel proposed for the USDA Research Facility can be developed with no adverse affect to significant historic properties.

## V. REFERENCES CITED


Bush, Anthony R., Matt McDermott, and Hallett H. Hammatt
2000 Archaeological Inventory Survey of an Approximately 20-Acre Parcel Proposed for the USDA Pacific Rim Agricultural Research Facility, Located Near the Intersection of Komohana and Puainako Streets, South Hilo, Hawai'i Island (TMK 2-4-01: por 122). Manuscript on file at the State Historic Preservation Division, Kapolei.

Borthwick, Douglas, Joy Collins, William H. Folk, and Hallett H. Hammatt
1993 Archaeological Inventory Survey and Testing of Lands Proposed for Research and Technology Lots at the University of Hawai at Hilo (TMK 2-4-01:07 and 41). Prepared for Engineering Concepts, Ms. on file at the State Historic Preservation Division, Kapolei, Hawaii.

Hunt, Terry, L. and Matt McDermott
1994 Archaeological Inventory Survey, Pu'ainako Street Extension Project, Lands of Waiakea, Kukuau 1 and 2, and Ponahawai, South Hilo District, Island of Hawaii, Prepared for Okahara & Associates, Engineering Consultants, Ms. on file at the State Historic Preservation Division, Kapolei, Hawaii.

# APPENDIX I

## *A Traditional and Cultural Practices Assessment*

Prepared By:
Cultural Surveys Hawaii, Inc. (January 2002)

# A TRADITIONAL AND CULTURAL PRACTICES ASSESSMENT FOR THE PROPOSED U. S. D. A. PACIFIC BASIN AGRICULTURAL RESEARCH FACILITY, SOUTH HILO, ISLAND OF HAWAI'I (TMK 2-4-01:por. 122).


*By*

Hallett H. Hammatt, Ph.D.
Mary Perzinski, B.A. (Historical Research)
Ka'ohulani Mc Guire (Community Consultation)


*Prepared for:*

SSFM International, Inc.


Cultural Surveys Hawai'i, Inc.
January 2002


## ABSTRACT


A Traditional and Cultural Practices Assessment for the proposed USDA Pacific Basin Agricultural Research Center was requested by SSFM International, Inc. The proposed project comprises approximately 30 acres situated in the *ahupua'a* of Waiākea, South Hilo, Island of Hawai'i (TMK 2-4-01: 122).

The focus of this cultural assessment was 1) historical research; 2) consultation; 3) identification of potential interview informants; and 4) identification of cultural concerns and potential negative impacts to native Hawaiian culture.

Community consultations did not lead to any formal interviews being conducted with knowledgeable informants. During the consultation period, there were no cultural concerns raised and no cultural properties or sites were identified.

## TABLE OF CONTENTS



## LIST OF TABLES





## LIST OF FIGURES

# I. INTRODUCTION

## A. Project Background/Purpose

Cultural Surveys Hawai'i conducted a Traditional and Cultural Practices Assessment of an approximately 30-acre parcel in the *Ahuopua'a* of Waiākea, South Hilo, Hawai'i (TMK 2-4-01: 122) (Figures 1 and 2). Cultural Surveys Hawai'i, Inc. (CSH) has been involved with various phases of the historic preservation review process for this U. S. D. A. project, including the archaeological inventory survey and burial mitigation.

## B. Scope of Work

This study will satisfy the requirements for an assessment of the potential impacts of the proposed development on traditional cultural practices, including native Hawaiian gathering rights. The scope of work is summarized as follows:

1) Examination of historical documents, Land Commission Awards, historic maps, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal and other resources or agricultural pursuits as may be indicated in the historic record.

2) A review of the existing archaeological information pertaining to the sites on the property as they may allow us to reconstruct traditional land use activities and identify and describe the cultural resources, practices and beliefs associated with the parcel and identify present uses, if appropriate.

3) Conduct oral interviews with persons knowledgeable about the historic and traditional practices in the project area and region. We anticipate 3-4 formal interviews and more informal interviews.

4) Preparation of a report on items 1-3 summarizing the information gathered related to traditional practices and land use. The report will assess the impact of the proposed action on the cultural practices and features identified.

## C. Methodology

Historical documents and maps were researched at the Hawai'i State Survey Office, Hawai'i State Library, State Historic Preservation Division (SHPD) library, and the library of Cultural Surveys Hawai'i.

Hawaiian organizations, agencies and community members were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge



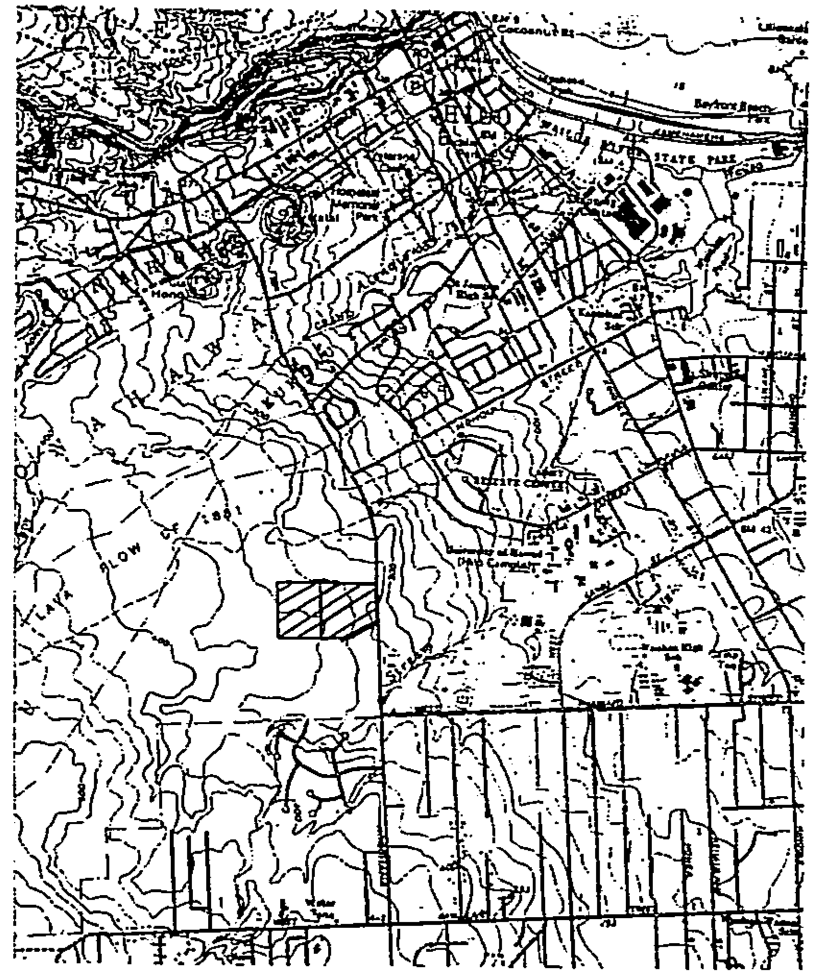


Figure 1 Portion of USGS Topographical Map, 7.5 Minute Series, Hilo Quadrangle, showing project area.

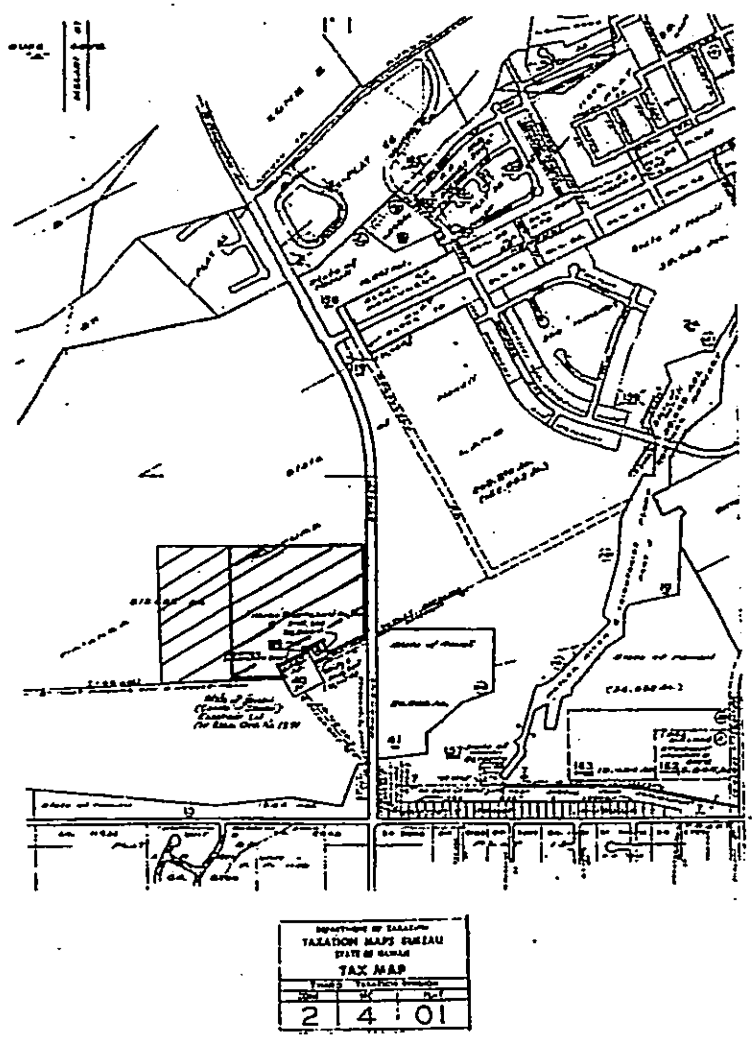



Figure 2 Tax Map 2-4-01: 122; showing location of project area.



of the project area and the surrounding vicinity. A discussion of the consultation process can be found in Section V on "Community Consultations". Please refer to Table I for a complete list of individuals and organizations contacted.

**D. Natural Setting**

Elevation of the project area ranges from 300-360 ft. above mean sea level. Rainfall averages 150-200 inches per year (Kelly *et al.* 1981). Waiākea Stream, located approximately 400 meters southeast of the southeast corner of the project area, is the only fresh water source in the immediate area. Other than the ubiquitous native *'uluhe* fern (*Dicranopteris linearis*) and some scattered *'ōhi'a* trees (*Metrosideros polymorpha*), the project area vegetation predominately consists of exotic (introduced) plants, including strawberry guava (*Psidium Cattleianum*), various grasses, several scattered large Albizia trees (*Paraserianthes falcataria*), and a moderately sized mango tree.

Project area soils include Pana'ewa very rocky, silty clay loam and exposed *pahoehoe* lava flow (Sato *et al.*, 1973). Typically, soil is scant, existing in intermittent pockets throughout the *pahoehoe* flow. Topography is undulating, with a gradual slope *ma kai* (to the east). Intermittent lava sinkhole features exist throughout the project area, ranging in diameter from 1 - 6 m. The 1881 lava flow is to the north of the current project area. According to the lava flow age maps included in Smith (1991) the project area substrate consists of 750-1500 year old lava flow. Similar ages for the lava flow substrate for the project area are given in Hunt and McDermott (1993:6–citing Lockwood and Buchanan-Banks 1991), who identify the Kulaloa flow dating to 1,100 to 1,400 BP.

A north-south oriented former unimproved road alignment, with associated bulldozer push piles and berms, was noted through the approximate center of the project area. Although completely overgrown with vegetation, parallel tire tracks are still visible in some areas. Based on vegetative overgrowth and modern garbage scattered along the road, it appears this road alignment is not older than 50 years, and may have been utilized as recently as 20 years ago. The rusted out remains of a car, model indistinguishable, was found along this road alignment. The road alignment is not considered an historic property. Along Komohana Street there is a stockpile of "armor rocks" (huge boulders), most likely related to construction and excavation associated with Komohana Street. Modern rubbish was found throughout much of the project area, with concentrations along the overgrown, unimproved road alignment.

## II. CULTURAL BACKGROUND

### A. Traditional Hawaiian Folklore of Waiākea

Waiākea literally means and broad waters (Pukui *et al.* 1974:221), but is also a type of taro grown in Kona, Hawai'i (*lehua ke'o ke'o*) (Pukui & Elbert 1986:377). Waiākea, with its rich natural resources of the forests and the sea, has long been a center of habitation for Hawaiians and is often mentioned in Hawaiian folklore and legends. According to many legends, Waiākea was also associated with the Hawaiian royalty (*ali'i*).

In *Native Planters in Old Hawaii*, Handy and Handy (1972) record the agricultural methods used to grow taro, sweet potatoes, and sugar cane in Waiākea. Handy and Handy describe the natural habitat and agricultural development of Waiākea and South Hilo:

> In lava-strewn South Hilo there were no streams whose valleys or banks were capable of being developed in terraces, but [taro] cuttings were stuck into the ground on the shores and islets for many miles along the course of the Wailuku River far up into the forest zone. In the marshes surrounding Waiākea Bay, east of Hilo, taro was planted in a unique way known as *kanu kipi*...On the lava-strewn plain of Waiākea and the slopes between Waiākea and the Wailuku River, dry taro was formerly planted wherever there was enough soil. There were forest plantations in Pana'ewa and in the lower fern-forest zone above Hilo town and along the course of the Wailuku River (Handy and Handy 1972:538-539).

Handy and Handy cite the Hawaiian language newspaper, *Ka Nūpepa Kū'oko'a*, in a 1922 article which refers to planting sweet potatoes and sugar cane on *pāhoehoe* lava fields:

> ...There are *pahoehoe* lava beds walled in by the ancestors, in which sweet potatoes and sugar cane were planted and they are still growing today. Not only one or two but several times forty (*mau ka'au*) of them. The house sites are still there, not one or two but several times four hundred in the woods of Panaewa. Our indigenous bananas are growing wild, these were planted by the hands of our ancestors. (Handy and Handy 1972:131-132)

There are abundant references to Waiākea in the myths and legends of Hawai'i recorded by the early ethnographers Thrum, Emerson, Westervelt, and Fornander. An early account of the Hawaiian chiefdom Waiākea is told by Samuel Kamakau in a story of the unification of the Island of Hawai'i under chief 'Umi-a-Liloa, beginning with the chiefly residences of Waiākea in the 16th century (1961:15-17). The legend establishes Waiākea as a relatively early residence of Hawaiian royalty. Hilo's Kanoa *Heiau*, where human sacrifices were offered, was also mentioned in the story, indicating its early existence (Kelly, Nakamura and Barrère 1981:1).

Table 1 on the following page is a comprehensive list of Hawaiian tales which include Waiākea as a place setting. These legends were primarily found in the Hawaiian Legends Index (Revised Edition) compiled by Lillian Ching and edited by Dr. Masae Gotanda, Director of Hawai'i State Library (1989).



**Table 1: Legends of Waiākea, Hawai'i**

| Author | Original Publication and Year | Legend Title |
|---|---|---|
| Emerson, Nathaniel | *Pele and Hiiaka* (1915) | "Pele and Hiiaka" |
| Fornander, Abraham | *Fornander Collection of Hawaiian Antiquities and Folk-lore, v. 1* (1916-1919) | "The Story of Umi" |
| Fornander, Abraham | *Fornander Collection of Hawaiian Antiquities and Folk-lore, v. 2* (1916-1919) | "Legend of Kuapakaa" |
| Fornander, Abraham | *Fornander Collection of Hawaiian Antiquities and Folk-lore, v. 2* (1916-1919) | "Legend of Halemano" |
| Fornander, Abraham | *Fornander Collection of Hawaiian Antiquities and Folk-lore, v. 1* (1916-1919) | "Legend of Kapuaokaoheloai" |
| Fornander, Abraham | *Fornander Collection of Hawaiian Antiquities and Folk-lore, v. 1* (1916-1919) | "Legend of Kaipalaoa, the Hoopapa Youngster" |
| Fornander, Abraham | *Fornander Collection of Hawaiian Antiquities and Folk-lore, v. 2* (1916-1919) | "Famous Men of Early Days" |
| Fornander, Abraham | *Fornander Collection of Hawaiian Antiquities and Folk-lore, v. 2* (1916-1919) | "Legend of Pamano" |
| Fornander, Abraham | *Fornander Collection of Hawaiian Antiquities and Folk-lore, v. 2* (1916-1919) | "Brief Stories of Ghosts and Cunning" |
| Gowen | *Hawaiian Idylls of Love and Death* (n.d.) | "Keala" |
| Green | *Folk-tales from Hawaii* (n.d.) also in *Hawaiian Stories and Wise Sayings* (n.d.) | "The Story of Pele and Hiiaka" |
| Hale'ole, S. N. | *The Hawaiian Romance of Laieikawai* (n.d.) | "Kaipalaoa" |

| Author | Original Publication and Year | Legend Title |
|---|---|---|
| Thrum, Thomas G. | *More Hawaiian Folk Tales* (1923) | "Umi's Necklace War Tradition" |
| Thrum, Thomas G. | *More Hawaiian Folk Tales* (1923) | "Kai a Kahinalii" |
| Thrum, Thomas G. | *More Hawaiian Folk Tales* (1923) | "Ulu's Sacrifice" |
| Thrum, Thomas G. | *More Hawaiian Folk Tales* (1923) | "The Hinas of Hawaiian Folk-lore" |
| Thrum, Thomas G. | *Hawaiian Folk Tales* (1998) | "Stories of the Menehunes: As Heiau Builders" |
| Westervelt, William | *Legends of Gods and Ghosts* (1915) | "Keaomelemele, The Maid of the Golden Cloud" |
| Westervelt, William | *Legends of Gods and Ghosts* (1915) | "Keaunini" |

Many of the above stories merely mention Waiākea in brief passing such as in Fornander's "Legend of Pamano" (1916-1919:304-305) and "Brief Stories of Ghosts and Cunning" (1916-1919:422-423) and Green's "The Story of Pele and Hiiaka" (n.d.:25). The "Legend of Halemano" tells of love between Halemano and his wife Kamalalawalu and their home in Waiākea, in an area called Uluomalama, apparently above the cliffs of Pana'ewa, Hilo. Halemanu "looked at his wife, and when he saw the tears in her eyes his love for her again welled up within him as he remembered how they had lived at Uluomalama in Waiākea, Hilo; so he chanted ... as follows:"

> We once lived in Hilo, in our own home,
> Our home that was in Panaewa...
> The streams of Hilo are innumerable,
> The high cliffs was the home where we lived...
> From the waters of Wailuku where the people are carried under,
> Which we had to go through to get to the many cliffs of Hilo,
> Those solemn cliffs that are bare of people...
>
> *Noho i Hilo i o maua hale-e,*
> *He hale noho i Panaewa e;...*
> *He kini, he lehu, kahawai o Hilo e,*
> *Pali kui ka hale a ke aloha i alo ai. ...*
> *Mai ka wai lumalumai kanaka o Wailuku,*
> *A kaua i alo aku ai i na pali kinikini o Hilo,*
> *O ia mau pali anoano kanaka ole, ...*
> (Fornander 1916-1919:250-251, vol. V, part II)



Another brief mention of Waiākea is found in Green's "The Story of Pele and Hiiaka" in *Hawaiian Stories and Wise Sayings*. Hi'iaka, Pele's sister, "slept at Waiakea, Hilo, and in the morning kept on as far as Kukui-lau-mania, where she turned to gaze back over the country, then continued her journey toward the cliffs of Hilo" (Green n.d.:25). Waiākea was often visited by Hawaiian chiefs of high rank. In Westervelt's "Keaomelemele, The Maid of the Golden Cloud," chief Kahanai-a-ke-Akua (adopted son of the gods), and his friend Waiola (water of life), "went down to Waiakea, a village by Hilo" (1915:133). The men were invited to sport, but only Waiola went because Kahanai "himself was of too high rank" (1915:133).

In the legend "Keala" (Gowen n.d.:43-50), "well-known landmarks" of Waiākea are viewed by Ahi, a Hawaiian priest, in his spirit form:

> The green water below was the bay of Hilo, the mountain was the terrible Kilauea, where in Halemaumau, the house of everlasting fire, the goddess Pele was wont to ride the red surges with her sisters and tilt with lances of flaming lava. The road was the mountain-path from Waiakea to Kapapala... (Gowen n.d.:47)

John Papa 'Ī'ī makes two general references to Waiākea, Hilo. According to 'Ī'ī, at the time of Kamehameha I (circa 1800),

> The lands of the chief of Kau were divided within their own district, each being given a portion and each asking for what he wanted. For this reason, a skilled war leader whose name I have forgotten said to Keoua Kuahuula, son of Kalaniopuu and half brother of Kiwalao, "Perhaps you should go to the chief and ask that these lands be given us. Let Waiākea and Keaau be the container from whence our food is to come and Olaa the lid" ('Ī'ī 1959:13-14).

'Ī'ī's second reference notes the well-known surf of "Kanukuokamanu in Waiākea, Hilo" ('Ī'ī 1959:134). Kanukuokamanu, on the western side of Wailoa River, was also mentioned in the 16th century story by Kamakau (1961:15-17) as a beach where chiefs and people gathered "at night ... to amuse themselves with hula dancing, chanting, and the playing of games calling for forfeits of entertainment or sexual favors" (Kelly *et al.* 1981:1). This summary was likely drawn from two legends: "Story of Umi" and "Umi's Necklace War Tradition."

The "Story of Umi" describes the chiefly residences at Hilo and the king of Hilo, Kulukulua. The legend tells of the chiefs of Hilo gathering at a place called Kanukuokamanu, in Waiākea: "One night there was a grand entertainment for all the chiefs of Hilo at Kanukuokamanu, in Waiākea; there was dancing and games of *papuhene, kilu* and *loku*. (*A he po lealea nui no na 'lii o Hilo a pau ma Kanukuokamanu ma Waiākea, he hula, he papahene, a he kilu, a me a ka loku*)" (Fornander 1916-1919:220-221). A similar story "Umi's Necklace War Tradition" also mentions the festive night at Kanukuokamanu, Waiākea, and Umi's marriage to Iiwalani, the daughter of the king of Hilo (Thrum 1923).

The "Legend of Kapuaokaokeloai" makes a passing reference to Waiākea as a place where the people of "high chief rank of Hilo" lived (*O Waiākea, i Hilo ka aina, o ka mua ke kaikunane, o ka muli ke kaikuahine, he mau alii lakou no Hilo*) (Fornander 1916-1919:540-541).

Again, this passage reiterates the importance of Hilo as a chiefly residence. This story is also told in "The Hinas of Hawaiian Folklore" (Thrum 1923).

Although a brief mention, another reference to the associated royalty of Waiākea can be found in the "Legend of Kaipalaoa, the Hoopapa Youngster" (Fornander 1916-1919:574-575). According to the legend, "Kaipalaoa"(a relative of Kukuipahu, the king of Kona) "was born in Waiākea, Hilo".

**Resources of Waiākea**

The rich resources of Waiākea were well known and sought after. According to the legend, "Ulu's Sacrifice," Waiākea was the home of 'Ulu (breadfruit) (Thrum 1923). During a famine, 'Ulu died of starvation and he was laid to rest near a stream. The following morning, there was a breadfruit tree standing where he was buried, ending the famine (Pukui 1974:219-220).

Many legends tell of the abundant fish and shrimp of Waiākea. The fishpond of Waiākea was so valued that Kamehameha I sent runners from Kawaihai and Kailua to fetch live mullet from Waiākea. Fornander's "Famous Men of Early Days" describes Kamehameha I sending his fastest runners, Makoa and Kaneakaehu, to "Hilo to get mullet from the pond of Waiākea, on the boundary adjoining Puna" (*o ka nanawa la o Makoa e holo ai i Hilo i ka anae o ka loko o Waiākea, aia ma ka palena e pili la me Puna*) (1916-1919:490-491).

Westervelt's story "Keaunini" tells of the abundant mullet of Lolakea and Waiākea. "The people feasted on the mullet of Lolakea and the baked dogs of Hilo and the humpbacked mullet of Waiakea and all the sweet things of Hawaii"(1915:191).

In the "Legend of Kuapakaa," the shrimps of Waiākea are mentioned, suggesting their value as a resource. The king of Hilo, Kulukulua, is also mentioned again in a chant as follows:

> Our chief of Hilo, Kulukulua, is not a chief [by birth];
> He is a snarer of the shrimps of Waiākea;
> After the snaring,
> He places the outside covering of the coconut on his ears.
>
> *O ua 'lii o makou o Hilo, o Kulukulua, aohe alii;*
> *He pahelehele opae no Waiākea;*
> *A pau ke pahelehele ana,*
> *Kau ae la i ka pulu niu i ka pepeiao.*
> (Fornander 1916-1919:84-85)

This chant suggests that the chief of Hilo participated in tasks of the commoners and plainly states that he was not a chief by birth. The chant also may be the source of the saying "Waiākea of the ears that hold coconut-fiber snares" (*Waiākea pepeiao pulu 'aha*) explained below.



There are two passages which mention Waiākea in Pukui's *'Ōlelo No'eau Hawaiian Proverbs & Poetical Sayings* (1983). The first passage (passage 2901) is a proverbial saying which refers to the small fish, shrimp, and crab resources of Waiākea: "Waiākea of the ears that hold coconut-fiber snares" (*Waiākea pepeiao pulu 'aha*). The saying is further explained:

> Snares for small fish, shrimp, or crabs were made of a coconut midrib and the fiber from the husk of the nut. When not in use the snare was sometimes placed behind the ear as one does a pencil. This saying is applied to one who will not heed - he uses his ears only to hold his snare (1983:318).

The second saying is a common expression used in chants of Hilo and refers to "The sparkling sand of Waiolama" (*Ke one 'anapa o Waiolama*) "a place between Waiākea and the town of Hilo. It was said to have sand that sparkled in the sunlight" (passage 1773:190).

"Kai a Kahinalii" is the tale of a disastrous flood which devastated the Island of Hawai'i. After the waters ebbed, two survivors, a fisherman and his wife descended "the gentle slope that leads to the bay of Waiākea. There they built a temple and offered sacrifices to the gods" (Thrum 1923:234). Perhaps this temple is one of the recorded *heiau* described below.

**Heiau of Waiākea**

There were at least five *heiau* within Waiākea: Kanoa *Heiau*, Kapaieie *Heiau*, Kiniakua *Heiau*, Pepeekeo *Heiau*, and Ohele *Heiau*. Thomas Thrum (1907), Samuel Kamakau (1961), and John Papa 'Ī'ī (1959) mention Kanoa *Heiau*, a *luakini heiau*, within Hilo. 'Ī'ī writes that human sacrifices were offered at Kanoa *Heiau* and Liholiho would journey to this and other Hawai'i *luakini heiau* (1959:137, 160). This *heiau* stood for at least three centuries, for, according to legend, it was present at the time of chief 'Umi-a-Liloa in the 16th century. According to Thrum, it was destroyed between 1853 and 1898 (1907:40).

Research by Rosendahl of Waiākea *Ahupua'a* is thorough and includes mention of two specific *heiau* within Waiākea: Kapaieie and Kiniakua (Rosendahl 1994:5). Kapaieie *Heiau* was originally recorded by A. E. Hudson in a 1932 manuscript of archaeological and historical literature research of east Hawai'i (Hudson 1932). According to Rosendahl, Kapaieie *Heiau* was located "along the old Hilo - 'Ōla'a trail (not far from the route of modern-day Kilauea Avenue)" (Rosendahl 1994:5). Hudson writes:

> There was a *heiau* named Kapaieie near Honokawailani in Waiākea. Bloxam who passed the site on his way from Hilo to the volcano say that its center was marked by a single coconut tree. At the time of his visit nothing remained but ruined walls choked with weeds. He was told that the priests would lie in wait for passersby and dispatch them with clubs. Thrum [1908:40] states that the site was famed in the Hilo-Puna wars but its size and class are unknown. No remains of any kind could be found and no Hawaiians with whom I talked had ever heard of it (Hudson 1932:240).

Hudson recorded the location of Kiniakua as being "near the spring of Waikapu" although "none of the maps or references consulted...identified the site locations" (Rosendahl

1994:5). This *heiau* was reportedly a "small *heiau ho'oūu'ai* (a temple at which ceremonies were offered to ensure successful harvests)" (*ibid*:5).

According to Thrum's "Stories of the Menehune: As Heiau Builders" the Pepeekeo *Heiau* at Hilo, was constructed by the Menehune in a single night with the boulders that had been gathered by the residents by order of their chief (Thrum 1998:117).

Thrum also had information on Obele *Heiau* which was located in Waiākea near the old Pitman store. It was reportedly "a *luakini* class *heiau* measuring 60 feet square. It was destroyed before Pitman's time" (Stokes and Dye 1991:155).



**B. Waiākea Myths and Legends Summary**

Waiākea, with its rich natural resources of the forests and the sea, has long been a center of habitation for Hawaiians and is often mentioned in Hawaiian folklore and legends. According to many legends, Waiākea has also been associated with Hawaiian royalty (*ali'i*) since the 16th century and a gathering place for many ceremonies. The rich mountain resources of taro and sweet potato and the abundant marine resources particularly shrimp and fish made Waiākea very valuable to the Hawaiian people. At least five *heiau* of various sizes and class, stood within Waiākea. One in particular, Kanoa *Heiau*, was of significant size and class where human sacrifices were offered to the gods. Many Hawaiian gods and goddesses frequented Waiākea including Pele, Hi'iaka and Pana'ewa.

## III. HISTORIC BACKGROUND

The *ahupua'a* of Waiākea, South Hilo, is large, encompassing some 95,000 acres. It extends from the coast to approximately the 6,000 foot elevation on the windward slope of Mauna Loa (Figure 3). 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 (McEldowney 1979). The current project area exists entirely within Zone II, or the Upland Agricultural zone. As such, only this zone is described in depth here.

Zone II is defined as ranging from 50 - 1,500 ft 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" (McEldowney 1979).

The present study area is situated within the lower elevations of 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 cited in McEldowney 1979:21). The reasons for what appeared to the early visitors as a "lack of more extensive planting " (McEldowney 1979:21) 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 included 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 " (McEldowney 1979: 18-19) but no descriptions of village complexes like those along the coast.

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.

### A. 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



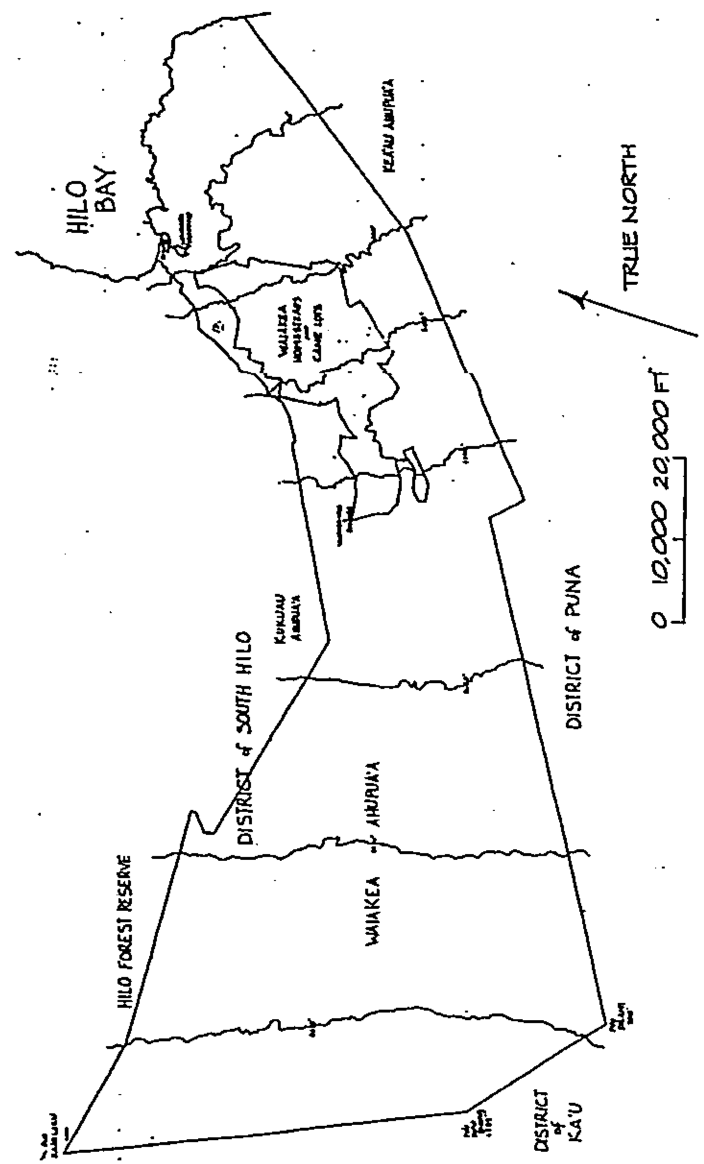



Figure 3 *Ahupua'a* of Waiākea (after USGS Topographic Map).

to Liholiho, his son and heir to the kingdom, "...additionally " Kamehameha had given the *'ili kūpono* of Pi'opi'o to his favorite wife Ka'ahumanu" (Kelly, Nakamura, Barrère 1981: 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 focused 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 land use of the Forest and Sub-Alpine Zones was changing. The more traditional land use activities in the upper zones, such as the procurement of timber products and bird feathers (McEldowney 1979:35), was replaced by the hunting of cattle, goats, and sheep 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" (McEldowney 1979:36).

**B. 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. AMSL) 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" (McEldowney 1979:37).

The coastal zone still contained the vast majority of the population. Houses and stores were concentrated in the northern half of Hilo bay, somewhat removed from Waiākea, because at the time the main pier for Hilo was at the mouth of the 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 (Figure 4).

**C. 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 (Figure 5).

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. As shown in Figure 5, the current project area is outside the land cultivated for sugar, there are no historic residence camps in immediate vicinity of the project area, and railroad features do not cross through the project area. The current project area is within the land described as "Waiākea Pasture Land" (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 (perhaps the Waiākea Pasture Land shown on Figure 6), and scattered vegetable gardens" (McEldowney 1979:39).

Isabella Bird describes the country area around Hilo in 1873 and the variety of crops grown, "Above Hilo, broad lands sweeping up cloudwards with their sugar-cane, *kalo*, melons, pine-apples, and banana groves suggest the boundless liberality of nature" (Bird 1964:38, also in Handy and Handy 1972:538).

**D. 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 Ola'a and along the N and S Hilo coast" (McEldowney 1979:41). 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 entirely 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


Figure 5 Waiākea Mill Co. Map (c. 1930), showing the project area.



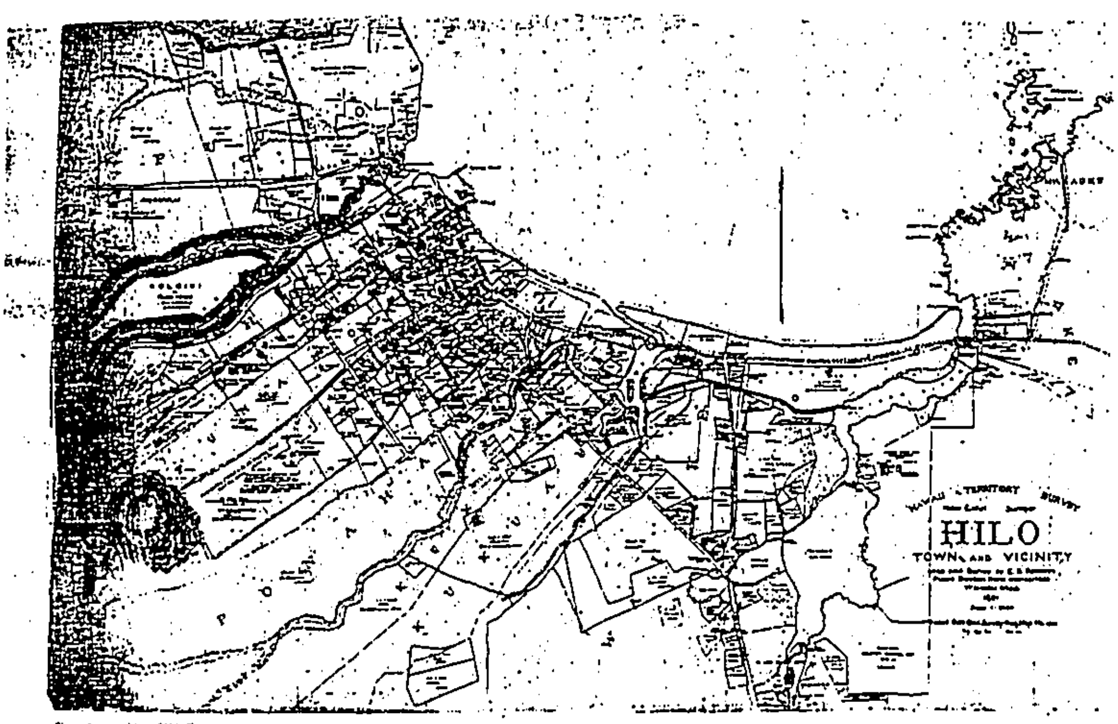



Figure 4 Map of Hilo Town and vicinity, project area off map to the south.

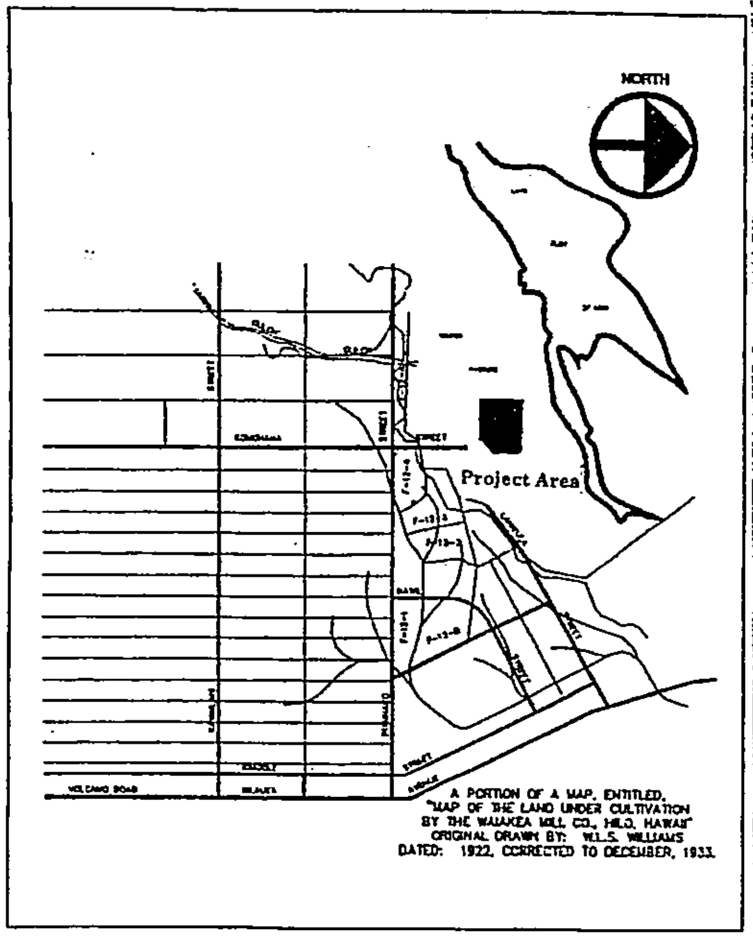



Figure 6 Waiākea Mill Co. Map (c. 1930), showing the project area within the area labeled "Waiākea Pasture Land".



several dairies" (McEldowney 1979:41). 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" (Kelly, Nakamura, Barrère 1981:121).

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" (McEldowney 1979:42). Clearly, sugar was the dominate economic factor during this period including the formation of settlements (*i.e.* camps).

**E. 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. Based on available historic maps, the project area was never used for large-scale sugar cane cultivation.

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 most likely ceased to be utilized for pasturage in the 1960s. Since that time a portion of the lot has been used to construct the County of Hawai'i reservoir and associated pipeline (Exec. Ord. No. 1391) and the Hawaiian Electric Light Co. Inc. electric transformers. An access road, partially paved extends to these utilities from Komohana Street, to the east.

## IV. PREVIOUS ARCHAEOLOGICAL RESEARCH

Below is a table summarizing previous archaeological investigations in the *ahupua'a* of Waiākea. Figure 7 shows the locations of this previous research in relation to the current project area.

**Table 2: Previous archaeological investigations in the *ahupua'a* of Waiākea**

| Reference | Location | Description and Results |
|---|---|---|
| Thrum 1907 | *Ahupua'a* of Waiākea heiau sites | No heiau located near the present project parcel. |
| Thrum 1908 | *Ahupua'a* of Waiākea | An inventory/description of Heiau throughout Hawaii. Identifies 3 heiau within the *ahupua'a* of Waiākea. |
| Hudson 1930 | East Hawaii | Site Survey. |
| Ching and Stauder 1974 | Recon Survey of Proposed 2.5 mile alignment between Keaukaha and South Hilo-Puna Boundary | 1 faced stacked pahoehoe wall (Site 6223); 1 possible burial platform/ monument (site 6224); 1 lava sink w/ pahoehoe wall blocking entrance (site 6225); 1 small rectangular enclosure (site 6227)- all sites were at southern end of project area near coastline |
| Bonk 1979 | Survey of HIIL of Pana'ewa, Tract 1, Waiakea, South Hilo | Historic wall segment and "old" road |
| McEldowney 1979 | Hilo Bay area | Zonal Characteristics--Land-use study. |
| Kelly, Nakamura, and Barrère 1981 | Hilo Bay area | History of Hilo Bay area; nothing specifically pertaining to current project area. |
| Cox 1983 | Memorandum on Unrecorded Heiau on State Lands, Waiakea, South Hilo TMK 2-1-07:11 | Heiau - Previously unrecorded though listed on Tax Map Key |
| Nagata 1985 | Inspection of Cave Site (TMK: 2-4-08:22) Pana'ewa, South Hilo | Two adult human burials |
| Rosendahl and Talea 1988 | Recon Survey for EIS for Proposed Irradiation Site (TMK: 2-1-12:106 (Site A); 2-1-12:Var (Site B); 2-1-25: 86 (Site C) | No sites or features encountered |



| Reference | Location | Description and Results |
|---|---|---|
| Rosendahl 1988 | Recon Survey for EIS for Hilo Judiciary Complex Sites (TMK: 2-2-33:11-14,19 & 20 [site 1]; 2-2-13:2, 18 and 2-2-14:72 [site 2]; 2-2-9:1, 54, 55, 56, 62 and 2-2-10:15 [site 3]; 2-3-15:1 [site 4]; 2-3-44:9 [site 5] | No sites or Features encountered due to ground disturbing activities |
| Rosendahl 1988 | Recon Survey for EIS for Hilo Wastewater Treatment Facility (TMK 2-1-13: 12, 13, 20, 22) | No sites or features encountered |
| Pietrusewsky 1989 | Human Remains Found at Waialoa Bridge Renovation | Incomplete Remains |
| Smith 1991 | Waiākea, South Hilo, Hawaii Island TMK: 3-2-4-01:7 | Sites exist on the >4000 year old flow; one site on the 1500 - 750 year old flow; inventory survey recommended. |
| Smith 1992 | Waiākea Cane Lots, Waiākea, South Hilo, Hawaii Island TMK: 3-2-4-57:1 | Several stacked stone walls, mounds, a large rectangular enclosure, and several "C"-shapes. |
| Moniz 1992 | *Ahupua'a* of Waiākea, Hilo, Hawai'i | A listing of 1979-1992 inventory surveys within Waiākea, including walls, platforms, and a burial cave. |
| Hunt 1992 | Lands of Waiākea, Kukuau 1& 2, and Ponahawai, South Hilo District, Hawai'i (Puainako Street Extension project) | Interim report of inventory survey field inspection findings--31 features identified within the project boundaries, including walls, mounds, platforms, and faced terraces. |
| Spear 1993 | Piihonua *Ahupua'a*, South Hilo TMK:2-3-32:4 | Inventory survey of 5-acre parcel. Two historic features located and documented--an oven and a trash dump. No further work recommended. |
| Borthwick and Hammatt 1993 | Survey and Testing of Proposed U of HI at Hilo Expansion Area (TMK 2-4-01:7 and 41) | 4 historic rock clearance mounds and 1 stacked boulder wall- constructed and maintained by Waiakea Mill Co. |
| Borthwick, Collins, Folk and Hammatt 1993 | *Ahupua'a* of Waiākea TMK: 2-4-01:7 and 41 | Inventory survey-163 acres immediately across Komohana Street from the present project area. Four sites found--all thought to be related to historic agriculture (sugar cane). No further work recommended beyond the documentation of the inventory survey. |

| Reference | Location | Description and Results |
|---|---|---|
| Hunt and McDermott 1994 | Lands of Waiākea, Kukuau 1 and 2, and Ponahawai, South Hilo (Puainako Street Extension project) | Inventory survey (final report of Hunt 1992). Historical, oral interview, and archaeological data combine to demonstrate the numerous stack stone features in the project area, comprising 13 sites, are all related to historic sugar cane agriculture. |
| Kennedy 1994 | Inventory Survey for Hilo Forestry Office Complex Extension (TMK 2-2-27:01), Waiakea, South Hilo | No significant archaeological features |
| Maly, Walker, and Rosendahl 1994 | Land of Waiākea, South Hilo, TMK:2-4-57:01 | Inventory survey of 4.5 Waiākea Cane lots parcel. Four sites, comprising 47 features (C-shape and L-shape walls, mounds terraces and walls). These features were thought similar in appearance to the historic features reported by Hunt and McDermott. One radiocarbon date and recovered artifacts may indicate prehistoric land-use of the parcel. Data recovery recommended. |
| Spear 1995 | Land of Waiākea, South Hilo, TMK:2-4-57:01 | Data recovery of the Maly *et al.* (1994) parcel. Following excavation, all features in the project area are considered historic, a few temporary habitations, but the majority related to historic sugar cane agricultural. No additional archaeological work is recommended. |
| Robins and Spear 1996 | Lands of Waiākea, Kukuau 1& 2, and Ponahawai, South Hilo District, Hawai'i (Puainako Street Extension project) | Inventory survey of same alignments, but wider corridor, of the same Puainako Street Extension project inventoried by Hunt and McDermott (1994)--additional historic sugar cane agricultural features were located. |
| Rechtman and Henry 1998 | Kawaili Street Development (TMK:3-2-4-01:5) | 117 Features all related to Historic Period sugar cane cultivation |
| McGerty and Spear 1999 | Land of Waiakea (TMK: 2-4-57:1) | 13 Features all related to sugar cane cultivation |
| Carson 1999 | 176 Acre Pana'ewa Campus Site (TMK 2-1-13: 154) | No significant archaeological sites or features |
| Hammatt and Bush 1999 | Inv. Survey for Proposed Stainback HWY Improvements (TMK 2-4-008) | Several lava tubes and blisters though no archaeological sites |



| Reference | Location | Description and Results |
|---|---|---|
| Hammatt and Bush 1999 | Inv Survey of Portions of HI Army National Guard Keaukaha Military Reservation (TMK: 2-1-12:3 and 2-1-13:10) | 4 Sites: 50-10-99-18869 (portion of Puna Trail); 50-10-35-21657(C-Shape); -21658 (group of 5 ahu); -21659 (modified lava blister) |
| Haun and Henry 2000 | Inv. Survey of Hilo Harbor Facilities Expansion (TMK: 3-2-1-09: 2, 12, 41, 42 and 3-2-1-07: 20-37) | Early 1900's U.S. Engineer facilities |
| Bush et al 2000 | Inv Survey of an Approx 20 Acre Parcel for the USDA Pacific Basin Ag Research Center (TMK: 2-4-01: por 122) | One isolated human femur in sinkhole (State Site 50-10-35-22,080) |
| Rechtman 2001 | Inv. Survey for the Proposed Wastewater Treatment Facility (TMK: 3-2-4-08:9) | No adverse affect to any historic or traditional cultural properties |

The majority of archaeological work in Waiākea has occurred near the downtown core of Hilo, at the University of Hawaii at Hilo and in and around General Lyman Field. The current project area is due south of the General Lyman Field with a few archaeological reports documenting sites within the general area. These include Ching and Stauder (1974), Nagata (1985) and Carson (1999).

Ching and Stauder (1974) conducted an archaeological reconnaissance and historical investigation of a 135- acre drag strip at Pana'ewa, South Hilo. During the survey no archaeological sites were recorded.

Nagata (1985), State Parks Administrator, in a memorandum to the director of the Hawai'i County Economic Opportunity Council responded to a discovery of a cave in Pana'ewa. He stated that Mr. Wendall Kam, staff archaeologist, inspected the cave and reported the presence of two adult human burials. It was recommended that the a "buffer zone" be established around the entrance to the site and to restrict any unauthorized access. The cave is believed to be located approximately 1.4 km east of the current project area.

Carson (1999) conducted an archaeological inventory survey of the 176-acre Pana'ewz Campus site in the Hilo District. During the survey he determined that no significant archaeological sites or features were present in the project area.

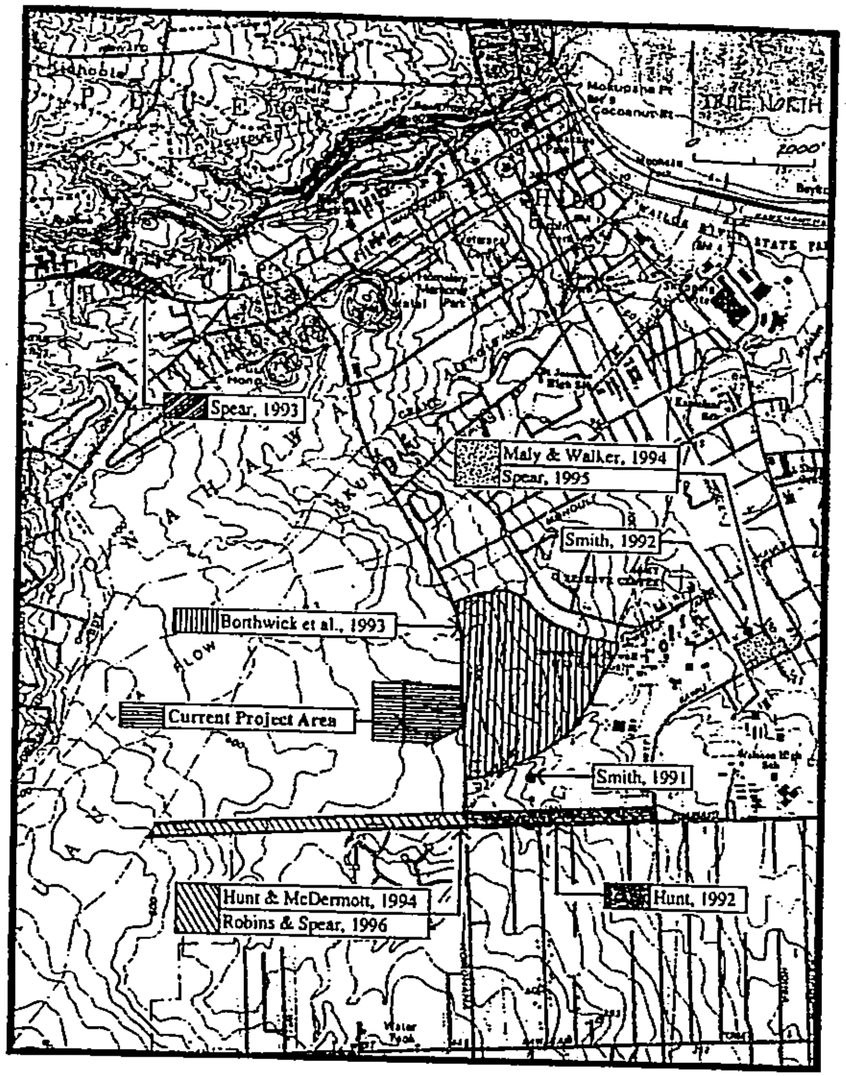



Figure 7 Portion of USGS Topographic Map, Hilo Quadrangle, showing previous archaeology with the vicinity of the current project area.



## V. RESULTS OF COMMUNITY CONSULTATIONS

Consultation was conducted with the following: Department of Land and Natural Resources/State Historic Preservation Division (DLNR/SHPD) - Culture and History Branch, Office of Hawaiian Affairs, Department of Hawaiian Studies - University of Hawai'i at Hilo; Department of Anthropology - University of Hawai'i at Hilo; Pana'ewa Homestead Association; Hawaiian Civic Clubs, community members. Everyone who was contacted (either by letter or by phone) was asked to comment on the proposed project – specifically in regard to their general knowledge of the project area, knowledge of cultural properties and sites in the project area, to identify any potential negative cultural impacts and, to identify potential interview informants or *kūpuna* who might be willing to share their knowledge of the project area.

It was hoped that interviews could be conducted with 3-4 knowledgeable *kūpuna* to gather oral history information about the project area. Through the consultation process, two potential *kūpuna* were identified: Kenneth Bell (70 yrs.) and Genesis Lee-Loy (83 yrs.). Through informal talk-story with both *kūpuna* it was determined they had insufficient knowledge of the project area to warrant an interview. Both Mr. Bell and Mr. Lee-Loy were familiar with the general area of the project location and indicated they had never heard of any cultural sites or cultural properties in or near the general area, nor were they familiar with any oral history information or *mo'olelo* (stories) concerning the project area.

Further consultation and talk-story with the community did not identify any cultural concerns in regards to cultural properties, sites or practices, nor did it disclose any potential negative cultural impacts.

The following Table 3 indicates the people and organizations who were consulted and contacted for this project.

**TABLE 3: Results of Community Consultations**

Key:
Y = Yes
N = No
A = Attempted (at least 3 attempts were made to contact individual, with no response)
S = Some knowledge of the project area
D = Declined to comment
U = Unable to contact, i.e., no phone or forwarding address, phone number unknown

| Name | Affiliation | Contacted (Y/N/NR/U) | Personal Knowledge (Y/N/S/D) | Referral(s) |
|---|---|---|---|---|
| Banks, Roberta | Nā Pua No'eau | Y | N | Y |
| Bell, Kenneth | Born/raised in Hilo | Y | S | N |
| Chun, Kamuela | University of Hawai'i | Y | N | Y |
| 'Ehu, Bess | Pana'ewa Homestead Association | Y | S | Y |

| Name | Affiliation | Contacted (Y/N/NR/U) | Personal Knowledge (Y/N/S/D) | Referral(s) |
|---|---|---|---|---|
| Garmon, Ululani | Edith Kanaka'ole Foundation; Hawai'i Island Burial Council | Y | N | N |
| Kama'u-Fragas, Mary | Hilo resident | Y | N | N |
| Hamilton, Ginger | University of Hawai'i | Y | N | Y |
| Kanaka'ole Kanahele, Pualani | Hawai'i Community College; Edith Kanaka'ole Foundation; Kumu Hula | Y | N | N |
| Kimura, Kauanoe | Hawaiian Studies, University of Hawai'i @ Hilo | Y | N | N |
| Langlas, Charles | Anthropology Department, University of Hawai'i @ Hilo | Y | N | N |
| Lee-Loy, Genesis | Born/raised in Hilo | Y | S | N |
| Maly, Kepā | Cultural Specialist; Consultant | Y | S | Y |
| Meyer, Manu | University of Hawai'i @ Hilo | Y | N | N |
| Mitchell, Auli'i | Kumu Hula | Y | N | N |
| Perreira, Malia | Pana'ewa Homestead Association | Y | N | Y |
| Plunkett, Terry | Royal Order of Kamehameha | Y | N | N |
| Sherlock, Ululani | Office of Hawaiian Affairs-Hilo Branch | Y | S | Y |



## VI. SUMMARY

The present project lies within the *ahupua'a* of Waiākea. It is contained within Zone II, or the Upland Agricultural Zone, according to McEldowney's (1979) zones of land use and associated resources. This is defined as the 50 - 1,500 ft. elevation, an area of "open parkland gently sloping to the base of the woods,..." (McEldowney 1979). Some permanent habitation occurred in this region, but the majority of habitation was of a temporary nature (*i.e.* "scattered huts" as opposed to the village complexes near the coast).

Chiefly associations with the *ahupua'a* of Waiākea began early, with chiefly residences being documented as early as ca. 1550 (Kelly, Nakamura, Barrère 1981), mainly due to the rich resources of the area (*i.e.* fishponds, crops, sandalwood, bird feathers, and later the whaling industry). Kamehameha I retained Waiākea after conquering the island, and later gave the *'ili* of Pi'opi'o to his favorite wife Ka'ahumanu.

In the early 1800s, with the coming of the sandalwood trade, the arrival of the ABCFM station in Hilo, and the whaling industry descending on the Hilo area came the shift from a subsistence-based to a more market-based economy. Land use still remained essentially the same, but was starting to evolve, as elements such as cattle, timber and whaling became more intensive.

In the mid-1800s, the Māhele brought with it the end of traditional land tenure, issuing in the age of privatization of land. Twenty-six Land Commission Awards (LCAs) were granted within Waiākea, all but two being in the coastal zone, and the remaining two being within the first 100 ft AMSL of the upland agricultural zone (not close to the current project area). Cattle ranching was at the forefront in interior land areas, while Hilo Town was being transformed into an entirely wooden-framed "New Bedford-type Whaling Town" (McEldowney 1979). Though the coastal zone still contained a vast majority of the population, the construction of houses and stores started to shift out of Waiākea and to the north, as the main pier for Hilo was located at the mouth of the Wailuku River. This is a significant shift from traditional coastal settlement.

The late 1800s brought with it the advent of sugarcane and the Waiākea Mill Company. Plantations developed in the 1860s, and by the 1888 the Waiākea Mill had procured all of the *ahupua'a* of Waiākea. Immigrant labor lived in "camps", near existing sugar cane railroad lines.

With the 1900s came the expansion of sugar cane production in the area, but also brought in the Parker and Shipman ranches for pasture in areas too rocky for sugar cane. "A substantial amount of grazing land adjacent to Hilo or to sugarcane fields supported dairy cows for Hilo's several dairies" (McEldowney, 1979). Homesteading was tried but declared a failure two years later. In the 1920s several large tracts of the remaining forest lands in Waiākea were designated as a forest reserve (McEldowney 1979).

In the late 1900s, major construction projects were completed in the Hilo area (*i.e.* Hilo Bay, wharfs, breakwater, and bridges, the Hilo Airport, and construction of the Saddle Road). After statehood, and with the closing of the sugar mill and canec plant, tourism was focused on. U.H. Hilo's campus which was constructed and continues to be developed.

Consultation with Hawaiian organizations, agencies and community members was conducted as part of this assessment. No negative cultural impacts or concerns were identified through the consultation process.



## VII. REFERENCES


Bird, Isabella L.
1964 *Six Months in the Sandwich Islands*. University of Hawaii Press, Honolulu, HI.

Bonk, William J.
1979 *An Archaeological Survey of a Portion of Hawaiian Home Lands of Panaewa, Tract 1, Waiakea, South Hilo, Hawaii*, University of Hawaii at Hilo

Borthwick, Douglas, Anthony Bush, and Hallett Hammatt
1998 *Archaeological Inventory Survey of the Proposed New Hawai'i Island Correctional Facility, Waiakea, South Hilo, Island of Hawai'i (TMK: 2-4-008:por. 1) Draft*

Borthwick, Douglas, Joy Collins, William H. Folk, and Hallett H. Hammatt
1993 *Archaeological Inventory 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)*. Prepared for Engineering Concepts, Ms. on file at the State Historic Preservation Division, Kapolei, Hawaii.

Bowen, Robert N.
1961 *Hawaiian Disposal of the Dead*: M. A. Thesis in Anthropology, University of Hawaii, Manoa.

Bowen, Robert N.
1974 Mokapu: Its Historical and Archaeological Past, Appendix A in *Early Hawaiians: An Initial Study of Skeletal Remains*: University Press of Kentucky, Lexington.

Bush, Tony, Matt McDermott and Hallett H. Hammatt
2000 *Archaeological Inventory Survey of an Approximately 20-acre Parcel Proposed for the USDA Pacific Basin Agricultural Research Center located near the intersection of Komohana and Puainako Streets, South Hilo, Hawai'i Island (TMK 2-4-01:POR 122)*, Cultural Surveys Hawai'i, Kailua, HI.

Carson, Mike
1999 *Archaeological Inventory Survey of the 176 Acre Pana'ewa Campus Site, Waiakea Ahupua'a, Hilo District, Hawai'i (TMK: 2-1-13:154)*

Ching, Francis and Cathrine Stauder
1974 *Archaeological Reconnaissance and Historical Investigation of the Proposed Drag Strip, Pana'ewa, South Hilo*

References (Continued)


Ching, Francis K. W. and Catherine Stauder
1974 *The Archaeology of South Hilo, Hawaii, Archaeological Reconnaissance and Preliminary Historical Investigation of the Proposed 2 1/2 Mile Alignment (Alt. A) Between Keaukaha and the South Hilo - Puna Boundary,* Archaeological Research Center Hawaii, Lawai, Kauai, HI.

Cleghorn, June Noelani Johnson
1987 *Hawaiian Burial Reconsidered: An Archaeological Analysis*: M. A. Thesis in Anthropology, University of Hawaii, Manoa.

Colum, Patrick
1937 *Legends of Hawaii.* Yale University Press, New Haven Conn.

Condé, Jesse C. and Gerald M. Best
1973 *Sugar Trains: Narrow Gauge Rails of Hawaii*, Glenwood Publishers, Felton Calif.

Hammatt, Hallett H. and Anthony Bush
1999 *Archaeological Inventory Survey of Selected Portions of the Hawai'i Army National Guard, 503.6-acre Keaukaha Military Reservation, Waiakea Ahupua'a, South Hilo District, Hawai'i Island, TMK: 2-1-12:3 and 2-1-13:10,* Final Draft, Cultural Surveys Hawai'i, Kailua, HI

Hammatt, Hallatt H and Anthony Bush
1999 *Archaeological Inventory Survey for the Proposed Stainback Highway Improvements Project, Waiakea, South Hilo, Island of Hawai'i (TMK: 2-4-008)* Draft, Cultural Surveys Hawai'i, Kailua , HI

Han, Toni L., Sara L. Collins, Stephan D. Clark, and Anne Garland
1986 *Moe Kau a Ho'oilo, Hawaiian Mortuary Practices at Keopu, Kona, Hawaii:* Department of Anthropology, Bishop Museum, Honolulu.

Handy, E.S. Craighill and Elizabeth G. Handy
1972 *Native Planters in Old Hawaii: Their Life, Lore, and Environment,* B.P. Bishop Museum Bulletin 233, B.P. Bishop Museum, Honolulu, HI.

Haun, Alan E. and Henry, Dave
2000 *Archaeological Inventory Survey Hilo Harbor Facilities Expansion (TMK: 3-2-1-09:2, 12, 41, 42; 3-2-1-07: 20-37) Land of Waiakea, South Hilo District, Island of Hawai'i*

Hudson, Alfred E.
1932 *Archaeology of East Hawaii*, Ms. in Department of Anthropology, Bishop Museum, Honolulu.




References (Continued)


Hunt, Terry L.
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,*

Hunt, Terry L., and Matthew McDermott
1994 *Archaeological Inventory Survey, Pu'ainako Street Extension Project, Lands of Waiākea, Kukuau 1 and 2, and Ponahawai, South Hilo District, Island of Hawaii.* Prepared for Okahara & Associates, Engineering Consultants, Ms. on file at the State Historic Preservation Division, Kapolei, Hawaii.

Hurst, Gwen and Paul L. Cleghorn
1991 *Historical Literature and Documents Search for the Proposed Redevelopment of the Hilo Judiciary Complex Project, Waiakea, South Hilo, Hawaii: Part I: Historical Literature and Documents Survey,* B.P. Bishop Museum, Honolulu, HI.

'Ī'ī, John Papa
1959 *Fragments of Hawaiian History* (Pukui translation), Bishop Museum Press, Honolulu, HI.

Kam, Wendell
1983 *Reconnaissance Survey Files: Unrecorded Heiau on State Lands, Waiakea, South Hilo, Hawaii (TMK 2-1-07:11),* State of Hawaii DLNR, Historic Preservation Office, Honolulu, HI.

Kelly, Marion, Barry Nakamura and Dorothy B. Barrère
1981 *Hilo Bay: A Chronological History, Land and Water Use in the Hilo Bay Area, Island of Hawai'i*, Bishop Museum, Honolulu.

Kennedy, Joseph
1994 *An Archaeological Inventory Survey for the Proposed Hilo Forestry Office Complex Extension Located at TMK: 2-2-27:01 (Portion) in Waiakea Ahupua'a, South Hilo District, Island of Hawaii- Draft*, Archaeological Consultants of Hawaii, Inc., Haleiwa, HI

Lockwood, J., and J. Buchanan-Banks
1991 *Preliminary Geologic report for the Alenaio Stream Flood Damage Reduction Study area, Hilo, Hawaii. Open-file Report 81-791, U. S. Geological Survey.*

Maly, Kepā, Alan T. Walker, and Paul H. Rosendahl
1994 *Archaeological Inventory Survey, Waiākea Cane Lots, Portion of Parcel 6, Land of Waiākea, South Hilo District, Island of Hawai'i (TMK: 2-4-57-01).* Prepared for Roy Takemoto, Ms. on file at the State Historic Preservation Division, Kapolei, Hawaii.

References (Continued)


Malo David
1951 *Hawaiian Antiquities* Bernice P. Bishop Museum, special publication 2, second edition: Bishop Museum Press, Honolulu

1996 *Ka Moolelo Hawaii: Hawaiian Traditions*: First People's Productions, Honolulu.

McGerty, Leann and Spear, Robert L
1999 *An Inventory Survey of an Additional Unsurveyed Portion of TMK: 2-4-57:1, Land of Waiakea, South Hilo District, Island of Hawai'i*

Moniz, Jadelyn J.
1992 "Summary of Prior Archaeological Work" *Historical and Archaeological Synthesis of Land Use and Settlement Patterns Waiākea Ahupua'a, Hilo Hawaii*, UH Anthropology 645: Historic Preservation, Fall 1992, Honolulu.

McEldowney, Holly
1979 *Archaeological and Historical Literature Search and Research Design: Lava Flow Control Study, Hilo, Hawaii*, Department of Anthropology, Bishop Museum, Prepared for the U. S. Army Engineer District, Pacific Ocean.

Nagata, Ralston
1985 *Field Inspection of Cave Site, Fodder Growing Project (CDUA-HA 1736) Parcel, Panaewa, South Hilo, Hawaii TMK: 2-4-08:22*, State Parks Administrator

Pietrusewsky, Michael
1989 *Human Remains Found at Wailoa Bridge Renovation Project, Waiakea, South Hilo, State Site # 50-10-35-11,115, TMK: 2-1-01:12*

Pukui, Mary Kawena
1983 *'Olelo No'eau: Hawaiian Proverbs and Poetical Sayings*, Bishop Museum Special Publication No.71, Bishop Museum Press, Honolulu, HI.

Pukui, Mary Kawena and Samuel H. Elbert
1986 *Hawaiian Dictionary*, 2nd Edition, University of Hawaii Press, Honolulu, HI.

Pukui, Mary K., Samuel H. Elbert and Esther Mookini
1974 *Place Names of Hawaii*, University of Hawaii Press, Honolulu, HI.




References (Continued)


Rechtman, Robert B.
2001 *Archaeological Inventory Survey and Limited Cultural Assessment for the Proposed Wastewater Treatment Facility at Kulani Correctional Facility (TMK: 3-2-4-08:9), Waiakea Ahupua'a, South Hilo District, Hawai'i*

Rechtman, Robert B. and Henry, Jack D.
1998 *University of Hawai'i Hilo Kawili Street Development Archaeological Inventory Survey (TMK: 3-2-4-01:5) Waiakea Ahupua'a, South Hilo District, Island of Hawai'i*

Robins, Jennifer, and Robert L. Spear
1996 *An Inventory Survey of the Puainako Street Realignment/Extension Project Expanded Corridor, Waiākea, Kukuau 1 and 2, and Ponahawai, South Hilo District, Island of Hawaii*. Prepared for Okahara and Associates, Ms. on file at the State Historic Preservation Division, Kapolei, Hawaii.

Rosendahl, Margaret L.K. and Lawrence Tales
1988 *Archaeological Reconnaissance Survey for Environmental Impact Statement (EIS) Proposed Irradiation Plant Site, District of South Hilo, Island of Hawaii (TMK 2-1-12:106 [Potential Site A]: 1-2-12:Var. [Potential Site B]: 2-1-25:Por. 86 [Potential Site C])*, PHRI, Hilo, HI.

Rosendahl, Margaret L.K.
1988 *Archaeological Reconnaissance Survey for Environmental Impact Statement (EIS) Hilo Wastewater Treatment Facility Site, Land of Waiakea, District of South Hilo, Island of Hawaii (TMK 2-1-13:Por. 12, 13, 20, 22)*, PHRI, Hilo, HI.

Rosendahl, Margaret L.K.
1988 *Archaeological Reconnaissance Survey for Environmental Impact Statement (EIS) Hilo Judiciary Complex Sites, Hilo, District of South Hilo, Island of Hawaii (TMK 2-2-33:12, 13, 14, 19, 20 [Site 1]: 202013:3, 18 and 2-2-14:72 [Site 2]: 2-2-9:1, 54, 55, 56, 62 and 2-2-10:16 [Site 3]: 2-3-15:1 [Site 4]: 2-3-44:9 [Site 56])*, PHRI, Hilo, HI.

Sato, H. *et al.*
1973 *Soil Survey of the Island of Hawaii*, U.S. Department of Agriculture and Univ. of Hawaii Agricultural Experiment Station.

Smith, Marc
1991 *Site Inspection of the University of Hawaii - Hilo Perimeter Road Alignment, Research and Technology Park Phase I, Waiākea, South Hilo, Hawaii Island (TMK: 3-2-4-01:7)*, November 8, 1991, State Historic Preservation Division, Department of Land and Natural Resources, Honolulu.

Smith, Marc
1991 *Site Inspection for State Land Disposition parcel in Waiakea Homesteads, South Hilo, Hawai'i (TMK: 3-2-4-41:78)*, December 11, 1991, State Historic Preservation Division, Department of Land and Natural Resources, Honolulu.

1992 *Field Inspection for State Land Disposition of the Proposed Department of Water Supply Office Site in Hilo, Waiākea Cane Lots, Waiākea, South Hilo, Hawaii Island (TMK: 3-2-4-56:1)*, January 3, 1992, State Historic Preservation Division, Department of Land and Natural Resources.

Snow, Charles E.
1974 *Early Hawaiians: An Initial Study of Skeletal Remains*: University Press of Kentucky, Lexington.

Spear, Robert L.
1993 *An Inventory Survey of the H.C.E.O.C. (Option II) Parcel, Piihonua Ahupua'a, South Hilo District, Hilo, Island of Hawai'i [TMK :2-3-32:4]*. Prepared for Stuart/Erickson & Associates, Ms. on file at the State Historic Preservation Division, Kapolei, Hawaii.

Spear, Robert L.
1995 *Data Recovery Excavations for Sites 50-10-35-19431, 19432, 19433, and 19434, Land of Waiākea, South Hilo District, Island of Hawai'i [TMK: 2-4-57:01]*. Prepared for Roy Takemoto, Ms. on file at the State Historic Preservation Division, Kapolei, Hawaii.

Stokes, John F. G., and Tom Dye (Editor)
1991 *Heiau of The Island of Hawai'i: A Historic Survey of Native Hawaiian Temple Sites*, ed. Tom Dye, Bishop Museum Press, Honolulu, HI.

Thrum, Thos., G.
1907 "Heiau and heiau sites throughout the Hawaiian Islands." *Hawaii Almanac and Annual for 1908.*

1908 *Hawaii Almanac and Annual for 1909*, Honolulu: [n.p.]

1923 *More Hawaiian Folk Tales*, A.C. McClurg & Co., Chicago, IL.





Thrum, Thos., G.
1998 "Stories of the Menehunes." *Hawaiian Folk Tales*, Mutual Publishing, Honolulu, HI.

Walker, Alan T. and Rosendahl, Paul H.
1996 *Archaeological Assessment Study Hilo Judiciary Complex Project, Lands of Wainaku, Ponahawai, Pi'ihonua and Waiakea, South Hilo District, Island of Hawai'i (TMK: 2-6-15:1, 2; 2-6-16:2; 2-4-49:18, 19: 2-2-15:33; 2-4-1:12; 2-3-36:3; 2-3-32:1; 2-4-57:1)*

Westervelt, William D.
1911 *Legends of Kewalo.*

1915 *Legends of Gods and Ghosts*. Boston, MA. (In Sterling and Summers, Bishop Museum, Honolulu, HI.)

# APPENDIX J

## *SOCIO-ECONOMIC IMPACT ASSESSMENT*

Prepared By:
SMS (April 2002)

Consulting
Database Marketing
Economic & Social Impact Studies
Research
Solutions Modeling
Training

**SMS**
1042 Fort Street Mall
Suite 200
Honolulu, HI 96813
Ph: (808) 537-3356
Fax: (808) 537-2686
E-mail: info@smshawaii.com
Website: www.smshawaii.com

*Beyond Information. Intelligence.*

# SOCIO-ECONOMIC IMPACT ASSESSMENT, PACIFIC BASIN AGRICULTURAL RESEARCH CENTER (INCLUDING INSTITUTE OF PACIFIC ISLANDS FORESTRY), HILO, HAWAII

*April 2002*

Prepared for:

SSFM International

U.S. Department of Agriculture
Agricultural Research Service

**SMS**
**Affiliations and Associations:**
Alan Barker Associates
Experian
International Survey Research
Medamark Research Inc
NCOA Certified

## EXECUTIVE SUMMARY

The United States Department of Agriculture, Agricultural Research Service, Pacific Basin Agricultural Research Center (PBARC) is proposing construction of a new facility on 30 acres of land in Hilo, Hawaii. The Forestry Service's Institute for Pacific Islands Forestry (IPIF) is also proposing construction of a new facility on part of the site. Together, these facilities would include about 147,400 square feet under roof. Construction would start in 2003 and proceed in phases over about four years. It appears reasonable to expect construction to be finished in 2007.

The two facilities are primarily research centers. When they are built, researchers now located on Oahu and the Big Island will be able to work in new and larger quarters in Hilo. There will be room for additional scientists and technicians as well.

Location of the research centers in Hilo makes sense because the Big Island has both more agricultural and forest land than the other islands, and that land is extremely varied. In Hilo, the project site is near astronomy research offices and an agriculture-oriented facility, the Komohana Agricultural Complex.

For the last two decades, Hawaii County has seen lower incomes and higher unemployment, compared to State averages. After the closing of the island's sugar plantations, agriculture is a small part of the local economy. Tourism is the major source of income for the island. Hilo's economy is far less active than that of West Hawaii, where the major resorts are located. However, Hilo is home to the University of Hawaii at Hilo and Hilo Community College, and is the headquarters for several new astronomical observatories located on Mauna Kea.

**Economic and Population Impacts:** Construction of the two research facilities will support some 315 person-years of construction work, and an additional 407 person-years of work supported by construction-related spending. Direct construction incomes are estimated as amounting to $13.1 million (2001 dollars), while workers in other construction-related jobs will earn another $11.0 million.

Construction of the new facilities will allow consolidation of research activities and provide space for an expanded research program. Up to 44 positions are to be relocated within Hawaii. About 51 new positions would be created as research in the facilities increases. The new direct incomes in the State of Hawaii are estimated as $3.4 million annually, while workers in indirect and induced jobs associated with project operations will earn another $1.4 million annually.

Impacts on the populations of Oahu and Hawaii will be very small. From Oahu, some staff may relocate, while others may change to other federal jobs on Oahu. On the Big Island, new technical and support jobs will be filled by local hires. New scientist positions will be filled based on a national search. As a result, the new population is estimated as at most 24 new scientists, plus their families: a total of about 63 persons.

In Hawaii County, the new staff and relocated staff are expected to support some 23 new households. In addition, some 24 to 48 new households could be created over time, as new residents seek homes and existing residents decide to move out to their own quarters. (On an annual basis, this impact amounts to about five to nine new households per year between 2005 and 2010.)

Conferences and workshops will bring a few visitors to the Big Island. (The impact is estimated at an average 700 visitor-days in Hawaii each year.)

Construction and operation of the project will bring new revenues to Hawaii. By the same token, increases in the Hilo population will create new demand for services, and hence additional government costs. The net impact on the State will be positive but small. Over time, it is estimated as at least $119,000 in additional revenues annually. (The methods used tend to magnify costs, so actual net revenues could be higher.) For the County of Hawaii, the net fiscal result is estimated as an increase in costs of at most $14,500 per year.

**Social Issues and Impacts:** The project will bring new jobs to Hilo, helping skilled residents find well-paying jobs near home. It will create stress for some USDA employees, who will choose between relocation or seeking other employment. On the other hand, it will offer those who do relocate the opportunity to enjoy recreational opportunities and the relatively low cost of housing in East Hawaii.

In light of recent controversies over irradiation and alien species introduction in Hawaii, some residents can be expected to be deeply concerned about activities at the project. As Federal research institutions, the PBARC and IPIF will maintain strict controls over plants, insects, and experimental materials for research. No non-native insects or plants not already established in Hawaii will be imported for study at the new facility. However, assertion that these behavioral controls are in place is not sufficient to alleviate potential resident concerns. To minimize anxiety and public reactions due to such concern, the project is advised to have an active public information strategy.



## CONTENTS

## EXHIBITS





# 1: INTRODUCTION

## 1.1 THE PROPOSED PROJECT

The Agricultural Research Service, United States Department of Agriculture, is planning a new facility to consolidate its Pacific tropical agricultural research operations. A 30-acres site in Hilo, Hawaii has been identified for development of the new Pacific Basin Agricultural Research Center. With consolidation, the Pacific Basin Agricultural Research Center (PBARC) will bring together research activities now conducted on the Island of Hawaii and at Manoa on Oahu. Operations currently located at Aiea on Oahu, and at Kapaa on Kauai will continue at those locations. The PBARC facility is planned to house a larger staff than is currently employed in Hawaii by the Agricultural Research Service. Research activities of the Agricultural Research Service (ARS) focus on crop production, protection, and export problems, to facilitate enhanced production of agricultural commodities for local markets and for export.

The new Institute of Pacific Islands Forestry facility (IPIF) would also be located on the proposed 30-acre site. The new facility will allow both consolidation and expansion of Forest Service activities in Hawaii. IPIF activities are to include collection and breeding of rare and endangered native plants, educational programs, and communication with researchers, forest industry personnel, and other Forest Service personnel in Hawaii, the Mainland United States, and the Pacific Islands.

The site is located on the east side of Komohana Street. Exhibit 1-A shows the site's location in relation to the Hilo street grid. It is on the east side of Komohana. Directly across the street is University Park, a research campus occupied by the headquarters and research facilities associated with several observatories. University Park is part of the University of Hawaii, Hilo campus.

The proposed PBARC will include:

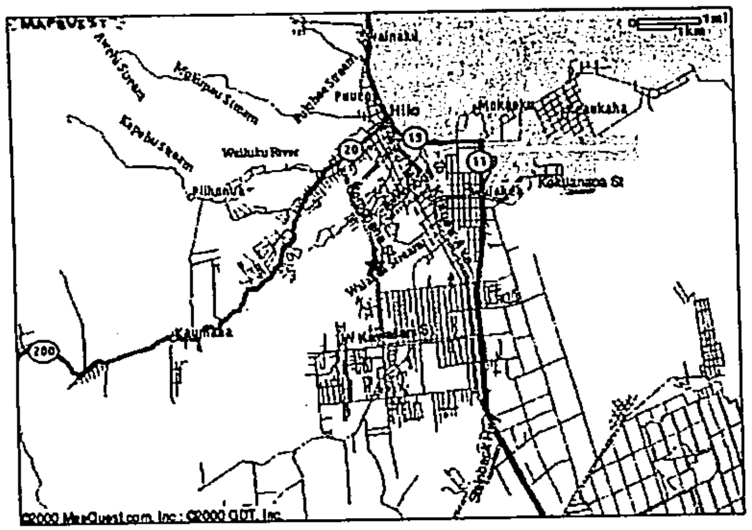
- An administrative building with arboretum;
- Laboratories;
- An insectary; and
- Greenhouses with support buildings.

The PBARC program requirements call for a total of 113,225 square feet of enclosed area under roof (including greenhouse space). Exhibit 1-B is a preliminary plan of the facility.

The proposed IPIF is to include offices, laboratories and support facilities requiring approximately 30,200 gross square feet. Exhibit 1-C is a preliminary plan.

In this report, "the project" is the combined new PBARC and IPIF facilities. Current plans call for the facilities to be built in phases over a few years. "The project" consists of construction and use of the completed PBARC and IPIF, with approximately the square footage discussed here. Exhibits 1-B and 1-C can be taken as preliminary plans for the project.

Exhibit 1-A: LOCATION MAP




NOTE: Project site is marked by star.

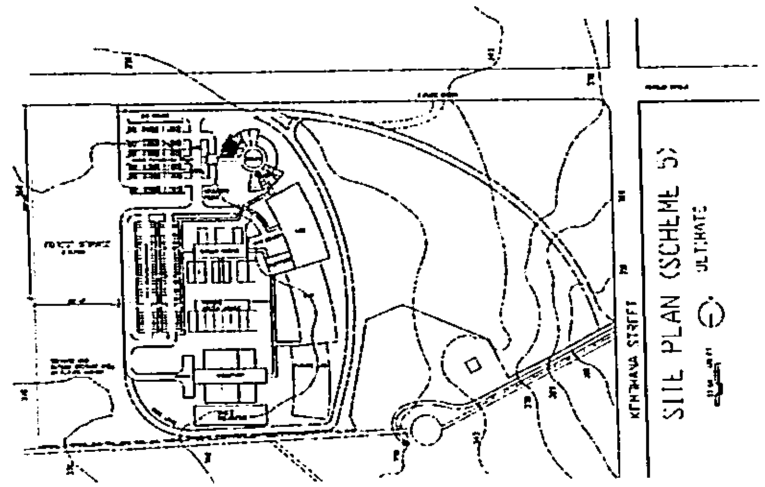
## 1.2 SCOPE OF THIS REPORT

This report identifies potential social and economic impacts of the proposed new facilities. It is divided into five sections:

- This section contains introductory material;
- The next section provides information on the current and likely future demographic and economic situation;
- The third section summarizes issues and concerns for the Hawaii Island community, both in general and with particular relevance to the proposed project;
- The fourth section contains calculations of jobs supported by the project, workforce incomes, population and housing impacts, and fiscal impacts of the project; and
- The fifth section discusses social impacts of the project and mitigation measures for undesired impacts.

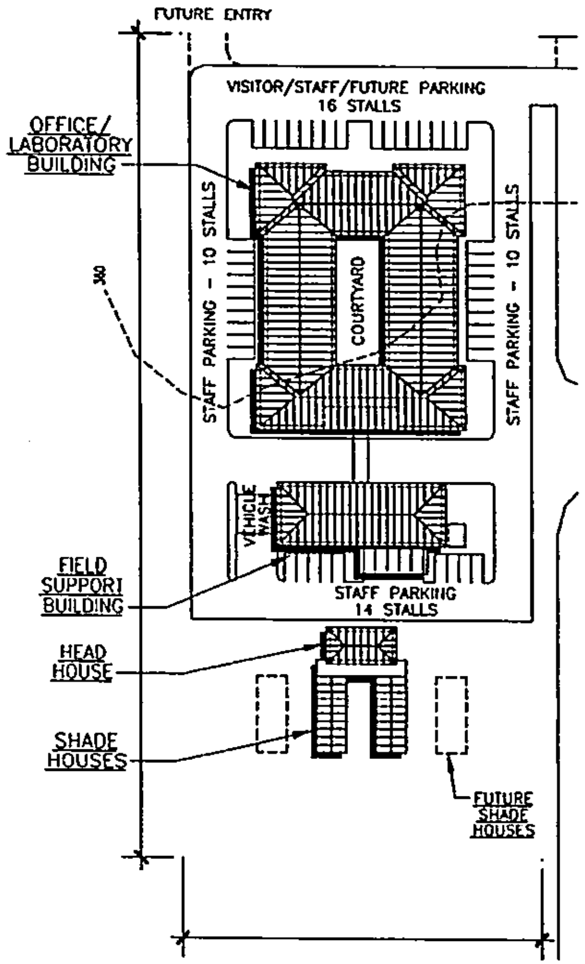


Exhibit 1-B: CONCEPT PLAN, PBARC




SOURCE: SSFM International, and Matsunaga & Associates.

Exhibit 1-C: CONCEPT PLAN, IPIF




SOURCE: SSFM International and Leo A. Daly



# 2: SOCIAL AND CULTURAL CONTEXT

Hilo is the capital of Hawaii County and the center of much of its agricultural activity. (Coffee growing, on the other hand, is found in West Hawaii.) Hawaii County has weathered an economic transformation and emerged, as the detailed discussion in this section shows, with a mixed economy and relatively high levels of employment, but modest incomes, on the whole.

## 2.1 GEOGRAPHY AND HISTORY

The Hilo site was chosen in part because of the size and variety of areas supporting tropical agriculture on the island of Hawaii. With more than 4,000 square miles of surface area, the island of Hawaii (Hawaii County) includes five-eighths of the state's land. The total farm acreage in Hawaii County was approximately 870,000 acres in 1999 (Hawaii Agricultural Statistics Service, 2001), 60.4% of the state total. Hawaii County is the largest producer of fruit, flowers, macadamia nuts, coffee and cattle in Hawaii. Hawaii County also has larger areas in government forest reserve and private forestland than the other counties (Hawaii State Department of Business, Economic Development and Tourism, 2001a). Hawaii County also has extensive variation in climate, with agricultural specialization well developed for different ecologies (e.g., papaya production in Puna, ginger cultivation along the Hamakua coast, and coffee plantings in South Kona).

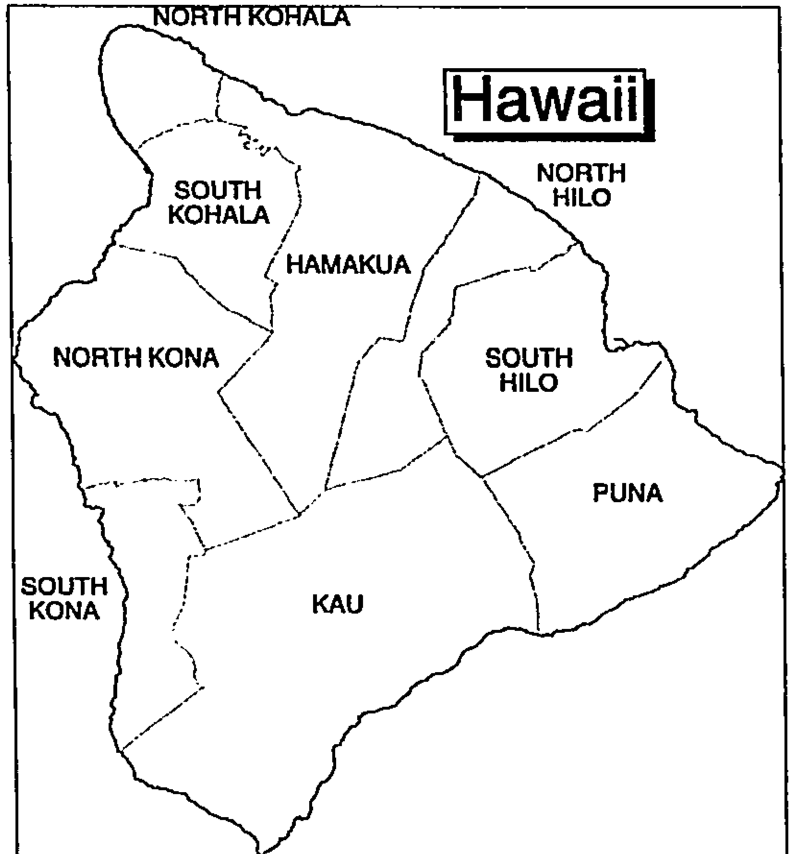
Hawaii Island's ecosystems range from high alpine zones near the summits of Mauna Kea and Mauna Loa, to low elevation systems varying from rain forest to desert. To add to the complexity, new land is being formed as lava flows from the Puu Oo vent system to the shoreline. Hence, Hawaii Island contains both varied farmlands and forbidding recent lava flows. However, the Natural Energy Laboratory at Keahole (on the Kona side of the island) proves that agriculture may flourish even on lava. There, seawater from the ocean depth cools hydroponics operations, fish farms, and commercial algae production.

Hilo has been the government center for Hawaii Island since County government was instituted in 1905. It is also home to the University of Hawaii, Hilo and a campus of the University of Hawaii Community College system. University Park, across Komohana Street from the project site, is being developed by the University of Hawaii as a research park and a site for campus expansion. It is connected with the main campus by Nowelo Street.

Hilo is located on a broad plain, leading to a wide bay. The open land above Hilo has been a source of near-disasters, as lava has flowed from Mauna Loa toward the town in the 1850s, 1880-81, 1942, and 1984. The bay has been a source of greater disasters, as tsunamis demolished much of the coastal area in 1946 and 1960. (Occasionally, volcanic activity beneath Hawaii Island has produced tsunamis. These are especially dangerous as they come too quickly for people to be warned away from the coast [Juvik and Juvik, 1998].) Hilo is in South Hilo District, as shown in Exhibit 2-A.

PBARC currently has facilities located near Hilo. In addition, the College of Tropical Agriculture and Human Resources, University of Hawaii operates the Komohana Agricultural Complex, about a quarter-mile from the PBARC site.

Exhibit 2-A: HAWAII COUNTY DISTRICTS



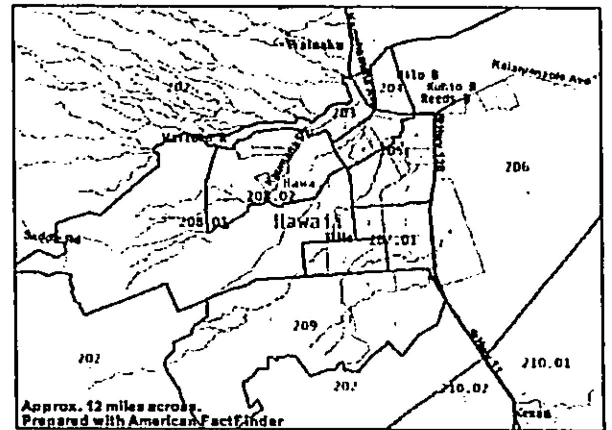

SOURCE: Hawaii Department of Business, Economic Development and Tourism (DBEDT), 1999

## 2.2 POPULATION AND DEMOGRAPHY

Hilo is Hawaii County's most populous town. Exhibit 2-B locates Hilo Census Designated Place – the town of Hilo – on the Island, while Exhibit 2-C provides information from the 2000 Census for Hilo, the County, and the State.



Exhibit 2-B: HILO CENSUS DESIGNATED PLACE




SOURCE: US Census (www.census.gov)

Exhibit 2-C: DEMOGRAPHY, 2000

| | Hilo CDP | | Hawaii County | | State of Hawaii | |
|---|---|---|---|---|---|---|
| Total Population | 40,759 | | 148,677 | | 1,211,537 | |
| | No. | % | No. | % | No. | % |
| Age: | | | | | | |
| 0 - 5 years | 2,301 | 5.6% | 9,130 | 6.1% | 78,163 | 6.5% |
| 5 - 19 years | 9,143 | 22.4% | 22,601 | 15.2% | 249,088 | 20.6% |
| 20 - 64 years | 22,492 | 55.2% | 96,827 | 65.1% | 723,685 | 59.7% |
| 65 + years | 6,823 | 16.7% | 20,119 | 13.5% | 160,601 | 13.3% |
| Median Age | 38.6 years | | 38.6 years | | 38.2 years | |
| Persons in Households | 39,368 | | 145,873 | | 1,175,755 | |
| Persons in General Quarters | 1,391 | | 2,804 | | 35,782 | |
| No. of Households | 14,577 | | 52,985 | | 403,240 | |
| No. of Persons Living Alone | 3,510 | | 12,240 | | 88,153 | |
| Average Family Size | 3.19 | | 3.24 | | 3.42 | |
| Average Household Size | 2.70 | | 2.75 | | 2.92 | |

SOURCE: US Census, 2001.

As Exhibit 2-C shows, Hawaii County's population is older, on average, than the statewide population. Hilo shows an even higher median age and larger segment of the population age 65 or older. Both average family size and average household size are smaller than for the island and State. This is in line with the high age structure, as typical of an area with older families.

Ethnically, Hawaii County's population is mixed, like the rest of Hawaii. However, persons with Hawaiian and Caucasian ancestry are especially numerous:

Exhibit 2-D: MAJOR ETHNIC GROUPS, 2000

| | Hawaii County | | State of Hawaii | |
|---|---|---|---|---|
| | No. | Col. % | No. | Col. % |
| Population | 141,840 | | 1,156,014 | |
| Ethnicity/Race | | | | |
| Caucasian | 34,530 | 24.3% | 243,626 | 21.1% |
| Hawaiian | 42,805 | 30.2% | 254,911 | 22.1% |
| Chinese | 3,077 | 2.2% | 66,839 | 5.8% |
| Filipino | 22,335 | 15.7% | 183,292 | 15.9% |
| Japanese | 25,165 | 17.8% | 253,475 | 21.9% |
| Other/Refused/Unknown | 13,909 | 9.8% | 153,872 | 13.3% |

NOTES: Based on survey, with information on 17,183 persons. Totals may not sum to 100% because of rounding.
SOURCE: Hawaii Department of Health, Hawaii Health Survey, 2001.

The Hawaii State Department of Health data in Exhibit 2-D are from a large survey. They are used instead of Census data on race and ethnicity as they more closely reflect locally salient ethnic identities. The State data are not available at the CDP level. The Census shows 70.3% of the Hilo CPD population as having one race/ethnicity affiliation, with Japanese as the most common ethnicity (26.7% of total population). The Hawaiian group is also large in Hilo (but not easily quantified from Census publications, since many Hawaiians recognize more than one ethnic background).

## 2.2 EDUCATION

Hawaii has a statewide public school system. Until 2001, Hawaii Island was a single district, with a superintendent based in Hilo. Two high school complexes, Hilo and Waiakea, are in Hilo. While State Department of Education schools have been much criticized by citizens and legislators, their test results have been improving in recent years. Statewide, Hawaii students in third grade score better than the U.S. average in reading and math on Stanford Achievement Tests (for 2000; no tests were administered in 2001). This gap narrows across the grade levels until Hawaii grade 10 students are scoring below the U.S. average in reading and math. Exhibit 2-E shows results for the State and Hawaii County:



Exhibit 2-E: 2000 STANFORD ACHIEVEMENT TEST RESULTS FOR GRADE 10

| | Reading | | | Math | | |
|---|---|---|---|---|---|---|
| School | Above Average | Average | Below Average | Above Average | Average | Below Average |
| US Average | 23 | 54 | 23 | 23 | 54 | 23 |
| DOE Statewide | 22 | 52 | 25 | 23 | 50 | 26 |
| Hawaii District | 23 | 49 | 27 | 21 | 50 | 28 |
| Hilo High | 25 | 49 | 26 | 25 | 50 | 25 |
| Waiakea | 29 | 49 | 22 | 30 | 46 | 24 |

NOTES: Scores are percentages of each group scoring in the top, middle, or bottom three stanines.
SOURCE: *Honolulu Star-Bulletin*, 2001.

The students from the two Hilo high schools performed better than the Hawaii District and state averages, with more students above average in reading and math.

The State Department of Education annually polls existing seniors on their future education plans. Hilo students were very similar to others in State DOE schools both in planning to continue their education and in looking in-state for their next school (as shown in Exhibit 2-F):

Exhibit 2-F: FUTURE EDUCATION PLANS OF HAWAII SENIORS

| | Hilo High | | Waiakea High | | HI District | | State | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No | % |
| Current Enrollment (all grades) | 1,428 | 100 | 1,358 | 100 | 25,470 | 13.8 | 183,629 | 100 |
| Exit Plans | | | | | | | | |
| # of Srs. | 350 | 25 | 375 | 28 | 1,606 | 100 | 10,310 | 100 |
| # completed survey | 327 | 93 | 349 | 93 | 1,487 | 93 | 8,969 | 87 |
| # plan to attend post-secondary school | 270 | 83 | 265 | 76 | 1,120 | 75 | 7,326 | 82 |
| # accepted by school | 180 | 67 | 166 | 62 | 723 | 65 | 4,338 | 60 |
| 4 yr. HI | 72 | 22 | 93 | 27 | 359 | 24 | 1,932 | 22 |
| 4 yr. Outside HI | 69 | 21 | 52 | 15 | 225 | 15 | 1,527 | 17 |
| 2 yr. HI | 95 | 29 | 88 | 25 | 354 | 24 | 2,664 | 30 |
| 2 yr. Outside HI | 9 | 4 | 13 | 4 | 61 | 4 | 364 | 4 |

SOURCE: Hawaii DOE, 2001.

## 2.4 HOUSING

The housing stock for Hilo CDP accounts for 25% of the county total and 3% of the state total. Hilo CDP has a higher percentage of occupied housing than Hawaii County or the State, largely because visitor units form only a small part of the housing stock (as indicated by the Census category "Vacant for seasonal or recreational use"). Hilo CDP and Hawaii County household sizes are small compared to the State, due in part to the overall aging of the local population.

Exhibit 2-G: HOUSING DATA, 2000 CENSUS

| | Hilo CDP | Hawaii County | State of Hawaii |
|---|---|---|---|
| Housing Stock: | 16,026 | 62,674 | 460,542 |
| Occupied Units<br>% occupied | 14,577<br>91.0% | 52,985<br>84.5% | 403,240<br>87.5% |
| Vacant<br>for seasonal use, etc.<br>% for seasonal use | 1,499<br>216<br>14.4% | 9,689<br>5,101<br>52.6% | 57,302<br>25,584<br>44.6% |
| Rental Vacancy Rate | 10.9% | 7.6% | 8.2% |
| Owner-occupied Units<br>(% of occupied units) | 8,873<br>60.9% | 34,175<br>65.5% | 227,888<br>56.5% |
| Renter-occupied Units<br>(% of occupied units) | 5,704<br>39.1% | 18,810<br>35.5% | 175,352<br>43.5% |
| Average population per<br>household<br>Family | <br>2.70<br>3.19 | <br>2.75<br>3.24 | <br>2.92<br>3.42 |

SOURCE: U.S. Census, 2001

## 2.5 ECONOMY

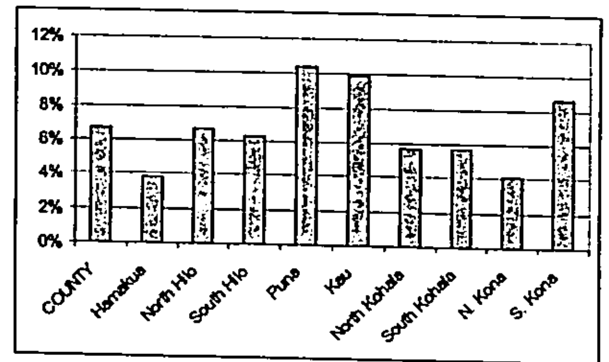
Hawaii County has been transformed over the last four decades, from a plantation economy to a mixed one. Tourism, diversified agriculture, construction and local niche industries such as astronomy have replaced sugar as the basis of the economy. The process has been uneven. South Kohala district, for example, has emerged as a resort area, with upscale hotels and residential areas, while North Kohala and Hamakua – former plantation areas – supply much of the tourism workforce and have only small-scale diversified agriculture and tourism attractions to employ residents.

Hilo has its own harbor and airport. These serve the entire island, but Keahole airport in Kona has emerged as more important for tourism. In 2000, the average daily visitor census in East Hawaii was estimated as 4,096, while the count for West Hawaii was 17,742 (DBEDT, 2001c). Unemployment also is unevenly distributed, as shown in Exhibit 2-H. The distribution is not simply due to recent plantation closings. Unemployment is high in Kau, where the closing of Kau Agribusiness affected many workers, but low in Hamakua, where the same process occurred only a few years before.



Unemployment in Hilo (South Hilo District) is below the county average. However, Hilo is the urban center for Puna District, with the highest level of unemployment. (Puna also has the fastest growing population of all districts in the State, up 50.8% from 1990 to 2000 [DBEDT 2001].) (As discussed later in this chapter, Hawaii Island unemployment has declined since 2000. The 2000 data are useful for showing the relative status of the districts in this regard.)

Exhibit 2-H: HAWAII COUNTY AND DISTRICTS UNEMPLOYMENT, 2000



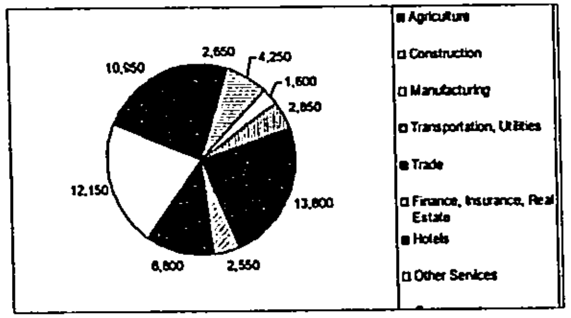

SOURCE: State Department of Labor and Industrial Relations files, reported in *Hawaii County Data Book* (www.co.hawaii.hi.us/databook_current/dbooktoc.htm).

### 2.5.1 Industries

The largest industries in Hawaii County in terms of jobs are in trade (retail and wholesale) and services. Hotels accounted for some 6,800 jobs in 2000, while agriculture supported 2,650 jobs, as shown in Exhibit 2-I.

As plantations closed in Puna and North Kohala, then Hamakua, and most recently Kau, residents and policy-makers have looked to diversified agriculture and forestry to use most of the acreage released from sugar and to generate new jobs. The results have been far less spectacular than desired. Nonetheless, the Big Island leads in production of some crops – coffee, macadamia nuts, papayas, ginger root and orchids – and is home to experiments in new crops such as heart of palm (Danninger, 1999).

Exhibit 2-I: JOBCOUNT IN MAJOR INDUSTRIES, HAWAII COUNTY, 2000




SOURCE: (Hawaii Department of Labor and Industrial Relations, 2001)

As of 1999, the value of Hawaii County crops and livestock was $143.4 million (DBEDT, 2001a). Of that figure, $121.1 million was in diversified agriculture – 48.1% of the state total. Exhibit 2-J shows recent totals for farm land and production. Exhibit 2-K indicates that the value of farm production has been climbing back toward the levels seen when sugar was the main crop, although value per farm is much smaller. With total sales per farm averaging about $50,000, the average farm can support at most one paid worker and little or no expenditure for experimentation.

Exhibit 2-J: FARM PRODUCTION, HAWAII COUNTY, 1999

| | Acreage (1,000 ac.) | Number of Farms | Value of Sales ($1,000s) |
|---|---|---|---|
| Sugarcane | - | - | - |
| Pineapples | | 5 | |
| Vegetables and melons | 2 | 600 | 18,569 |
| Fruits, excluding pineapples | 5 | 805 | 15,547 |
| Coffee | 3 | 635 | 9,300 |
| Macadamia nuts | (D) | (D) | (D) |
| Taro | | 100 | 632 |
| Flowers and nursery products | | 376 | 41,578 |

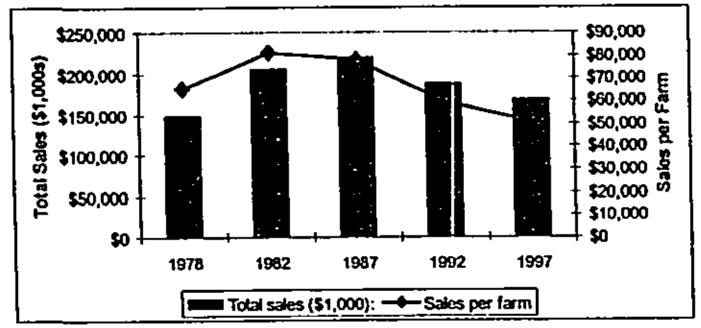
NOTE: D = Information not disclosed so that individual producers would not be identifiable.
SOURCE: Hawaiian Agricultural Statistical Service, as reported in DBEDT, 2001a.

Over a decade, the number of farms in Hawaii County grew modestly, from 2,700 to 3,300, but farm acreage declined by 13.9% to 870,000 acres in 1999 and 2000 (DBEDT, 2001a). In



addition to the paid workforce shown in Exhibit 10, an additional 2,350 farm owners and their family members work in agriculture in Hawaii County.

Exhibit 2-K: VALUE OF FARM PRODUCTION, HAWAII COUNTY, 1978-1997




SOURCES: US Census, Economic Census data for selected years, as reported in Hawaii County, 2001. Dollar figures are in current dollars as of each Census, not in constant dollars.

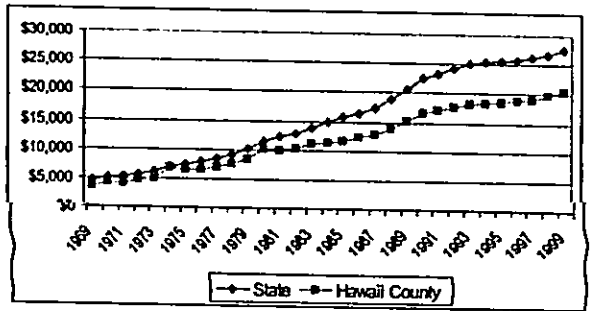
The decline in acreage is due to the closing of sugar plantations. Without a plantation crop to replace it, forestry becomes important as a land use that can be productive. However, proposals for large-scale plantings of eucalyptus trees for wood chip production have been opposed as likely to be environmentally destructive and as tying up land that could, at least in part, be farmed by residents (Wilson, 1997) As of 1999, Hawaii County had 1.1 million acres of forest land, of which 600,000 could potentially be of commercial value. However, planted acreage amounted to 43,620 acres, 5.4% of the potential area (Hawaii County, 2001).

Other industries affecting East Hawaii include tourism: with 2.7 million visitors per year, Volcanoes National Park is Hawaii's most frequented visitor attraction. Observatories on Mauna Kea, with revenues of about $50 million annually, are based in Waimea and Hilo (SMS, 2000).

### 2.5.2 Economic Situation of Residents

Personal income of Hawaii County residents has been increasing over time, but not as fast as for the State as a whole:

## Exhibit 2-L: PER CAPITA INCOME, STATE AND HAWAII COUNTY, 1969-1999




SOURCE: DBEDT, 2001a

Exhibit 2-L shows that, since the early 1970s, Hawaii County residents' incomes failed to grow as fast as other Hawaii State residents. Similarly, Hawaii fell behind the nation as a whole: the per capita disposable personal income level for residents of the State of Hawaii fell from 117% to 97% of the national average, so the Hawaii County lag in income growth is even more pronounced in relation to national trends.

Unemployment in Hawaii County has been consistently above the State average. The most recent reported figures are 4.9% for the State (as of December 2001) and 5.9% for Hawaii County (Hawaii DLIR, 2002). (Earlier, 2000 annual estimates were used as unemployment rates for both the districts and the county have been provided.)

The 2000 Hawaii Health Survey indicates that 21.9% of the Hawaii County population is below the poverty line, while only 14.1% of the statewide population is (Hawaii DOH, 2001). (The US Department of Health and Human Services sets poverty guidelines for the Mainland US, Hawaii and Alaska for families of different sizes. The Hawaii figures are 12% to 15% higher than Mainland ones. The guidelines are used by Federal and State agencies to identify those who qualify for programs such as free lunches at schools.) The same survey shows the median household income in Hawaii County as 78.0% of the state median, as shown in Exhibit 2-M:

### Exhibit 2-M: HOUSEHOLD INCOME, 2000

| | Percentage of Households | |
|---|---|---|
| | Hawaii County | State |
| less than $15,000 | 19.7% | 12.0% |
| $15,000-$29,999 | 24.1% | 19.3% |
| $30,000-$44,999 | 20.3% | 20.9% |
| $45,000-$59,999 | 13.5% | 13.9% |
| $60,000-$74,999 | 8.3% | 10.7% |
| $75,000-$99,999 | 7.7% | 11.7% |
| $100,000 and up | 6.4% | 11.4% |
| Median | $32,084 | $41,137 |



Both the extremely low- and low- income groups (up to $30,000) in Exhibit 2-M form a much larger share of the Hawaii County population than for the State as a whole.

## 2.6 EMERGING TRENDS

The low unemployment figures in the last section point out the fact that Hawaii County was well positioned to rebound after the September 11 tragedies. Unlike Oahu, where many tourists are Japanese, the Neighbor Islands largely attract Mainland visitors, who returned to Hawaii in large numbers by the end of 2001.

*In the wake of September 11*, economic forecasts are even less certain than usual. The most recent published short-term forecast from the State (DBEDT 2001c) *suggests that growth will be minimal in 2001-2002*, but return to slow growth trends as of 2003:

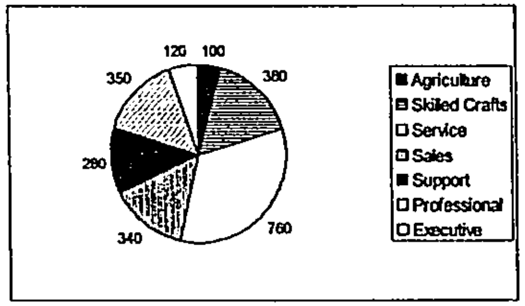
### Exhibit 2-N: STATE ECONOMIC FORECAST, TO 2004

| Economic Indicators | 2000 (actual) | 2001 (forecast) | 2002 (forecast) | 2003 (forecast) | 2004 (forecast) |
|---|---|---|---|---|---|
| Total population (thousands) | 1,216.40 | 1,226.10 | 1,235.90 | 1,244.60 | 1,253.30 |
| Visitor arrivals (thousands) | 6,948.60 | 6,321.40 | 6,510.90 | 6,949.10 | 7,120.40 |
| Visitor expenditures (million dollars) | 10,918.10 | 10,022.80 | 10,313.50 | 11,200.40 | 11,693.30 |
| Honolulu CPI-U (1982-84=100) | 176.3 | 178.6 | 180.9 | 184 | 187.5 |
| Personal income (million dollars) | 33,776.00 | 34,789.30 | 35,485.10 | 36,798.00 | 38,233.10 |
| Personal income ($1992 million) | 29,745.00 | 30,251.80 | 30,463.60 | 31,072.90 | 31,684.40 |
| Total wage & salary jobs (in thousands) | 559.4 | 561.9 | 557.9 | 569.1 | 580.4 |
| Gross state product (million dollars) | 39,394.3 | 40,376.6 | 41,130.0 | 42,564.4 | 44,217.7 |
| Real gross state product ($1992 million) | 35,142.1 | 35,556.2 | 35,754.8 | 36,383.2 | 37,091.7 |
| Annual Percentage Change | | | | | |
| Total population (thousands) | (NA) | 0.8 | 0.8 | 0.7 | 0.7 |
| Visitor arrivals (thousands) | 3.1 | -9 | 3 | 6.7 | 2.5 |
| Visitor expenditures (million dollars) | 8.2 | -8.2 | 2.9 | 8.6 | 4.4 |
| Honolulu CPI-U (1982-84=100) | 1.7 | 1.3 | 1.3 | 1.7 | 1.9 |
| Personal income (million dollars) | 4.1 | 3.3 | 2 | 3.7 | 3.9 |
| Personal income ($1992 million) | 2.4 | 2 | 0.7 | 2 | 2 |
| Total wage & salary jobs (thousands) | 3.1 | 0.4 | -0.7 | 2 | 2 |
| Gross state product (million dollars) | 5.3 | 2.5 | 1.9 | 3.5 | 3.9 |
| Real gross state product ($1992 million) | 3.7 | 1.2 | 0.6 | 1.8 | 1.9 |

For Hawaii County, the long-term forecast is for steady growth (DBEDT 2000). The population has been expected to grow by about 1% annually, with jobs and personal income growing at about 1.6% annually over the period. (The long-term forecast extrapolates from historical trends, and tends to emphasize the role of tourism, as the major driver of Hawaii's economy. The most recent version was issued too early to take into account the 2000 Census or recent economic problems.)

Whether or not the island economy grows in the next year or two, there is likely to be demand for more new workers than are graduating from Hawaii County schools. While the annual graduating cohort is about 1,600 persons, the number of jobs expected to open each year is about 2,330 (DLIR, 2001). More than half of that number is due to separations, i.e., people retiring or otherwise leaving local jobs. New openings will be most numerous in service jobs. Openings in agriculture will be few:

Exhibit 2-O: ESTIMATED ANNUAL NEW JOB OPENINGS, HAWAII COUNTY, TO 2008




Growth in agriculture will depend on short-term factors, above all the weather. Over the next few years, changes in Hawaii's air services could affect export crop industries. Currently, the two local airlines are merging -- which should reduce scheduled lift to maximize passenger occupancy. This could mean less freight volume and higher rates. Again, long-haul service to and from the US Mainland is increasingly handled by newer jets (e.g., Boeing 757s) with less cargo space available for freight than on older planes. (The result may not be a limit on growth so much as increased dependence on freight shippers such as Federal Express.)



## 3: ISSUES AND CONCERNS

This section notes issues and concerns of Hawaii residents and policy makers that provide a context for understanding agricultural development on the island of Hawaii, and could shape perceptions of the proposed PBARC and IPIF facilities.

Two issues intertwine in recent debates:

- Agriculture has a privileged place in Hawaii. It is Constitutionally protected, with the State asserting an interest in keeping land in agriculture. Along with environmental protection, agriculture is seen as a way of upholding "the life of the land" and hence the well-being of Hawaii as a place and society.

  Even though the state population is largely urban, many families trace their Hawaii origins to plantation communities, and hence see themselves as rooted in the agricultural past. Another indication of the importance of agriculture for Hawaii is the importance given to local crop production in Hawaii's vaunted new cuisine. Celebrity chefs stress the quality of locally grown foods as well as their own abilities.

- Technological interventions in agriculture are strongly opposed by some. In the general population, many express uncertainty or concern about the implications of new agricultural technology for human safety. Some of these are open to new initiatives but prefer to minimize risks.

In Hawaii County, proposals for irradiating papayas and other fruit brought these concerns to a head. Papayas sent to the Mainland US need treatment because fruit flies are endemic in Hawaii. Chemical treatment using ethylene dibromide was banned by the Environmental Protection Agency as of 1984, and methyl bromide treatment was banned as of 2001. With chemical treatment being phased out, farmers depended on heat and vapor treatments, and some fruit was shipped to an irradiator on the US Mainland to identify appropriate levels of exposure, that would kill fruit flies but have minimal effect on the fruit.

State Agriculture Department staff and US Agricultural Research Service scientists collaborated in investigating irradiation. When the State and County went ahead with a proposal to fund construction of a nuclear irradiation plant, community reactions were strong. Still, in 1997, the County Council voted to support the plant. In 1998, the issue was put on the general ballot. A narrow majority of Hawaii Island voters voted against banning irradiation. Voters opposed to irradiation expressed a range of concerns. Perhaps the most quoted was Harry Kim, then Civil Defense Director, and now Mayor of Hawaii County: "I wish we would look into other alternatives. . . . If mankind obeys the rules of the Nuclear Regulatory Commission, this facility can and will be safe." (Thompson, 1997). Kim and others expressed doubts that accidents due to human error and tectonic instability could be ruled out.

Next, the proposed means of irradiation was changed, from a process using radioactive Cobalt-60 to one using electron beam technology. This step responded to the concern expressed by Mayor Kim. The new irradiator was located in Keaau, outside Hilo. It opened in mid-2000 (Tanji, 2000).

While the switch to electron-beam irradiation removed the issue of radioactivity, it did not satisfy all critics. Organic food lobbyists recognize that the new process "does not incur the environmental risks of nuclear irradiation. It is also cheaper and therefore more likely to be used for the near future." (Organic Consumers Association, 2001a). Nonetheless, the same source asserts that "E-beam irradiation will lead to public acceptance of irradiation, at which point nuclear materials will be quietly introduced." The same group has urged consumers to threaten to boycott Hawaii papayas in order to stop the sale of irradiated foods (2001b).

Genetic engineering has been a topic of discussion and protest. It is increasingly important in Hawaii agriculture. First, genetically engineered strains of local crops – notably papayas and corn – are being developed in Hawaii for local consumption and the export market. Next, major Mainland US agricultural firms are using sites in Hawaii to grow seed corn. Hawaii offers both isolated sites for production of different varieties and excellent growing conditions. Areas on Kauai, Oahu and Molokai are being farmed in this way. On Kauai, opponents of genetic engineering who styled themselves as The Menehune destroyed corn, fruit and awa plants at sites operated by Novartis Seeds and the Agricultural Research Center operated by the University of Hawaii (TenBruggencate, 2000). After the two initial break-ins, no further activity has been reported in Hawaii. In fact, the Kauai vandalism may be the work of a few persons, without any local support. On the Mainland US, however, two lobbying groups – US Public Interest Research Group and Genetically Engineered Food Alert – called for a moratorium on outdoor testing of genetically engineered crops in mid-2001 (Asato, 2001)

On Maui, a related set of issues emerged during the environmental process for proposed improvements to Kahului Airport. Some farm groups and officials at the Haleakala branch of Volcanoes National Park saw a longer runway as leading to direct international flights, and hence to increased risk of introduction of alien flora and fauna. The issue emerged as a critical one in the State Land Use Commission and Federal court discussions of the Kahului Airport Environmental Impact Statement (EK Noda and Associates, 1997). In response to criticism and concerns, an Alien Species Action Plan was developed and steps have been taken to control the potential risk of alien introductions to agriculture and to endangered Hawaiian plants on Maui.

The implications of these concerns for the proposed PBARC and IPIF facilities are complex:

- First, agriculture, agricultural research, and outreach activities to support farmers have widespread support. This is clear in the comments on the project from agencies, gathered as part of the pre-assessment notification process.

- Next, PBARC and IPIF scientists are aware of the concerns that the local agriculture and ecology could be vulnerable to alien species or contamination by new strains. They limit research in Hawaii on pests to ones already in the islands. Again, laboratory work on genetic engineering is done on small samples, under Federal guidelines.

- Activists have accused corporate agriculture of lying. They may show equal lack of respect for researchers. Should discussion arise over experimentation at the proposed Center, the debate could easily be heated. In order to conduct a reasoned community discussion in which all can contribute and learn, care will be needed to present a factual account and to uphold standards of evidence and respect.



# 4: ECONOMIC AND DEMOGRAPHIC IMPACTS

This section assesses impacts on jobs, incomes, population, housing, and local government revenues associated with construction and operation of the proposed research facilities in Hilo.

## 4.1 CONCEPTS USED IN ECONOMIC IMPACT ASSESSMENT

In socio-economic impact analysis, an impact is the difference between possible futures, with and without the proposed project, rather than the difference between present conditions and future ones with the project. Many factors will affect the future. A particular project should be held accountable for those changes that it brings about, not for ones that pre-exist it or stem from different sources.

The difference between the current situation and the future can profoundly affect perceptions of any project. In a related vein, perceptions are often shaped by experience with recent projects, which may have little to do with the proposed action. These comparisons are important parts of a community's response to development, and must be viewed as an impact in early phases – but the impact of stimulating a concern (e.g., about newcomers possibly coming into a community) is distinct from the eventual demographic impact (whether in fact newcomers will arrive in great numbers).

Impacts arise in relation to context. Often, a change brought by a project may be highly significant at the local level, yet small on a regional or county scale. In the present case, the difference between the local and state levels is more complex. The development of the PBARC and IPIF facilities will have different impacts in relation to Hawaii County and the State of Hawaii. Construction of new facilities will allow for (a) consolidation of ongoing activities and (b) expansion of research and increased staffing. The latter affects both the State and the County. The former has a County level impact, as jobs are transferred from Oahu or Kauai to Hawaii County, but not a State level impact.

A few technical terms are used here to distinguish impacts of several sorts. First, a distinction is made between impacts of the actual construction and operations of a project, and the effects of project-related spending throughout the local economy. In discussions of jobs and income, three broad types are distinguished:

- *Direct* jobs are immediately involved with construction of a project or with its operations.

- *Indirect* jobs are created as businesses directly involved with a project purchase goods and services in the local economy.

- *Induced* jobs are created as workers spend their income for goods and services.

Indirect and induced employment in Hawaii can be estimated using multipliers from a model of input-output relations in Hawaii's economy developed by State researchers.

Direct jobs are not necessarily located at the site of a project. As a rule of thumb, about 20% of direct construction jobs are off-site (in base yards, offices, and the like). Indirect and induced jobs are created throughout the state. These are likely to be concentrated in commercial and/or industrial centers, rather than near a job site.

## 4.2 EMPLOYMENT AND WAGES

### 4.2.1 Construction

Preliminary estimates of the cost of building the two facilities are shown in Exhibit 4-A. If construction takes about 48 months to complete (over several phases), the average direct construction employment associated with the facilities would be about 80 jobs each year. Construction spending and workers' spending would in turn support another 100 jobs annually. The great majority of these jobs would be in Hawaii County, so the incomes of the workers involved have been calculated using recent average wages from that county.

**Exhibit 4-A: CONSTRUCTION COSTS, JOBS, AND WAGES**

| | Total | Average Annual (2) |
|---|---|---|
| Estimated Construction Cost | | |
| PBARC | $41.8 million | (1) |
| IPIF | $6.7 million | |
| | $48.5 million | |
| Construction Workforce | | |
| Direct | 315 | 82 |
| Indirect and Induced | 407 | 106 |
| Construction Incomes | | |
| Direct | $13.1 | $3.4 |
| Indirect and Induced | $11.0 | $2.9 |

NOTES: Construction wages are estimated based on industry averages for Hawaii County, 2000, adjusted to 2001 in line with Consumer Price Index. Ratio of workers to construction cost based on 2000 ratio of construction cost to jobcount. Indirect and induced workforce multipliers from State Input-Output Model.

(1) The most recent construction cost estimate is a range, from $40 to $50 million. The cost used here is from an earlier study (Matsunaga, 2001), and should be considered provisional.

(2) Construction will begin in 2003. The first phase of PBARC is scheduled to open in 2004. Later phases of both projects will continue through 2007. A 48-month construction period is assumed here for PBARC, and 36-month for IPIF.

Construction wages come to a total of $13.1 million for the direct workforce – approximately $3.4 million per year.

The impact of project construction on the larger workforce would come to some 407 person-years of work, and wages of approximately $11.0 million (for indirect and induced workers). As with the direct workforce, this impact would be spread over several years. (The time period over



which indirect and induced impacts are felt is unclear, since these occur when spending by businesses and workers returns money to the local economy.)

### 4.2.2 Operations

With the new facilities, both the Agricultural Research Service and the Forest Service will consolidate operations in one area, be able to conduct additional research, and be able to house more researchers, as budgets permit. Facilities have been planned in light of continuing research objectives. There is no guarantee that Federal funding will permit staffing to increase quickly to meet those objectives. On the other hand, with an active research program and available space, the USDA labs could attract visiting researchers from the University of Hawaii or other schools with a strong interest in tropical agriculture and forestry. It is hence prudent, for the purpose of impact analysis, to treat the facilities as likely to be fully staffed by about 2010.

Consolidation will result in the closing of current facilities at Manoa on Oahu and loss of jobs on that island. The number of jobs involved -- 20 on Oahu – is extremely small in comparison to the island job counts. The economic impact of job loss in the City and County of Honolulu is hence minimal. (The impact on persons now in those jobs will be discussed separately, in Section 5.1.)

Hawaii County will gain jobs due to both consolidation and expansion. Exhibit 4-B shows current and planned future employment levels. Exhibit 4-C shows, at the top, the increase in job count for the State (due to job creation) and the County (due to job creation and consolidation). The direct jobs added in the State are estimated as totaling 76; another 32 jobs would be moved from other counties to Hilo, bringing the new job impact on Hawaii County to a total of 108 jobs.

Operations jobs titles include scientist, ecologist, biologist, forester, management analyst, technician, support staff. Many are graded at GS 11 and above in federal pay scales (i.e., above the current median household income for the State of Hawaii).

The wages for direct operations employees shown in Exhibit 4-C are calculated from average wages for Federal employees in Hawaii County. They hence estimate total wages, not wages for any one employee.

New technicians and support staff are commonly hired on-island. Scientists are likely to be recruited through national advertisements, recruitment from graduate programs, or transfers within a Federal agency. Because of these policies, the majority of new hires at the PBARC and IPIF will be Hawaii Island residents, but some will come from other areas.

Operations employment, unlike construction employment, is usually expected to continue as long as the project stands. The additional jobs shown in Exhibits 4-B and 4-C would hence be a permanent increase in the Hawaii County jobcount. However, PBARC and other agencies have been able to hire locally to fill many positions, so only a few of the new hires are likely to be new to the State or County.

**Exhibit 4-B: DIRECT OPERATIONS JOBS**

| | |
|---|---|
| Current Employment | |
| Agricultural Research Service | |
| Oahu | 26 |
| Kauai | 6 |
| Hawaii Island | 50 |
| Forestry Service | |
| Oahu | 18 |
| Hawaii Island | 11 |
| Current Total | 111 |
| Future Employment, after build out | |
| Agricultural Research Service | |
| Hawaii Island | |
| PBARC | 135 |
| Stainback Highway | 0 (1) |
| Oahu (Aiea) | 6 |
| Kauai | 6 |
| Forestry Service | |
| Oahu | 0 (2) |
| Hawaii Island | |
| IPIF | 44 |
| Volcano | 3 |
| Total | 194 |
| Total on site | 179 |

NOTES: Current and future employment from PBARC and IPIF planning documents, and personal communications from staff of the two facilities (Paul H.Moore, PBARC, December, 2001, March, 2002; John Ewel and Gail Edmondson, IPIF, January 2002.)

(1) Stainback Highway site will likely be retained, but staff are treated here as based in PBARC.

(2) IPIF will likely maintain a Honolulu office, with a person staffing it part-time. That person would be based in Hilo. The Volcano site would retain its current duties and staffing.

SOURCES: Matsunaga, 2001; Daly, 2001.

Indirect and induced employment impacts are shown for the State and County levels in Exhibit 4-C. For the State level, the ratio of direct jobs to indirect and induced ones is estimated from an Input-Output model that has been developed and refined by State economists over two decades. At the County level, the ratio is smaller, since spending in Hilo can support jobs in Honolulu (in corporate offices, warehouses and the like) as well as local jobs of suppliers and retail firms. Hence, while the direct impact of operations is larger at the County level, the indirect and induced impacts are nearly the same at the County and State levels.



**Exhibit 4-C: DIRECT, INDIRECT, AND INDUCED JOBS ASSOCIATED WITH OPERATIONS**

| | |
|---|---|
| Direct Operations Jobs, Hilo | 179 |
| New Direct Jobs, State | 83 |
| New Direct Jobs, County | 121 |
| Indirect and Induced Jobs | |
| State Impact | 51 |
| Hawaii County Impact | 55 |
| Changes in Incomes | |
| State of Hawaii | |
| Direct | $3.4 million |
| Indirect and Induced | $1.4 million |
| | $4.8 |
| County of Hawaii | |
| Direct | $5.0 million |
| Indirect and Induced | $1.5 million |
| | $6.5 |

SOURCES: State Input-Output Model (DBEDT, 1998); Records of wages by industry (DLIR, 2001).

(The Type II employment multiplier for Federal government workers at the State level is 1.61, i.e., 0.61 indirect and induced jobs associated with each direct job. SMS estimates the County indirect and induced multiplier as 1.46, based on past attempts to estimate County level impacts [Armstrong et al., 1971] and the fact that the multiplier for Federal employees indicates that induced impacts, but nearly no indirect impacts, are generated by these workers.)

For the County of Hawaii, then, the total continuing impact of project development is estimated as reaching more than 180 jobs, with an increase in annual wages totaling about $7.1 million (2001 dollars).

## 4.3 IMPACTS ON POPULATION AND HOUSING

### 4.3.1 Resident Population and Housing

The population supported by the new jobs can be estimated as shown in Exhibit 4-D. At the County level, in-migrants could number 24 (based on estimates of the number of scientists who would be added to the facilities' staffs). Their jobs are estimated as supporting about 60 new residents.

**Exhibit 4-D: RESIDENT POPULATION AND HOUSING IMPACTS**

| | |
|---|---|
| New Jobs (Direct, Indirect, Induced) | |
| State of Hawaii | 134 |
| Hawaii County | 176 |
| Residential Impact: | |
| In-migrant jobs | |
| New scientists, PBARC | 24 (maximum est.) |
| New to State or County | |
| Persons | 63 |
| Households | 23 |

NOTES:
Population and housing impacts based on operations jobs, not construction, since the latter is limited in term. Number of persons per household and ratio of jobs per household calculated for Hawaii County from Census data and State DLIR job counts. New household creation estimated for all potential in-migrants, and not counted in relation to overall job growth, since increased local hiring for direct, indirect and induced jobs results in expected population and housing demand, not external demand.

### 4.3.2 Visitor Population

The research facilities under study here are not visitor attractions, much less visitor accommodations. They will attract visitors only as conference attendees. Both PBARC and IPIF will hold small conferences and workshops, on perhaps a quarterly basis. Together, these facilities can be expected to attract a few out-of-state visitors – perhaps 100 annually, on average, for the duration of a conference (two to three days) and associated vacation time, for a total time in Hawaii of about seven days. The average annual visitor impact, then, would be 700 person-days. These visitors' spending in Hawaii would come to an estimated $113,500 annually (in constant 2001 dollars, based on reported average daily spending of $160.10 by US visitors from the Western United States in 2000 [DBEDT, 2001b]).

## 4.4 FISCAL IMPACTS

The project will have four major impacts on government revenues:

- Construction brings funds to Hawaii, on which taxes are paid. Exhibit 4-E estimates the State revenues associated with project construction as coming to $4.0 million. (This is a one-time impact, not a continuing one.)

- New operations-related employees will pay income taxes and excise taxes on disposable income. When the ratios used in Exhibit 4-E are applied to new operations-related wages statewide, the total impact on State revenues comes to about $390,000 annually. ("Operations-related" incomes include direct, indirect and induced workers'



wages associated with operations, just as the "construction-related" workforce in Exhibit 5-E is the total direct, indirect and induced workforce associated with construction.)

**Exhibit 4-E: STATE REVENUES ASSOCIATED WITH CONSTRUCTION**

| *In Millions of $s* | |
|---|---|
| Construction Spending | $48.5 |
| Construction-Related Wages | $24.1 |
| Revenues | |
| EXCISE TAXES on | |
| Construction Spending (1) | $1.9 |
| Construction-Related Workforce Spending (2) | $0.6 |
| CORPORATE INCOME TAX (3) | |
| Construction (3) | $0.1 |
| PERSONAL INCOME TAX (4) | |
| Construction-Related Workforce Incomes | $1.3 |
| TOTAL | $4.0 |

NOTES:
1 Calculated at 4% of direct construction spending
2 Calculated at 4% of workforce income spent on taxable items. Disposable income estimated from 1995-1997 U.S. Bureau of Labor Statistics Survey
3 Calculated at .25% of construction spending, from historical data on business receipts and corporate income taxes collected.
4 Calculated at 5.5% of wages ( based on 1995-1996 ratio of workforce income to income tax collections).
SOURCES: DBEDT, 2001a, Hawaii Department of Taxation, 1991; Tax Foundation of Hawaii, 1998.

- The visitor spending estimated above would generate an additional $8,500 annually in revenues for the State and Counties (applying ratios from the State's model of the flow of visitor expenditures through Hawaii's economy, in DBEDT, 2001a).

- With new workers forming new households, property tax revenues will grow. In South Hilo District, Hawaii County, the average home cost $145,300 as of late 2000. Property taxes on such a house would come to $895 annually at current rates for owner-occupants. With some 23 households supported by in-migrant direct workers, the annual impact on property taxes is an increase of at least $20,000. Next, some residents hired into operations-related jobs will, in time, come to form separate households thanks in part to their earnings from the project. They would also contribute at least $20,000 in additional property taxes to the County of Hawaii

(Presumably, the City and County of Honolulu would not lose property tax revenues as some USDA employees move to Hilo, since their old homes would still be taxable.)

These various revenue streams cannot be simply added together, since revenues from construction would be nearly all collected before operations-related revenues, and it is not clear how quickly operations – and hence operations-related jobs and visitors – would grow between PBARC opening, in 2005, and 2010.

Costs to the State and County can be estimated using an average cost approach. This is a maximal approach to cost estimation, since marginal costs are nearly always lower than average costs. (The State and County are not likely to add personnel in many departments, much less facilities, to serve a few hundred more residents.) Exhibits 4-F to 4-I show calculations of average spending per person and average population-sensitive revenues per person for the State and County. These estimates are then used in Exhibit 4-J to calculate the maximal cost of the project for local government on an annual basis, after 2010, in constant 2001 dollars.

If the project had the maximal effects on local government revenues estimated here, the net annual impact on State of Hawaii revenues would be an increase of nearly $120,000 annually by 2010. For the County of Hawaii, the impact would be small. It is estimated here as an annual net cost of about $14,500. However, we must emphasize that

- The average cost method exaggerates costs, while
- The wage estimates used here probably underestimate the new wages created, since the PBARC and IPIF facilities will attract experienced researchers, and hence may underestimate taxes on employee incomes and spending.
- The calculations in Exhibit 4-J omit the $4.2 million in construction-related revenues estimated in Exhibit 4-E.

The estimated impacts shown here are extremely small. They amount to about 0.002% of the State operating budget and 0.009% of the County's budget. Simply by reason of their size, they must be treated as not significant. Also, since the average cost method misses savings that may occur when marginal increases in demand occur, the net impacts would be likely more positive than estimated here.



**Exhibit 4-F: AVERAGE COST PER PERSON OF GOVERNMENT SPENDING, STATE OF HAWAII**

| Function (1) | 1996 Expenditures | Service Population Includes Visitors? | Expenditures per Resident (2) | Expenditures per Visitor (2) |
|---|---|---|---|---|
| General Government | $495,059,501 | No | $416.97 | -- |
| Public Safety | $166,167,104 | Yes | $128.10 | $128.10 |
| Highways | $158,990,121 | Yes | $122.56 | $122.56 |
| Natural Resources | $44,995,540 | Yes | $34.69 | $34.69 |
| Health and Sanitation | $173,887,147 | Yes | $134.05 | $134.05 |
| Hospitals and Institutions | $316,030,443 | No | $266.18 | -- |
| Public Welfare | $1,039,884,135 | No | $875.85 | -- |
| Education | $1,453,477,688 | No | $1,224.20 | -- |
| Recreation | $37,887,110 | Yes | $29.21 | $29.21 |
| Utilities | $314,352,115 | No | $264.77 | -- |
| Debt Service | $607,529,078 | No | $511.70 | -- |
| Retirement and Pension | $268,052,216 | No | $225.77 | -- |
| Employees' Health and Hospital Insurance | $639,156 | No | $0.54 | -- |
| Unemployment Compensation | $233,884,118 | No | $196.99 | -- |
| Grants-in-Aid to Counties | $2,826,072 | No | $2.38 | -- |
| Urban Redevelopment and Housing | $152,857,420 | No | $128.75 | -- |
| Cash Capital Improvements | $347,812,039 | Yes | $268.13 | $268.13 |
| Miscellaneous | $205,551,321 | No | $173.13 | -- |
| TOTAL | $6,019,882,326 | | $5,004 | $717 |
| ADJUSTED TOTAL (2001 DOLLARS) | | | $5,236 | $750 |

NOTES:

(1) Tax Foundation of Hawaii, 1997.

(2) Based on DBEDT 1996 mid-year population estimates: Resident 1,187,283; De Facto 1,297,200

(3) Based on increases in Consumer Price Index-Urban, Honolulu from 1996 to 2001: 4.63%

## Exhibit 4-G: POPULATION-SENSITIVE REVENUES, STATE OF HAWAII

| | Revenues (1) | Average Per Capita Share | |
|---|---|---|---|
| Taxes | | | |
| Fuel | $138,267,012 | | |
| Liquor | $37,810,985 | | |
| Tobacco | $39,571,941 | | |
| Conveyance | $5,669,074 | | |
| Licenses | $23,985,415 | | |
| Other Revenues | | | |
| Fines | $18,293,000 | | |
| Grants-In-Aid | $696,967,538 (2) | | |
| TOTAL (1996 $s) | $958,564,965 | $738.95 (2) | |
| TOTAL (2001 $s) | | $773.15 | |
| Average Cost per Resident | | $5,235.53 | |
| Average Revenue per Resident | | $773.15 | |
| Net Cost per Resident | | | $4,462.38 |

NOTES:
(1) Tax Foundation of Hawaii, 1997.
(2) Per capita cost calculated on 1996 de facto population: 1,297,200



## Exhibit 4-H: AVERAGE COST PER PERSON OF GOVERNMENT SPENDING, COUNTY OF HAWAII

| Function (1) | 1996 Expenditures | Service Population Includes Visitors? | Expenditures per Resident | Expenditures per Visitor (2) |
|---|---|---|---|---|
| General Government | $16,260,924 | No | $117.16 | – |
| Public Safety | $52,896,043 | Yes | $324.32 | $324.32 |
| Highways | $5,380,245 | Yes | $32.99 | $32.99 |
| Health and Sanitation | $12,317,295 | Yes | $75.52 | $75.52 |
| Public Schools | $230,862 | No | $1.66 | – |
| Public Welfare | $12,532,455 | No | $90.30 | – |
| Recreation | $11,031,228 | Yes | $67.63 | $67.63 |
| Mass Transit | $2,616,187 | No | $18.85 | – |
| Interest | $6,067,081 | No | $43.71 | – |
| Bond Redemption | $5,327,414 | No | $38.38 | – |
| Retirement and Pension | $13,326,008 | No | $96.01 | – |
| Cash Capital Improvements | $2,838,793 | Yes | $16.18 | $16.18 |
| Miscellaneous | $11,267,853 | No | $81.19 | – |
| Total | $151,892,388 | | $1,003.90 | $516.64 |
| Adjusted Total (2001 Dollars) | | | $1,050.37 | $540.55 |

NOTES:
(1) Tax Foundation of Hawaii, 1997.
(2) Based on DBEDT 1996 mid-year population estimates: Resident 138,792; De Facto 163,100
(3) Based on increases in Consumer Price Index-Urban, Honolulu from 1996 to 2001: 4.63%

### Exhibit 4-I: POPULATION-SENSITIVE REVENUES, COUNTY OF HAWAII

| | Revenues (1) | Average Per Capita Share | |
|---|---|---|---|
| TAXES | | | |
| Fuel | $5,819,694 | | |
| Utility | $3,423,144 | | |
| Motor Vehicle | $2,302,350 | | |
| OTHER REVENUES | | | |
| Liquor Licenses | $893,033 | | |
| Parking Meters | $131,595 | | |
| Other Licenses | $2,840,700 | | |
| Fines | $665,479 | | |
| Dept. Earnings | $11,757,736 | | |
| TOTAL (1996 $s) | $21,814,037 | $133.75 | |
| TOTAL (2001 $s) | | $139.94 | |
| Average Cost per Resident | | $1,050.37 | |
| Average Revenue per Resident | | $139.94 | |
| Net Cost per Resident | | | $910.43 |

NOTES:
(1) Tax Foundation of Hawaii, 1997.
(2) Per capita cost calculated on the basis of 1996 de facto population.



### Exhibit 4-J: MAXIMAL ESTIMATE OF LOCAL GOVERNMENT COSTS ASSOCIATED WITH PROJECT AFTER BUILDOUT

| | State | County |
|---|---|---|
| *A. Estimate of Costs to Local Government* | | |
| New Population Associated with Project | | |
| Residents | 63 | 63 |
| Visitors | 2 | 2 |
| Cost of Additional Person | | |
| Residents (Net) | $4,462.38 | $910.43 |
| Visitors | $749.90 | $540.55 |
| Cost Associated with Project Populations | | |
| Residents | $278,975 | $56,917 |
| Visitors | $1,438 | $1,037 |
| Totals | $280,413 | $57,954 |
| *B. Project-Related Revenues to Local Government after 2010 (excluding construction)* | | |
| Operations-Related Employee Taxes | | |
| Income Tax | $263,996 | |
| Excise Tax on Spending | $128,830 | |
| | $392,827 | |
| Taxes Associated with Visitor Spending | $6,937 | $1,578 |
| Property Taxes | | |
| On homes of in-migrant workers | | $20,324 |
| On homes of new households formed by other operations-related workers | | $21,575 |
| *C. Net Impact on Local Government Revenues* | | |
| State | $119,351 | |
| County of Hawaii | | -$14,477 |

NOTES: From Exhibits 4-F through 4-I, and taxes discussed in text. Consruction-related revenues are not included here.

# 5: SOCIAL IMPACTS

Social impacts may affect persons, local areas, or larger communities. Some impacts are nearly automatic in their immediate effects, but all depend on community context and response for their intensity. For example, road repairs may have a quantifiable impact on traffic flow. The social impact of those repairs may range from widespread frustration and community debate, to a minimal reaction, depending on whether those repairs are seen as serving narrow interests or helping to improve through routes for the community.

Social impacts can be attenuated or exacerbated by factors such as timing. To take the example of road repairs again: these can affect businesses disproportionately if they make it difficult for customers to reach them at peak times. The impact on businesses can be mitigated through attention to the timing of repairs.

The social impacts discussed here can accordingly vary in their intensity and importance depending on community context and public reception. The likely intensity of different impacts is estimated here on the basis of the information gathered for this report. Future conditions could lessen or increase that intensity. Importantly, actions to mitigate potential adverse impacts can go far towards minimizing both the impacts and negative public response.

## 5.1 IMPACTS ON AGRICULTURE DEPARTMENT STAFF AND THEIR FAMILIES

As the two research facilities move to Hilo, US Department of Agriculture (USDA) staff positions will be relocated from Oahu and Kauai to the Big Island. Staff and their families will face choices. Some may choose between moving and retiring. Others face a choice of moving, seeking another Federal job, or seeking a job outside the Federal system.

For spouses and children of PBARC and IPIF staff, a move to Hilo will mean moving to a smaller town, with fewer and less varied job opportunities and different schools. Such a move can severely affect personal relationships and career opportunities.

On the other hand, those moving to Hilo will find homes available at about two-thirds the cost of housing on Oahu, and with much more land.

The impact of the move has already been lessened by the fact that USDA staff have years to prepare for relocation. This allows them to weigh their alternatives and minimize disruptions in their lives.

## 5.2 IMPACTS ON IMMEDIATE AREA

The immediate area on the same side of Komohana Street as the project is undeveloped. Across the street, in University Park, are headquarters for observatories. A science museum is being planned for one lot in University Park. To the south are the Komohana Agricultural Complex, with offices of the University of Hawaii College of Tropical Agriculture and Human Resources (CTAHR) and the Farm Bureau. Further south are residential areas and University dormitories.

Because no homes are immediately adjacent to the project, construction is not expected to cause any problems for area residents. Construction plans do not involve any changes to



Komohana Street that might affect local and through traffic. (The project entrance will be off an existing access to Komohana Street. Eventually, the project could be reached via an extension of Nowelo Street, planned as part of the development of the larger area. That access is not under discussion here, as the USDA does not propose to build that road for the project.)

Many homes in Hilo are surrounded by gardens. Fruit plants are found in most yards. It is likely that, from time to time, residents of homes within a mile or two of the project site will be concerned that PBARC activities are affecting their yards and plants. With an insectary on-site, PBARC will be an obvious suspect when the number of flies or other insects increases in the area. The fact that PBARC research deals, in part, with plant diseases and pests will arouse concerns that these could spread. Similarly, concerns may arise that genetically engineered strains of fruits and other plants will spread to others' yards.

PBARC and IPIF managers are aware of such concerns. The planning of the project goes far towards alleviating them, through controls on the handling of pests and genetically engineered materials. Also, current plans call for a buffer – the laboratory buildings and a large landscaped open area – between the insectary, greenhouses and other growing areas, and the public view.

Controls on research activities, even if these are fully effective, are not sufficient to alleviate all concerns about possible spread of new plants or pests. To respond to such concerns, the project may be well advised to develop a public information strategy, discussed below.

## 5.3 IMPACTS ON AGRICULTURE IN HAWAII COUNTY

Project documents tend to stress that the IPIF and PBARC are designed to affect the economy and ecology of Hawaii and the Pacific Basin, rather than just Hawaii County. However, consolidation and expansion of research activity are likely to have positive impacts on Big Island agriculture:

- Researchers will be available to support extension agents and farmers or forest managers as they address crop and pest problems;
- Researchers will be directly involved with some farmers, if they are observing growth of those farmers' crops or are tending test plots nearby; and
- Because pest research on the Big Island will deal only with pests that are already present on the Island, the PBARC research program will be responsive to local problems.

CTAHR and the State Department of Agriculture have active extension and research programs on the Big Island. It should be stressed that the impact of the PBARC and IPIF will be to support and strengthen existing outreach activities.

## 5.4 IMPACTS ON HILO AND HAWAII COUNTY

The most obvious positive impact of the project is that it will offer new jobs to Hawaii County residents, making it possible for them to have skilled technical and research employment.

Next, it will contribute to Hilo's social capital. Hilo's intellectual life has been increasingly active of late. The University of Hawaii at Hilo is expanding programs. It is a leader in astronomy and Hawaiian studies. With a large contingent of USDA researchers, local ecological and agricultural research will be expanded. Staff will be available as occasional lecturers or as adjunct professors in their areas of specialization. The overall result will be an increase in research productivity and debate in Hilo.

The new facilities will offer internships to UH Hilo students, and will likely hire several UH Hilo and Hilo Community College graduates as new positions are funded.

## 5.5 MITIGATION MEASURES

Overall, the project is likely to have modest social impacts. Its potential adverse impacts consist of (a) stresses on USDA staff and their families, as they face relocation, and (b) concerns, on the part of some residents of the Hilo area, that pests or unwanted plants could spread from the project site.

USDA staff problems will be mitigated in two major ways:

- Both facilities are leaving positions open that might otherwise be filled, so as not to attract new hires who might not be able to move; and
- Staff are being given opportunities to consider their options, including retirement or a change of jobs within the Federal system. Staff will not move for at least another year, so they have much time to explore their options.

The concerns of Hilo residents can be met with both controls on the handling of dangerous or suspect materials and a public outreach strategy. Such a strategy might have the following elements:

- Leading stakeholders are informed of project activities and controls.
- Island newspaper writers are invited to tour the facilities and given briefings on research activities before activities direct their concerns toward the project.
- Interested persons are encouraged to learn about PBARC and IPIF activities and to share their knowledge with others in the community. Staff in both facilities plan to work closely with CTAHR researchers, with extension agents, and with farmers and forestry developers on the island. These people can be encouraged to share knowledge of the project as a responsible member of the community.
- The research facilities have established procedures to respond quickly and clearly to citizen concerns as these arise. Such procedures could include:
    - o Designating one person in each institution to respond to press inquiries;
    - o Establishing a list of local contacts to inform concerning activities about which concerns have been expressed, and setting up mechanisms (phone trees, e-mail lists, fax lists) to distribute information in a timely way when need arises; and



    - o Identifying a telephone that can be used as a hot line to respond to queries or as a dedicated answering machine, to be checked at least daily, where concerns can be recorded.
- The facilities present themselves as open to the community, e.g., by holding occasional open house events and by hosting meetings of local groups such as the Farm Bureau.

These mitigations are proposed in order to minimize suspicion of the project and to enable the project to respond to rumors and concerns effectively. Such actions may not have been needed so long as USDA facilities are located miles away from other settlements (on Stainback Highway) or in the midst of a public works yard. They may be prudent as new facilities are built in an area likely to see continuing development in the next years.

The outreach strategy described here will require a few hours' effort annually by the facility directors to public communication. In addition, it calls for a co-ordinated response to concerns as these arise.

## REFERENCES


Community Resources, Inc. *Survey of Employee Characteristics and Housing Patterns: Westin Mauna Kea and Mauna Lani Resort*. Prepared for Mauna Kea Properties and Mauna Lani Resort, Inc. Honolulu, HI, 1987a.

Community Resources, Inc. *Description of Micro-Computer Models for Determining Socio-Economic Impacts of West Hawaii Resort Development.* Prepared for Mauna Kea Properties, Ritz-Carlton Hotels, and Mauna Lani Resort, Inc. Honolulu, HI, 1987b.

Daly, Leo A., Company. *Prospectus Development Study: USDA Forest Service, Pacific Southwest Research Station, Institute of Pacific Islands Forestry.* Honolulu, HI, 2001.

Danninger, L. "Grant boosts diversified agriculture in Hilo." *Pacific Business News*. July 23, 1999. (pacific.bizjournals.com/pacific/article/1999/Jul/23/in/in11a.html).

Gomes, A. (2000, March 11) Fruit irradiator firm secures loan. *Honolulu Advertiser*. Honolulu, HI. (http://www.honoluluadvertiser.com/busnews3.html).

Hawaii County. *County of Hawaii Data Book.* Hilo, HI, 2001 (electronic document open to continuing updates: www.co.hawaii.hi.us/databook_current/dbooktoc.htm ).

Hawaii Department of Business, Economic Development and Tourism. *The Hawaii Input-Output Study: 1992 Benchmark Report.* Honolulu, HI, 1998.

Hawaii Department of Business, Economic Development and Tourism. *State of Hawaii Data Book, 1998.* Honolulu, HI, 1999. (www.hawaii.gov/dbedt/db98/index.html).

Hawaii Department of Business, Economic Development and Tourism. *Population and Economic Projections for the State of Hawaii to 2025: DBEDT 2025 Series.* Honolulu, HI, 2000. (www.hawaii.gov/dbedt/2025/index.html )

Hawaii Department of Business, Economic Development and Tourism. *State of Hawaii Data Book, 2000.* Honolulu, HI, 2001a (www.hawaii.gov/dbedt.db00/index.html.).

Hawaii Department of Business, Economic Development and Tourism. *Annual Visitor Research Report 2000.* Honolulu, HI, 2001b.

Hawaii Department of Business, Economic Development and Tourism. *Quarterly Statistical and Economic Report, December, 2001.* Honolulu, HI, 2001c. (www.hawaii.gov/dbedt/qsr1201/outlook.html)

Hawaii Department of Education. *Senior Exit Plans Survey, Class of 2001.* Honolulu, HI, 2001. (arch.k12.hi.us/school/seps/SEPS2001.html)

Hawaii Department of Health. "2000 Survey Report Data (Tables)." Honolulu, HI, 2001. (www.state.hi.us/doh/stats/surveys/hhs.html)





Hawaii Department of Labor and Industrial Relations. *Hawaii County Employment Outlook for Industries and Occupations, 1996-2006.* Honolulu, HI. 2000. (reported in Hawaii County Data Book, www.co.hawaii.hi.us/databook_current/dbooktoc.htm ).

Hawaii Department of Labor and Industrial Relations. *Current Employment Statistics.* Honolulu, HI, 2001 (historical series plus updates at website, www.state.hi.us/dlir/rs/loihi/ ).

Hawaii Department of Labor and Industrial Relations. Unemployment Rate Press Release,. Honolulu, HI, January 22, 2002.

Hawaii Department of Taxation. *Hawaii Income Patterns, Corporations - 1989.* Honolulu, HI, 1991.

*Honolulu Star-Bulletin.* "Hawaii Public Schools: SAT Scores Database." February 6, 2001 (doit4.starbulletin.com/satscores00/FMPro?-db=satscores00.fp3&-lay=Web2&-format=search.htm&-view)

Juvik, S.P. and Juvik, J.O. *Atlas of Hawaii*, Third Edition. Honolulu, HI 1998.

Noda, E.K. and Associates. *Final Environmental Impact Statement: Kahului Airport Improvements.* Prepared for the Federal Aviation Administration and the Hawaii State Department of Transportation. 5 vol. Honolulu, HI, 1997.

Matsunaga, Richard, and Associates Architects, Inc. *U.S. Pacific Basin Agricultural Research Center: Final Program of Requirements.* Honolulu, HI, 2001.

Organic Consumers Association. "Archival Hawaii Irradiation Page." Little Marais, MN., 2001a. (www.purefood.org/irrad/hawaii.cfm )

Organic Consumers Association. "Action: Stop Irradiation of Fresh Fruits from Hawaii." Little Marais, MN., 2001b. (www.purefood.org/irrad/papayaletter.cfm )

SMS Research & Marketing Services, Inc. "Economic Impact of Mauna Kea Observatories." Appendix M of *Mauna Kea Science Reserve Master Plan.* (Group 70 International, Inc., Ed.) Honolulu, HI, 2000.

Tanji, E. " New irradiation facility unlocks doors to Mainland." *The Honolulu Advertiser*, July 11, 2001.

Tax Foundation of Hawaii. *Government in Hawaii 1997.* Honolulu, HI, 1997.

TenBruggencate, J. "Bioterrorism in isles: Vandals destroy crops on Kauai: Genetically altered plants were missed." *Honolulu Advertiser.* May 23, 2000.

Thompson, R. "Irradiation Opponents Prepare for Battle." *Honolulu Star-Bulletin.* May 21, 1997. (starbulletin.com/97/05/21/news/story4.html ).

United States Department of Commerce, Bureau of the Census. *Profile of General Demographic Characteristics, 2000 Census of Population and Housing, Hawaii.* Washington, DC, 2001. (www2.census.gov/census_2000/datasets/demographic_profile/Hawaii/2kh15.pdf).

Wilson, M. "View Point: Commercial Forestry will Benefit both Land and People." *Honolulu Star-Bulletin*, September 5, 1997 (starbulletin.com/97/09/09/editorial/viewpointf.html ).

# APPENDIX K

## *INDUSTRIAL WASTEWATER FACILITIES*

Prepared By:
The Limtiaco Consulting Group (March 2002)

# Industrial Wastewater Facilities for the Proposed USDA Pacific Basin Agricultural Research Center in Hilo, Hawaii

Preliminary Engineering Report in Support of the Draft Environmental Assessment

Prepared for
SSFM International, Inc.

Prepared by
THE LIMTIACO CONSULTING GROUP

March 2002

## INTRODUCTION & SCOPE

A proposed onsite industrial wastewater treatment and disposal facility will serve the insectary at the future United States Department of Agriculture (USDA) Pacific Basin Agricultural Research Center (PBARC). This report presents the conceptual design parameters and other features for the industrial wastewater facility.

Issues relating to the management of domestic wastewater are not discussed in this report. Domestic wastewater infrastructure for the PBARC is being addressed separately from industrial wastewater. This report assumes that the industrial wastewater (mostly from planned insectary) will have no domestic components (e.g., toilet waste).

This does not preclude the option of shared infrastructure between the onsite domestic sewer and the industrial wastewater system. The County sewer and treatment system could serve as a backup disposal method for the industrial wastewater system. However, there is no available County sewer adjacent to the PBARC site at present, and federal project funds are not available for offsite infrastructure improvements.

## TECHNICAL ASSUMPTIONS

The industrial wastewater characteristics of the proposed PBARC insectary are not defined with certainty. This report assumes that fruitfly research is expected to be a major use of the insectary. The industrial wastewater facility at the PBARC is herein conceptually based on the flows, concentrations, and practices at two existing insectaries on Oahu. The USDA laboratory in Manoa disposes all its untreated wastewater, including the insectary wastewater, into the City and County of Honolulu's sewer system. The fruitfly research carried out in Manoa may be relocated to Hilo once the PBARC insectary is operational. The California Department of Food and Agriculture (CDFA) medfly rearing facility in Waimanalo has an onsite wastewater treatment and disposal system. This facility produces sterile male fruitfly larvae for shipment to and release in California for biological infestation control.

Fruitflies are raised using a process that generates an industrial waste stream from the washdown of used fruitfly diet trays and other related equipment. The fruitfly diet is basically comprised of sugar, mill feed and yeast. The volume and pollutant concentration of the wash water are minimized by recycling of the used diet for animal feed prior to washing. It is assumed that similar practices will continue at the PBARC.

The assumed peak flow for the wastewater facility is 10,000 gallons per day (gpd). This is a conservative estimate, which is based on the insectary devoting most of its resources to fruitfly research, and the washdown occurring a few hours each workday. Water fixtures for insectary washdown may limit the peak flow for the treatment facility below this estimate. Thus, the peak flow estimate can be reduced based on the design of washdown facility.

## CHARACTERISTICS OF INDUSTRIAL WASTEWATER INFLUENT

As stated earlier, the assumed industrial wastewater characteristics for the PBARC are based on existing insectaries on Oahu. Tao and Yang (1996) describe the characteristics of insectary wastewater at the CDFA medfly rearing facility based on periodic (typically once a week) grab samples over 9 months. Their results are provided in **Table 1**.

Table 1 Characteristics of Industrial Wastewater, CDFA Medfly Rearing Facility

| Parameter | Range | 50 percentile | 90 percentile |
|---|---|---|---|
| pH | 3.2 – 5.87 | 4.1 | 4.75 |
| Total Solids, milligrams per liter | 425 – 5100 | 1750 | 3350 |
| Total Suspended Solids, milligrams per liter | 90 – 2570 | 450 | 2100 |
| Total Chemical Oxygen Demand, milligrams per liter | 734 – 6100 | 2400 | 5200 |
| Soluble Chemical Oxygen Demand, milligrams per liter | 661 – 4444 | 2000 | 2800 |
| Total 5-day Biochemical Oxygen Demand, milligrams per liter | 535 – 2700 | 1400 | 2120 |
| Total Kjeldahl Nitrogen, milligrams per liter | 6 – 190 | 86 | 142 |
| Ammonium-Nitrogen, milligrams per liter | 1 – 35 | 9.1 | 19.7 |
| Nitrate-Nitrogen, milligrams per liter | 0.5 – 15 | 3.2 | 9 |
| Total Phosphorus, milligrams per liter | 4.9 – 113 | 32 | 50 |

Source: Tao and Yang (1996)

Based on limited sampling conducted for this project, the USDA Manoa fruitfly wastewater was found to be consistent with the CDFA findings. 3 days of composite sampling of wastewater from the cleaning of adult cages, poppers, used diet trays, and other equipment were analyzed. **Table 2** presents these results.



Table 2 Characteristics of Industrial Wastewater, USDA-ARS Tropical Fruit & Vegetable Research Laboratory, Manoa

| Parameter | 8/31/2000 | 9/6/2000 | 9/7/2000 |
|---|---|---|---|
| pH | 4.6 | 4.2 | 4.7 |
| Total Suspended Solids, milligrams per liter | 1520 | 1810 | 533 |
| Total Dissolved Solids, milligrams per liter | 766 | 3800 | 483 |
| Turbidity, Nephelometric Turbidity Units | 7.0 | 8.4 | 6.4 |
| 5-day Biochemical Oxygen Demand, milligrams per liter | greater than 735 | 2100 | 673 |
| 5-day Soluble Biochemical Oxygen Demand, milligrams per liter | greater than 735 | greater than 700 | 359 |
| Chemical Oxygen Demand, milligrams per liter | 2020 | 7860 | 1260 |
| Soluble Chemical Oxygen Demand, milligrams per liter | 1350 | 5570 | 419 |
| Total Kjeldahl Nitrogen, milligrams per liter | 45.3 | 148 | 7.84 |
| Ammonium-Nitrogen, milligrams per liter | 3.53 | 20.6 | 4.48 |
| Nitrate-Nitrogen, milligrams per liter | less than 0.1 | less than 0.1 | less than 0.1 |
| Nitrite-Nitrogen, milligrams per liter | less than 0.1 | less than 0.1 | less than 0.1 |
| Total Phosphorus, milligrams per liter | 13.3 | 31.7 | 12.0 |
| Ortho-Phosphorus, milligrams per liter | 12.3 | 30.4 | 9.43 |

As a general rule of thumb, a biochemical oxygen demand-to-nitrogen-to-phosphate ratio of 100:5:1 indicates sufficient nutrient levels for biological treatment. Nutrient deficiencies can result in limited growth of secondary treatment organisms, which in turn can limit the level of treatment of organic matter. Thus, this industrial wastewater should be readily biodegradable, especially when considering that its primary constituents are simply the unused fruitfly diet of sugar, mill feed, and yeast (a source of nitrogen and phosphorus), and byproducts of the fruitflies' consumption of this diet. The data reported by Tao and Yang (1996), which are supported by the results of the sampling at the USDA lab in Manoa, suggest that supplementary nutrients are not required for this type of waste stream for biological treatment.

## DISPOSAL OF TREATED EFFLUENT

The selection of an industrial wastewater treatment system is determined by the effluent disposal requirements. The primary method for effluent disposal will be water recycling. Treated recycled water will be used to irrigate demonstration gardens, ornamental plants, landscaped areas, and undeveloped portions of the PBARC property. Effluent will be stored in a covered tank or pond in the event that wet weather reduces the irrigation demand for recycled water. Irrigation facilities will be developed in coordination with PBARC landscaping during the detailed design phase of this project.

The Wastewater Branch of the State Department of Health (DOH) issued guidelines for the use of domestic reclaimed water in 1993. Suitable irrigation uses for reclaimed water, as provided in this guidance document, are presented in Table 3. The DOH's 1998 addendum to the reclaimed water guidelines provides the definitions for the R-1, R-2, and R-3 classifications, which are summarized in Table 4. These guidelines do not officially apply to the PBARC industrial recycled water because it contains no domestic component. However, in lieu of specific industrial recycled water standards, the guidelines will be used as general guidance for this project.

Filtration and disinfection, processes that are employed in domestic wastewater treatment to remove human pathogens for the production of R-1 water, are not planned for the PBARC industrial wastewater treatment facility. The PBARC recycled water will be free of fecal coliform bacteria and viral pathogens because of the purely industrial source of the wastewater.

The DOH may require lysimeter sampling and analysis from irrigated areas to monitor soil conditions. There have been no adverse impacts reported from lysimeter sampling at the CDFA facility in Waimanalo.

As a secondary disposal method, a connection to the County sewer system is being considered. At this time, however, there is no available County sewer line adjacent to the PBARC site. The nearest onsite sewer will serve as the connection point for this backup disposal. This aspect of the industrial wastewater facility will be developed in more detail during the design phase of this project.



Table 3 Summary of Suitable Irrigation Uses for Reclaimed Water

| Suitable uses of reclaimed water | Reclaimed water quality | | |
|---|---|---|---|
| | R-1 | R-2 | R-3 |
| Golf course landscapes | A | U/B | N |
| Freeway and cemetery landscapes | A | A | N |
| Parks, elementary schoolyards, athletic fields, and landscapes around some residential property | A | U | N |
| Roadside and median landscapes | A | U/B | N |
| Nonedible vegetation in areas with limited public exposure | A | AB | U |
| Sod farms | A | AB | N |
| Ornamental plants for commercial use | A | AB | N |
| Food crops above ground and not contacted by irrigation | A | U | N |
| Pastures for milking and other animals | A | U | N |
| Fodder, fiber, and seed crops not eaten by humans | A | AB | DU |
| Orchards and vineyards bearing food crops | A | D/U | DU |
| Orchards and vineyards not bearing food crops during irrigation | A | AB | DU |
| Timber and trees not bearing food crops | A | AB | DU |
| Food crops undergoing commercial pathogen destroying process before consumption | A | AB | DU |

Source: Department of Health, Wastewater Branch (1993)
Abbreviations:
S = Spray A = All (S, D, U) / = Or
D = Drip and surface B = Spray with buffer
U = Subsurface N = Not allowed

Table 4 Guideline Definitions of Reclaimed Water

| Reclaimed Water Classification | Definition |
|---|---|
| R-1 | "R-1 Water (Significant reduction in viral and bacterial pathogens)" means reclaimed water that has been oxidized, filtered, and disinfected to meet the following criteria: <br>• A disinfection process that, when combined with the filtration process, has been demonstrated to reduce the concentration of plaque-forming units of F-specific bacteriophage MS2, or polio virus, per unit volume of water in the wastewater that will occur during the reclamation process. A virus that is at least as resistant to disinfection as polio virus may be used for purposes of the demonstration. <br>• Fecal coliform bacteria densities as follows: <br>o The median density measured in the disinfected effluent does not exceed 2.2 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed; and <br>o The density does not exceed 23 per 100 milliliters more than one sample in any 30-day period; and <br>o No sample shall exceed 200 per 100 milliliters. |
| R-2 | "R-2 Water (Disinfected Secondary-23 Reclaimed Water)" means reclaimed water that has been oxidized, and disinfected to meet the following criteria: <br>• Fecal coliform bacteria densities as follows: <br>o The median density measured in the disinfected effluent does not exceed 23 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses has been completed; and <br>o The density does not exceed 200 per 100 milliliters in more than one sample in any 30-day period. |
| R-3 | "R-3 Water (Undisinfected Secondary Reclaimed Water)" means oxidized wastewater. |

Source: Department of Health, Wastewater Branch (1998)



## TREATMENT OF INDUSTRIAL WASTEWATER

Industrial wastewater from the insectary will be treated to meet disposal requirements. Influent industrial wastewater will first be screened of large particles using a basket screen prior to pumping and entering the treatment units. Solids will be removed from the basket screens manually and disposed as solid waste. Pumping requirements will be determined during the detailed design phase based on siting and topography.

Biological treatment will be based on the Sequencing Batch Reactor (SBR) technology. This process is well suited to the wastewater stream from the insectary and is used successfully at the CDFA facility in Waimanalo. SBR treatment is performed in batches (i.e., not a continuous, flow-through process). There are five basic phases during a single treatment cycle: 1) tank fill, 2) aeration, 3) sludge settling, 4) supernatant decant, and 5) sludge withdrawal. A sixth phase – mixing (limiting aeration) – can be inserted between aeration and settling for denitrification (conversion of nitrate to nitrogen gas). Denitrification is not an anticipated requirement for the PBARC facility.

Two SBR tanks, each about 30,000 gallons in total volume, will be provided at the PBARC. They will be located above grade. Tanks will be cylindrical and made of FRP or a similar non-corrosive, UV-resistant material. An exterior ladder should be provided for each tank for access and for easy viewing of tank contents. Supernatant and sludge withdrawal piping should be distributed around the circumference of the tank.

Aeration in the SBR tanks will be achieved using blowers and PVC coarse bubble diffusers. Surface mixers are an alternative, but it entails wetted mechanical equipment and mounting over the tanks. Fine bubble (ceramic or membrane) diffusers are more costly (capital and replacement costs) and are more difficult to maintain. Placement of the diffusers will be at a level above the anticipated settled sludge blanket to minimize clogging of the diffusers. Holes drilled into the underside of the diffusers will enable settled sludge to resuspend during the aeration phase of treatment, as well as facilitate sludge removal.

An operations building will house a blower room and provide workspace for operations and maintenance, ancillary equipment, and storage.

The supernatant decant flow from the SBR units will be the effluent from the treatment facility to be used as recycled water for the disposal methods described above. The recycled water irrigation system will consist of a storage tank with gravity drip lines, which will be sized based on irrigation requirements. Depending on the relative elevations and locations of the irrigated areas, the effluent storage tank, and the treatment facility, a pumping station may be required.

Sludge removed from the SBR tanks will be drained to a covered sludge drying bed approximately 500 square feet. Containment will consist of a 40" CMU wall, porous textile membrane, fine sand, and coarse sand beds. Roof will be wood frame with FRP roof material. Access to the drying bed will be provided for loading dried solids onto a truck. Dried biosolids will be disposed as solid waste.

Operation of the treatment plant will be managed by one day-shift employee for approximately 2 hours per day. Daily duties will include removing and cleaning the basket screen, operation of the SBR treatment cycles (valving, blower on/off), record-keeping, housekeeping. Periodic duties will include preventive maintenance and dried sludge disposal.

A total land area of 10,000 square feet will be provided for wastewater treatment, not including landscaped areas that will utilize reclaimed water. **Figure 1** shows the generalized conceptual plan for the industrial wastewater facility.

## ENVIRONMENTAL IMPACTS

Because the insectary wastewater is industrial in nature, the transmission of waterborne human diseases is not a concern. Based on preliminary discussions with the Wastewater Branch of the DOH, the irrigation of landscapes and demonstration gardens is an acceptable use for the recycled water from the proposed industrial wastewater treatment plant. The DOH also acknowledged that the facility will not be treating domestic wastewater, and is thus not regulated under Hawaii Administrative Rules that are intended for domestic wastewater systems.

Periodically – for example, when irrigation demand decreases during wet weather or when effluent does not meet irrigation water quality requirements – the treated effluent will be disposed into the County sewer system for treatment at the Hilo wastewater treatment plant.

The odor from the assumed source of industrial wastewater – used fruitfly diet trays – can be offensive, similar to fermenting fruit. The location of the industrial wastewater treatment facility will be adjacent to the insectary to minimize the potential for odor to spread away from its source. The treatment facility will degrade the organic compounds that cause this odor. In addition, other methods for odor mitigation will be employed such as planting a row of trees as a wind barrier.

## REFERENCES


State of Hawaii, Department of Health. *Hawaii Administrative Rules, Title 11, Chapter 54, Department of Health, Water Quality Standards*. April 17, 2000.

State of Hawaii, Department of Health. *Hawaii Administrative Rules, Title 11, Chapter 62, Department of Health, Wastewater Systems*. August 30, 1991.

State of Hawaii, Department of Health, Wastewater Branch. *Addendum No. 1, Guidelines for the Treatment and Use of Reclaimed Water*. October 1998.

State of Hawaii, Department of Health, Wastewater Branch. *Guidelines for the Treatment and Use of Reclaimed Water*. November 1993.

Tao, Jun and Yang, P.Y. Department of Biosystems Engineering, University of Hawaii at Manoa. *Final Project Report on Evaluation of Characteristics and Treatment of Facility Wastewater*, Submitted to California's Medfly Rearing Facility, California Department of Food and Agriculture, August 31, 1996.

Tulang, Dennis and Yee, Harold. State of Hawaii, Department of Health, Wastewater Branch. Personal Communication on August 3, 2000.

# APPENDIX L

## *TRAFFIC IMPACT ASSESSMENT REPORT*

Prepared By:
Phillip Rowell and Associates (March 2002)

TRAFFIC IMPACT ASSESSMENT REPORT FOR

# U.S. DEPARTMENT OF AGRICULTURE PACIFIC BASIN AGRICULTURAL RESEARCH CENTER

IN HILO, HAWAII

# FINAL REPORT

Prepared For


**SSFM INTERNATIONAL, INC.**
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

**Phillip Rowell and Associates**
47-273 'D' Hui Iwa Street
Kaneohe, Hawai'i 96744
Tel: 808-239-8206 Fax: 808-239-4175
Email: prowell@gte.net


March 28, 2002

## TABLE OF CONTENTS



### LIST OF FIGURES



### LIST OF TABLES

# 1. INTRODUCTION

Phillip Rowell and Associates has been retained by SSFM International, Inc., to prepare a Traffic Impact Analysis Report (TIAR) for a proposed USDA Pacific Basin Agricultural Research Center in Hilo, Hawaii. The purpose of this study is to determine the traffic impacts of the proposed project and to identify and assess potential mitigation measures.

*This introductory chapter discusses the location of the project, the proposed development, and the study methodology.*

**Project Location and Description**

The proposed project is a new USDA Pacific Basin Agricultural Research Center (PBARC) to be constructed adjacent to the University of Hawaii at Hilo in Hilo, Hawaii. The project will be located along the west side of Komohana Street between Puainako Street and Nowelo Street. The general location in the Hilo area is shown in Figure 1.

The project is summarized as follows:

1. The proposed agricultural research center will have a gross floor area of 76,000 square feet. This area will include office, administration and laboratory areas.
2. In addition to the proposed research center, there will be a 24,000 square foot research center for the Forestry Service adjacent to the research building.
3. There will be a visitors center on the site. For purposes of this study, it was assumed that the visitors center would operate during the off-peak hours only.





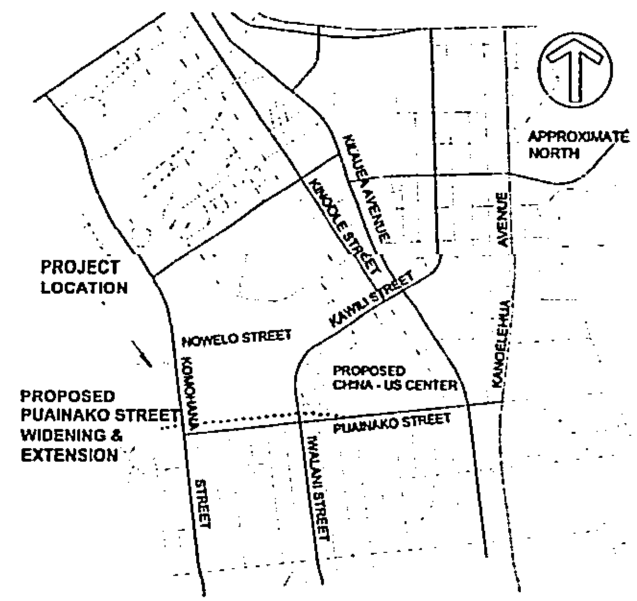



Figure 1

**PROJECT LOCATION MAP**

4. Ultimately, access to the site will be via a driveway along the south side of an extension of Nowelo Street west of Komohana Street. Until Nowelo Street is extended, a temporary access to the site will be via a private driveway along the west side of Komohana Street approximately midway between Puainako Street and Nowelo Street. This driveway currently serves a HELCO station and DWS reservoir. No improvements are planned for the intersection of this driveway along Komohana Street since it is only a temporary access. The temporary and final access schemes are shown schematically in Figure 2.

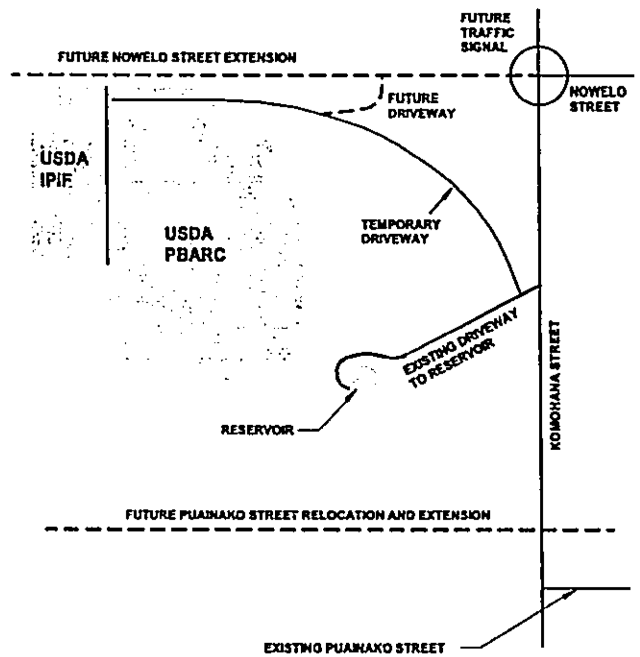



**Figure 2**

**SCHEMATIC SITE PLAN**





**Study Area**

The study area for this study includes Komohana Street between Puainako Street and Nowelo Street. This area includes the following intersections, which were analyzed:

1. Komohana Street at Puainako Street,
2. Komohana Street at Nowelo Street, and
3. Komohana Street at the temporary driveway

**Study Methodology and Order of Presentation**

*1. Analysis of Existing Traffic Conditions*

Existing traffic volumes at the study intersections were determined from traffic counts performed during March, 2001. Intersection configurations and traffic control information were also collected in the field at the time of the traffic counts. Other data collected included speed limits and right-of-way controls.

Using the data collected, existing traffic operating conditions in the vicinity of the project were determined. The methodology for signalized and unsignalized intersections, described in the 2000 *Highway Capacity Manual* (HCM)[1], was used to determine the level-of-service (LOS) at the study intersections.

Existing traffic conditions, the LOS concept and the results of the LOS analysis for existing conditions are presented in Chapter 2.

*2. Determination of Cumulative Traffic Projections*

The year 2010 was used as the design year. This does not necessarily represent the project completion date. It represents a conservative estimate for full occupancy for purposes of conducting the traffic impact analysis. By using 2010 as the design year, the traffic projections are consistent with those used in the traffic impact analysis report for the proposed China-US Center[2]. Cumulative traffic conditions are defined as future traffic conditions during the design year without the proposed project. A description of the process used to estimate 2010 cumulative traffic volumes and the resulting cumulative traffic projections is presented in Chapter 3.

*3. Analysis of Project-Related Traffic Impacts*

The next step in the traffic analysis was to estimate the peak-hour traffic that would be generated by the proposed project. This was done using standard trip generation procedures outlined in the *Trip Generation Handbook*[3] and *Trip Generation*[4]. The procedure is described in Chapter 4.

---

[1] *Highway Capacity Manual*, Institute of Transportation Engineers, Washington, D.C., 2000
[2] *Traffic Impact Analysis Report for China-US Center*, Philip Rowell and Associates, September 2001
[3] *Trip Generation Handbook*, Institute of Transportation Engineers, October 1998
[4] *Trip Generation*, Institute of Transportation Engineers, Washington, D.C., 1997

These trips were distributed based on the available approach and departure routes. The project-related traffic was then superimposed on 2010 cumulative traffic volumes at the study intersections. The HCM methodology was used again to conduct a LOS analysis for cumulative plus project conditions. The results of this analysis were compared to 2010 cumulative conditions to determine the incremental impacts of this project. The analysis of the project-related impacts and the conclusions of the analyses are presented in Chapter 5.





## 2. ANALYSIS OF EXISTING CONDITIONS

This chapter presents the existing traffic conditions on the roadways adjacent to the proposed project. The level-of-service (LOS) concept and the results of the LOS analysis for existing conditions are also presented. The purpose of this analysis is to establish the base conditions for the determination of the impacts of the project which are described in a subsequent chapter.

**Description of Existing Streets and Intersection Controls**

The following is summary of the major roadways in the study area:

*Puainako Street*

Puainako Street is an east-west, two-lane State highway along the south portion of the study area. Major intersections are signalized. The 2000 Average Daily Traffic (ADT) was approximately 35,000 vehicles per day (vpd) west of Kanoelehua Avenue. The ADT decreased to approximately 10,000 vpd west of Kinoole Street. East of Kawili Street, the ADT is approximately 7,200 vpd, based on 2001 traffic counts. Between Kawili Street and Komohana Street, the ADT is approximately 5,500 vpd.

There are two projects to improve Puainako Street. The first is the installation of signals at the intersection of Puainako Street at Komohana Street. The second is the widening of Puainako Street from two to four lanes and realignment north of the roadway's existing location from Kawili Street to west of Komohana Street.

*Komohana Street*

Komohana Street is currently a two-lane, two-way street along the eastern boundary of the project site. No traffic data was available from the State for Komohana Street in this area. Based on traffic counts performed for this study, the ADT along Komohana Street between Puainako Street and Nowelo Street is approximately 15,000 vpd. The directional distribution of peak hour traffic is 75/25 during the morning and 65/35 during the afternoon. This implies that very different traffic signal timing plans are required to maintain acceptable levels-of-service during both peak periods. A typical directional distribution of 60/40.

The intersection of Puainako Street at Komohana Street is currently unsignalized. However, there are plans to signalize this intersection.

*Nowelo Street*

Nowelo Street, within the study area is a four-lane, divided roadway. Nowelo Street provides access from Komohana Street to the University Park area of the UH-Hilo campus. Nowelo Street also provides an alternate access to the UH-Hilo campus from Komohana Street.

The intersection of Nowelo Street at Komohana Street is currently an unsignalized, T-intersection. The Nowelo Street approach has separate left and right turn lane. There is a separate left turn for southbound Komohana Street to eastbound Nowelo Street.

**Existing Peak Hour Traffic Volumes**

The AM and PM peak hour traffic volumes at the study intersections are shown in Figure 3. The traffic volumes include large trucks, buses and motorcycles. They do not include mopeds or bicycles.

These counts were performed March 6 and 7, 2001. The counts were taken prior to the actual start of the project (September) so that they would include traffic associated with typical school term at UH-Hilo rather than summer school traffic, which may is less than traffic for the standard school year. The counts were also taken prior to the teacher's strict of that year.

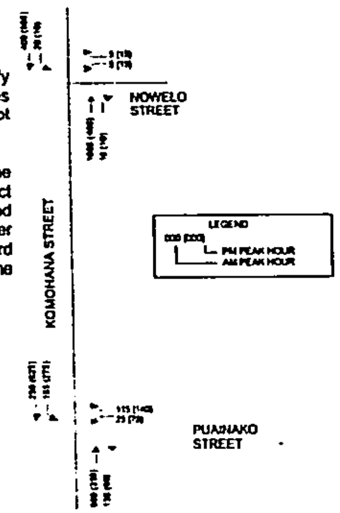



Figure 3

EXISTING (2001) PEAK HOUR TRAFFIC VOLUMES



*Traffic Impact Analysis Report*
*for USDA Pacific Basin Agricultural Research Center*

**Level-of-Service Concept**

*Signalized Intersections*

The operations method described in the *2000 Highway Capacity Manual* (HCM) was used to analyze the operating efficiency of the signalized intersections adjacent to the study site. This method involves the calculation of a volume-to-capacity (V/C) ratio and average vehicle delay which is related to a level-of-service.

"Level-of-Service" is a term which denotes any of an infinite number of combinations of traffic operating conditions that may occur on a given lane or roadway when it is subjected to various traffic volumes. Level-of-service (LOS) is a qualitative measure of the effect of a number of factors which include space, speed, travel time, traffic interruptions, freedom to manouver, safety, driving comfort and convenience.

There are six levels-of-service, A through F, which relate to the driving conditions from best to worst, respectively. The characteristics of traffic operations for each level-of-service are summarized in Table 1. In general, LOS A represents free-flow conditions with no congestion. LOS F, on the other hand, represents severe congestion with stop-and-go conditions. Level-of-service D is typically considered acceptable for peak hour conditions in urban areas.

Corresponding to each level-of-service shown in the table is a volume/capacity ratio. This is the ratio of either existing or projected traffic volumes to the capacity of the intersection. Capacity is defined as the maximum number of vehicles that can be accommodated by the roadway during a specified period of time. The capacity of a particular roadway is dependent upon its physical characteristics such as the number of lanes, the operational characteristics of the roadway (one-way, two-way, turn prohibitions, bus stops, etc.), the type of traffic using the roadway (trucks, buses, etc.) and turning movements.

**Table 1 Level-of-Service Definitions for Signalized Intersections(1)**

| Level of Service | Interpretation | Volume-to-Capacity Ratio(2) | Stopped Delay (Seconds) |
|---|---|---|---|
| A, B | Uncongested operations; all vehicles clear in a single cycle. | 0.000-0.700 | <20.0 |
| C | Light congestion; occasional backups on critical approaches | 0.701-0.800 | 20.1-35.0 |
| D | Congestion on critical approaches but intersection functional. Vehicles must wait through more than one cycle during short periods. No long standing lines formed. | 0.801-0.900 | 35.1-55.0 |
| E | Severe congestion with some standing lines on critical approaches. Blockage of intersection may occur if signal does not provide protected turning movements. | 0.901-1.000 | 55.1-80.0 |
| F | Total breakdown with stop-and-go operation | >1.001 | >80.0 |

Notes:
(1) Source: *Highway Capacity Manual*, 2000, p 16-2.
(2) This is the ratio of the calculated critical volume to Level-of-Service E Capacity.

*Unsignalized Intersections*

Like signalized intersections, the operating conditions of intersections controlled by stop signs can be classified by a level-of-service from A to F. However, the method for determining level-of-service for unsignalized intersections is based on the use of gaps in traffic on the major street by vehicles crossing or turning through that stream. Specifically, the capacity of the controlled legs of an intersection is based on two factors: 1) the distribution of gaps in the major street traffic stream, and 2) driver judgement in selecting gaps through which to execute a desired maneuver. The criteria for level-of-service at an unsignalized intersection is therefore based on delay of each turning movement. A subsequent calculation is performed to determine the overall level-of-service of the intersection. Table 2 summarizes the definitions for level-of-service and the corresponding delay.

**Table 2 Level-of-Service Definitions for Unsignalized Intersections[1]**

| Level-of-Service | Expected Delay to Minor Street Traffic | Delay (Seconds) |
|---|---|---|
| A | Little or no delay | <10 |
| B | Short traffic delays | 10.1 to 15.0 |
| C | Average traffic delays | 15.1 to 25.0 |
| D | Long traffic delays | 25.1 to 35.0 |
| E | Very long traffic delays | 35.1 to 60.0 |
| F | See note (2) below | >60.1 |

Notes:
(1) Source: *Highway Capacity Manual*, 2000.
(2) When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvement of the intersection.





**Level-of-Service Analysis of Existing Conditions**

The results of the Level-of-Service analysis for the study intersections are shown in Table 3. Shown in the table are the average vehicle delays and the levels-of-service.

**Table 3 Existing Levels-of-Service**

| Intersection and Movement | AM Peak Hour Delay [1] | AM Peak Hour LOS [2] | PM Peak Hour Delay [1] | PM Peak Hour LOS [2] |
|---|---|---|---|---|
| *Komohana Street at Puainako Street (Unsignalized)* | | | | |
| Southbound Left & Thru | 12.5 | B | 9.1 | A |
| Westbound Left | 61.4 | F | 110.5 | F |
| Westbound Right | 26.7 | D | 11.8 | B |
| *Komohana Street at Nowelo Street (Unsignalized)* | | | | |
| Southbound Left | 10.8 | B | 8.4 | A |
| Westbound Left | 34.7 | D | 30.5 | D |
| Westbound Right | 18.9 | C | 11.3 | B |

NOTES:
(1) Delay is average vehicle delay per vehicle in seconds
(2) LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. Level-of-Service is based on average vehicle delay for unsignalized intersections.

The results of the level-of-service analysis indicates that there are long delays to left turning vehicles from both intersections. This is consistent with conditions observed during the traffic counts.

# 3. PROJECTED CUMULATIVE TRAFFIC CONDITIONS

The purpose of this chapter is to discuss the assumptions and data used to estimate 2010 cumulative traffic conditions. Cumulative traffic conditions are defined as the traffic conditions resulting from background growth and related projects. Background traffic volumes do not include traffic generated by the proposed project.

Cumulative traffic volumes are the result of background growth, which cannot be attributed to a specific project, and traffic generated by related projects in the vicinity of the proposed project. Related projects include development and redevelopment projects and roadway improvement projects. The basis for this information is traffic studies for these projects.

For this study, future background traffic in the study area was estimated from traffic projection data provided in the following reports:

(1) *Hawaii Long Range Land Transportation Plan*, Frederic R. Harris, Inc., May 1998.

(2) *University of Hawaii Long Range Development Plan*, PBR Hawaii, March 1996,

(3) *Traffic Impact Analysis Report for the Proposed Puainako Street Extension*, The Traffic Management Consultant, February 14, 1997,

(4) *University of Hawaii at Hilo, Multi-Purpose Sports and Recreational Complex Feasibility Study*, Group 70 International, Inc., August 2000,

(5) *Traffic Impact Assessment Report fo University Park, University of Hawaii at Hilo*, Pacific Planning and Engineering, Inc. April 1997, and





(6) DRAFT *Traffic Impact Analysis Report for China - U.S. Center*, Philip Rowell and Associates, March, 2001.

**Design Year**

The year 2010 was selected as the design, or study, year for this traffic impact analysis. The design, or study, year is not necessarily the year of construction completion for the project. It represents a time period when the project has been completed and is fully occupied. It also represents a date for which background traffic conditions are defined.

**Related Roadway Improvements**

There are four roadway improvements scheduled for the study area that are scheduled for completion before 2010. These improvements are the following:

(1) Puainako Street will be widened from two to four lanes, relocated north of the existing location, and extended west of Komohana Street. The intersection of Puainako Street at Komohana Street will be signalized. These improvements are associated with the Puainako Street Widening Project.

(2) A second southbound left turn lane will be provided at the intersection of Komohana Street at Puainako Street. This improvement was recommended in the TIAR for the China- U.S. Center to accommodate traffic associated with the Multi-Purpose Sport and Recreational Complex.

(3) Komohana Street will be widened from two to four lanes. This improvement is indicated in the *Hawaii Long Range Land Transportation Plan* and the *TIAR for Puainako Street Extension.*

(4) The intersection of Komohana Street at Nowelo Street will be signalized. This improvement is presented in the TIAR for University Park.

**Background Traffic Growth**

Background traffic volumes were estimated from data provided in the *Island of Hawaii Long Range Land Transportation Plan* and the *TIAR for the Puainako Street Extension*. Both documents estimated 2020 traffic projections for Puainako Street, Kanoelehua Avenue and Komohana Street. The later document analyzed a "No Build" scenario and a "Build" scenario in order to assess the impact of the project. The 2020 traffic projections provided in the TIAR for the Puainako Street Extension were adjusted for 2010 conditions. The 2020 traffic projections were discounted 2% per year for 10 years, or 20%, to account for the growth between 2010 and 2020. The net traffic volumes were used as 2010 background traffic volumes.

**Related Projects**

Related projects are projects that are either under construction or likely to be completed before the design year that will impact traffic conditions at the study intersections. Where possible, the traffic studies of these projects were obtained and used to estimate the amount of traffic that would use the roadway network within the study area. The following projects were identified as related projects:

1. *Multi-Purpose Sports and Recreational Complex*

The Multi-Purpose and Recreational Complex is to be located at the site of the existing parking lot between the campus tennis courts and Kawili Street. The Complex will consist of the following:

- An Exhibit Area
- Basketball and Volleyball Courts
- Aerobic/Dance/Martial Arts Training Area
- A 50-meter outdoor swimming pool with bleachers for 500 persons
- Weight Training Area
- Conference Room
- Nurse's Station, and
- Retail Space

2. *University Park*

University Park will be located between of the existing campus and Komohana Street. The development will include the following:

- Facilities for approximately 3,100 students 560 faculty and staff
- 750 Bed Residence Hall
- 8000 seat multi-purpose center
- expansion of the Research and Technology Park to accommodate 684 additional employees

3. *China - U.S. Center*

The China -U.S. Center is a multi-use development to be located in the northwest quadrant of the intersection of Puainako Street at Kawili Street. The project will consist of the following components:

- 130,000 square feet of retail
- 150 residential units, or dormitory rooms
- 50 visitor suites
- 20 Family Lodging Units
- 250 seat conference center, and
- 100 hotel rooms

The Center will be constructed in three phases. Completion of the final phase is scheduled for 2008

Table 4 is a list of projects identified as related projects and the estimated number of peak hour trips that each would generate.

**Table 4 Related Projects and Peak Hour Trips Generated**

| | Peak Hour Trips Generated | |
|---|---|---|
| Related Project | AM Peak Hour | PM Peak Hour |
| Multi-Purpose Sport and Recreational Complex | 0 | 800 |
| University Park | 290 | 280 |
| China - U.S. Center | 370 | 710 |
| TOTAL | 660 | 1790 |





**2010 Cumulative Traffic Volumes**

Estimated 2010 cumulative traffic volumes were calculated for the 2010 network using the following assumptions:

1. The 2010 background traffic projections do not include traffic associated with the Multi-Purpose Sport and Recreational Complex, University Park or China - U.S. Center.

2. The three related projects will be completed before the design year of the proposed project. Therefore, all traffic associated with these projects are included in the 2010 background traffic estimates.

3. The intersection of Komohana Street at Puainako Street has been improved to a four-way intersection and to provide a traffic signal. The intersection of Komohana Street at Nowelo has been signalized. These improvements were identified in the previously completed traffic studies for the Multi-Purpose Sport and Recreational Complex and University Park.

2010 background traffic projections were estimated by adding traffic associated with the related projects to 2010 traffic projections estimated from the *Hawaii Long Range Land Transportation Plan* and the *Traffic Impact Analysis for the Proposed Puainako Street Extension*. The resulting 2010 cumulative traffic projections are shown in Figure 4.

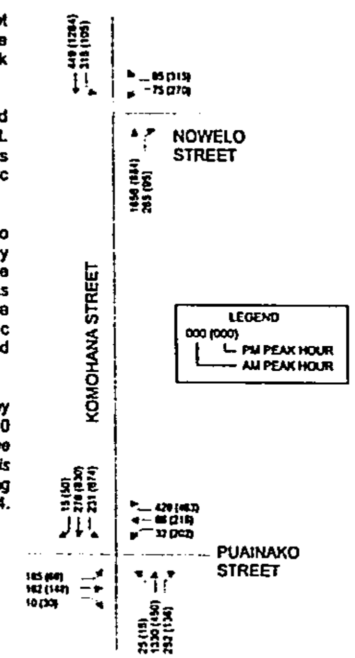



Figure 4

**2010 CUMULATIVE PEAK HOUR TRAFFIC VOLUMES**

# 4. PROJECT-RELATED TRAFFIC CONDITIONS

This chapter discusses the methodology used to identify the traffic-related impacts of the proposed project. Generally, the process involves the estimation of weekday peak-hour trips that would be generated by the proposed project, distribution and assignment of these trips on the approach and departure routes, and finally, determination of the levels-of-service at affected intersections and driveways subsequent to implementation of the project. This chapter presents the generation, distribution and assignment of project generated traffic and the cumulative plus project traffic projections. The results of the level-of-service analysis of cumulative plus project conditions is presented in the following chapter.

**Project Trip Generation**

Future traffic volumes generated by the project were estimated using the procedures described in the *Trip Generation Handbook*,[5] published by the Institute of Transportation Engineers. This methodology uses trip generation rates to estimate the number of trips that a proposed project will generate during the morning and afternoon peak hours.

The trip generation calculations were performed using the following assumptions:

1. The proposed PBARC will have gross floor area of 76,000 square feet. This area includes office, administration offices and laboratories.

2. Trip generation characteristics of the proposed USDA PBARC are comparable to those associated with a research and development center as defined by the Institute of Transportation Engineers.

[5] Institute of Transportation Engineers, *Trip Generation Handbook*, Washington, D.C., 1998, p. 7-12





3. The insectary (24,000 square feet) and the greenhouse (13,225 square feet) do not generate trips. Personnel using these facilities will have offices in the research building.

4. The facility will have a visitors center. The visitors center will not be used during peak commute hours and, therefore, does not generate any trips during the peak hours.

5. The USDA IPIF will have 24,000 square foot research, laboratory and office building as part of this entire development. Traffic from both facilities will use the same driveway into the site. Trips from the IPIF were included in the calculations. Trips generated by the IPIF were estimated using trip generation rates for research and development centers, the same as the USDA PBARC.

The trip rates and the estimated number of peak hour trips that the proposed development will generate are shown in Table 5. The trips shown are the peak hourly trips generated by the project during the peak hour of the adjacent street.

**Table 5 Trip Generation Summary of Proposed Project**

| | | USDA PBARC | | | USDA IPIF | | | |
|---|---|---|---|---|---|---|---|---|
| Time Period | Direction | Rate or Factor(1) | TGSF(2) | Peak Hour Trips | Rate or Factor(1) | TGSF(2) | Peak Hour Trips | Total New Trips |
| AM Peak Hour | Trips per Unit | 1.24 | 76.0 | 94 | 1.24 | 24.0 | 30 | 124 |
| | % Inbound | 83% | | 78 | 83% | | 25 | 103 |
| | % Outbound | 17% | | 16 | 17% | | 5 | 21 |
| PM Peak Hour | Trips per Unit | 1.08 | 76.0 | 82 | 1.08 | 24.0 | 26 | 108 |
| | % Inbound | 15% | | 12 | 15% | | 4 | 16 |
| | % Outbound | 85% | | 70 | 85% | | 22 | 92 |

NOTE:
(1) Trip rates are for Research and Development Center, Land Use Code 760
(2) TGSF = Thousand Gross Square Feet

As shown in the table, the proposed USDA PBARC will generate 94 trips during the morning peak hour and 82 trips during the afternoon peak hour. The USDA IPIF will generate 30 trips during the morning peak hour and 26 during the afternoon peak hour. The total USDA project will generate 124 trips during the morning peak hour and 108 during the afternoon peak hour.

**Trip Distribution and Assignments**

As discussed in the Introduction of this report, access to the site will be via a driveway along the south side of an extension of Nowelo Street west of Komohana Street. However, until this extension of Nowelo Street is constructed, a temporary access to the site will be via a private driveway along the west side of Komohana Street approximately midway between Puainako Street and Nowelo Street. This driveway currently serves a HELCO station and DWS reservoir. No improvements are planned for the intersection of this driveway along Komohana Street since it is only a temporary access.

The project-related trips were distributed and assigned for the two access and egress scenarios. The first is the temporary scenario, which uses the existing driveway along the west side of Komohana Street approximately midway between the proposed Puainako Street Extension and Nowelo Street. The second is the ultimate access and egress scenario which provides a driveway along the extension of Nowelo Street west of Komohana Street. The project related trip assignments for these two scenarios are shown in Figure 5.

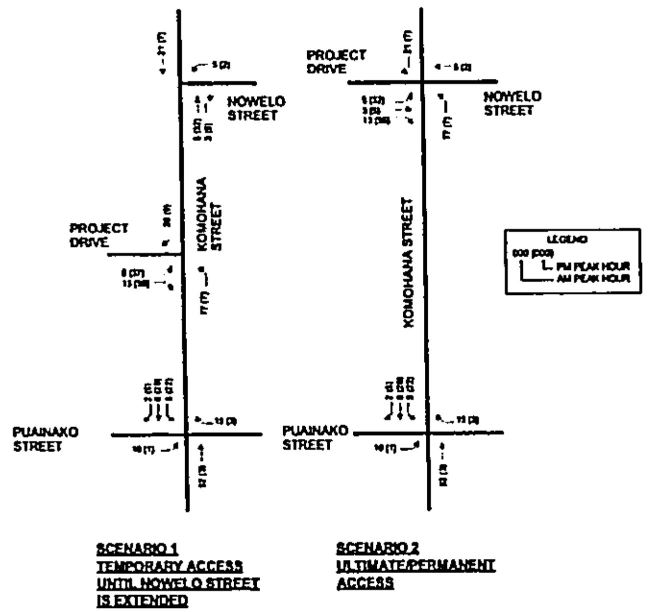



Figure 5

**PROJECT TRIP ASSIGNMENTS**

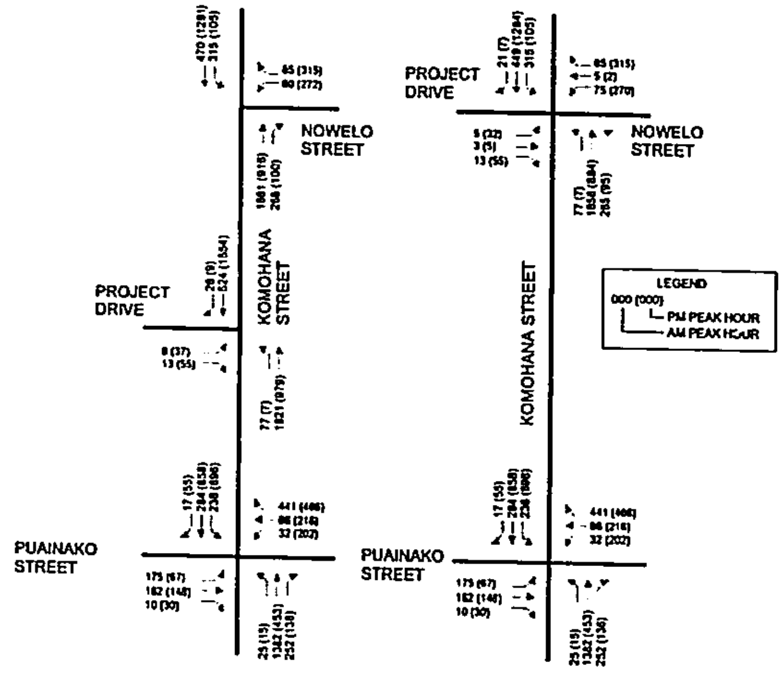




**2010 Cumulative Plus Project Projections**

Cumulative plus project traffic conditions are defined as 2010 background traffic conditions plus project related traffic. The incremental difference between cumulative and cumulative plus project is the traffic impact of the project under study.

2010 cumulative plus project traffic volumes with the project were estimated by superimposing the peak hourly traffic generated by the proposed project on the 2010 cumulative peak hour traffic volumes presented in Chapter 3. The traffic projections for 2010 cumulative plus project conditions are shown on Figure 6.




SCENARIO 1 SCENARIO 2

Figure 6

**2010 CUMULATIVE PLUS PROJECT PEAK HOUR TRAFFIC VOLUMES**





# 5. CONCLUSIONS AND RECOMMENDATIONS

The purpose of this chapter is to summarize the results of the level-of-service analysis, which identifies the project-related impacts. In addition, any mitigation measures necessary and feasible are identified and other access, egress and circulation issues are discussed.

**Definition of Significant Impacts**

Since there is no local criteria defining a significant traffic impact, criteria used by the Los Angeles Department of Transportation for determining if a project has a significant traffic impact for which mitigation measures must be identified was used for this study. The following criteria is used to define a significant impact for a signalized intersection:

**Table 6 Definition of a Significant Traffic Impact[1]**

| Final V/C Ratio | Project Related Increase in V/C |
|---|---|
| 0.700-0.800 | equal to or greater than 0.040 |
| 0.800 - 0.900 | equal to or greater than 0.020 |
| > 0.900 | equal to or greater than 0.010 |

NOTES:
(1) Los Angeles Department of Transportation, *Traffic Study Policies and Procedures*, 1993, page 10

There are no similar criteria for unsignalized intersections. The *Traffic Study Policies and Procedures* suggest that (1) unsignalized intersections be analyzed assuming signalized conditions so that intersections are evaluated using comparable criteria and (2) the volume-to-capacity ratio for the overall intersection, rather than each traffic movement, is used to evaluate the intersection.

In calculating the volume-to-capacity ratio for the overall intersection, deficient traffic movements may be overlooked because poor and good levels-of-service may balance, resulting in an acceptable level-of-service. Therefore, the criteria shown in Table 6 is used to define a significant impact for each traffic movement as well as the overall intersection.

Lastly, it should be noted that the criteria shown in Table 6 were developed before the latest revision to the Highway Capacity Manual, which now defines level-of-service based on delay rather than volume-to-capacity ratio. We have been advised that the *Traffic Policies and Procedures* are currently be revised to be consistent with the *2000 Highway Capacity Manual.*

**Project Related Traffic Impacts**

The traffic impact of the proposed project was assessed by analyzing the changes of the volume-to-capacity ratio at the study intersections. The level-of-service analysis was performed using the following assumptions:

1. The level-of-service analysis was performed for the two scenarios described in the previous chapter.
2. For Scenario 1, the driveway along Komohana Street into the proposed project is one-lane inbound and one-lane outbound. Since this driveway is only a temporary access pending extension of Nowelo Street and construction of a permanent driveway along the south side of Nowelo Street, no separate left turn lane will be provided.
3. For Scenario 2, the intersection of Komohana Street at Nowelo Street is modified so that the intersection is a four-legged intersection. The west leg will provide a permanent access to the proposed project. The lane configuration used for the analysis is shown on Figure 7.
4. The traffic signals are fully actuated.
5. Pedestrian and bicycle activity at the study intersections is negligible.
6. As described in Chapter 3 of this report, Komohana Street has been widened from two to four lanes within the study area as described in the *Island of Hawaii Long Range Highway Plan* and the traffic impact study for University Park.[6]

[6] Pacific Planning and Engineering, *Traffic Impact Study for University Park*, April 1997, p 13





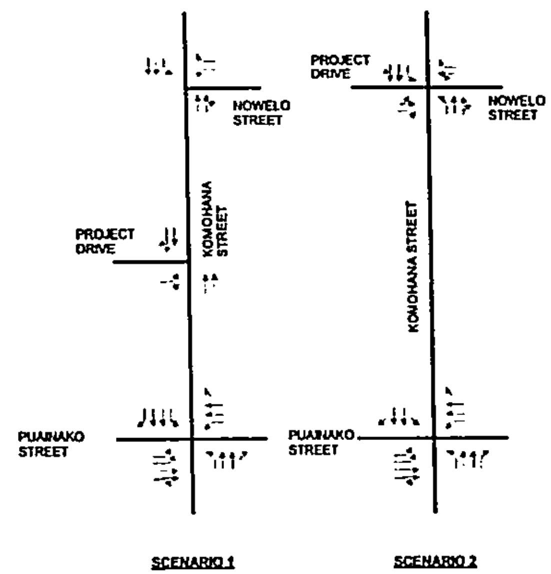



Figure 7

LANE CONFIGURATIONS USED FOR LEVEL-OF-SERVICE ANALYSIS

*Komohana Street at Puainako Street*

The results of the Level-of-Service analysis for the intersection of Komohana Street at Puainako Street are shown in Table 7. Shown in the table are volume-to-capacity ratios, average vehicle delay and the Level-of-Service, as defined using the average vehicle delay, for cumulative and cumulative plus project Scenario 1 and cumulative plus project Scenario 2.

Several of the volume-to-capacity ratios are lower for the cumulative plus project condition than for the cumulative condition. This is a result of adjusting the traffic signal timing in response to changes in traffic demand. Based on discussions with HDOT, these adjustments may or may not be implemented. Changes in traffic signal timing are made in response to specific problems or complaints and not in anticipation of traffic generated by a proposed project. The traffic projections used in the analysis are conservative and may not be realized.

**Table 7 Level-of-Service Analysis for 2010 Peak Hour Conditions[(1)]**
**Komohana Street at Puainako Street**

| | | Cumulative | | | Scenario 1 Cumulative Plus Project | | | Scenario 1 Change | Scenario 2 Cumulative Plus Project | | | Scenario 2 Change |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Intersection and Movement | V/C | Delay[1] | LOS[2] | V/C | Delay[1] | LOS[2] | V/C | V/C | Delay[1] | LOS[2] | V/C |
| AM Peak Hour | Eastbound Left | 0.319 | 26.3 | C | 0.351 | 27.4 | C | 0.032 | 0.351 | 27.4 | C | 0.032 |
| | Eastbound Thru & Right | 0.192 | 25.2 | C | 0.200 | 26.0 | C | 0.008 | 0.200 | 26.0 | C | 0.008 |
| | Westbound Left | 0.169 | 33.1 | C | 0.180 | 34.2 | C | 0.011 | 0.180 | 34.2 | C | 0.011 |
| | Westbound Thru | 0.114 | 31.4 | C | 0.121 | 32.3 | C | 0.007 | 0.121 | 32.3 | C | 0.007 |
| | Westbound Right | 0.353 | 20.4 | C | 0.388 | 21.6 | C | 0.035 | 0.388 | 21.6 | C | 0.035 |
| | Northbound Left | 0.056 | 13.4 | B | 0.055 | 12.8 | B | -0.001 | 0.055 | 12.8 | B | -0.001 |
| | Northbound Thru | 0.877 | 28.5 | C | 0.890 | 28.7 | C | 0.013 | 0.890 | 28.7 | C | 0.013 |
| | Northbound Right | 0.199 | 14.7 | B | 0.194 | 14.1 | B | -0.005 | 0.194 | 14.1 | B | -0.005 |
| | Southbound Left | 0.190 | 13.7 | B | 0.188 | 14.1 | B | -0.002 | 0.188 | 14.1 | B | -0.002 |
| | Southbound Thru | 0.131 | 6.0 | A | 0.131 | 5.6 | A | 0.000 | 0.131 | 5.6 | A | 0.000 |
| | Southbound Right | 0.016 | 5.4 | A | 0.018 | 5.1 | A | 0.002 | 0.018 | 5.1 | A | 0.002 |
| PM Peak hour | Eastbound Left | 0.108 | 25.8 | C | 0.109 | 25.8 | C | 0.001 | 0.109 | 25.8 | C | 0.001 |
| | Eastbound Thru & Right | 0.336 | 34.6 | C | 0.336 | 34.6 | C | 0.000 | 0.336 | 34.6 | C | 0.000 |
| | Westbound Left | 0.488 | 25.9 | C | 0.488 | 25.9 | C | 0.000 | 0.488 | 25.9 | C | 0.000 |
| | Westbound Thru | 0.260 | 27.4 | C | 0.260 | 27.4 | C | 0.000 | 0.260 | 27.4 | C | 0.000 |
| | Westbound Right | 0.213 | 5.5 | A | 0.216 | 5.6 | A | 0.003 | 0.216 | 5.6 | A | 0.003 |
| | Northbound Left | 0.153 | 33.4 | C | 0.157 | 33.6 | C | 0.004 | 0.157 | 33.6 | C | 0.004 |
| | Northbound Thru | 0.733 | 41.2 | D | 0.738 | 41.4 | D | 0.005 | 0.738 | 41.4 | D | 0.005 |
| | Northbound Right | 0.220 | 32.5 | C | 0.220 | 32.5 | C | 0.000 | 0.220 | 32.5 | C | 0.000 |
| | Southbound Left | 0.401 | 10.9 | B | 0.413 | 11.1 | B | 0.012 | 0.413 | 11.1 | B | 0.012 |
| | Southbound Thru | 0.434 | 10.9 | B | 0.448 | 11.0 | B | 0.014 | 0.448 | 11.0 | B | 0.014 |
| | Southbound Right | 0.059 | 8.0 | A | 0.064 | 8.0 | A | 0.005 | 0.064 | 8.0 | A | 0.005 |

NOTES:
(1) Delay is average delay per vehicle in seconds.
(2) LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*

The conclusions of the level-of-service analysis are:

1. For cumulative conditions without the project, all movements will operate at level-of-service C or better during the morning peak hour. During the afternoon peak hour, all movements except the





northbound through movement will operate at level-of-service C or better. The northbound through movement will operate at level-of-service D.

2. Since the project trip assignments for this intersection are the same for both scenarios, the impacts of project generated traffic are the same for both Scenarios 1 and 2.

3. During the morning peak hours for cumulative plus project conditions, the levels-of-service for all movements will be C or better, as defined by the average vehicle delay.

4. During the afternoon peak hours, the levels-of-service for all movements are C or better, as defined by the average vehicle delay, except for the northbound through movement, which operates at level-of-service D. However, the volume-to-capacity ratio for this movement is 0.738, which is level-of-service C, as defined using the volume-to-capacity ratio. This usually means that the delay is the result of the traffic signal timing rather than lane capacity. Since the final volume-to-capacity ratio is between 0.700 and 0.800 and the change is only 0.005, the impact of project generated traffic on this movement is insignificant. No mitigation is recommended.

*Komohana Street at Nowelo Street*

The results of the Level-of-Service analysis for the intersection of Komohana Street at Nowelo Street are shown in Table 8. Shown in the table are volume-to-capacity ratios, average vehicle delay and the Level-of-Service, as defined using the average vehicle delay, for cumulative and cumulative plus project Scenario 1 and cumulative plus project Scenario 2.

**Table 8 Level-of-Service Analysis for 2010 Peak Hour Conditions[(1)]**
**Komohana Street at Nowelo Street**

| | | Cumulative | | | Scenario 1 Cumulative Plus Project | | | Scenario 1 Change | Scenario 2 Cumulative Plus Project | | | Scenario 2 Change |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Intersection and Movement | V/C | Delay[1] | LOS[2] | V/C | Delay[1] | LOS[2] | V/C | V/C | Delay[1] | LOS[2] | V/C |
| AM Peak Hour | Eastbound Left | | | | | | | 0.000 | 0.028 | 29.4 | C | 0.028 |
| | Eastbound Thru & Right | | | | | | | 0.000 | 0.029 | 29.5 | C | 0.029 |
| | Westbound Left | 0.276 | 35.0 | D | 0.296 | 35.4 | D | 0.020 | 0.325 | 34.2 | C | 0.049 |
| | Westbound Thru & Right | 0.309 | 35.9 | D | 0.309 | 35.9 | D | 0.000 | 0.269 | 32.8 | C | -0.040 |
| | Northbound Left | | | | | | | 0.000 | 0.165 | 8.8 | A | 0.165 |
| | Northbound Thru & Right | 1.012 | 41.3 | D | 1.012 | 41.1 | D | 0.000 | 0.990 | 35.1 | D | -0.022 |
| | Southbound Left | 0.753 | 36.4 | D | 0.753 | 36.4 | D | 0.000 | 0.856 | 47.4 | D | 0.103 |
| | Southbound Thru & Right | 0.181 | 3.0 | A | 0.186 | 3.0 | A | 0.005 | 0.194 | 3.6 | A | 0.013 |
| PM Peak hour | Eastbound Left | | | | | | | 0.000 | 0.096 | 21.1 | C | 0.096 |
| | Eastbound Thru & Right | | | | | | | 0.000 | 0.041 | 20.4 | C | 0.041 |
| | Westbound Left | 0.498 | 26.9 | C | 0.502 | 27.0 | C | 0.004 | 0.693 | 34.8 | C | 0.195 |
| | Westbound Thru & Right | 0.589 | 29.6 | C | 0.589 | 29.6 | C | 0.000 | 0.630 | 30.8 | C | 0.041 |
| | Northbound Left | | | | | | | 0.000 | 0.068 | 13.3 | B | 0.068 |
| | Northbound Thru & Right | 0.618 | 18.5 | B | 0.642 | 19.0 | B | 0.024 | 0.618 | 18.5 | B | 0.000 |
| | Southbound Left | 0.314 | 13.1 | B | 0.324 | 13.7 | B | 0.010 | 0.314 | 13.1 | B | 0.000 |
| | Southbound Thru & Right | 0.659 | 13.5 | B | 0.662 | 13.6 | B | 0.003 | 0.661 | 13.5 | B | 0.002 |

NOTES:
(1) Delay is average delay per vehicle in seconds.
(2) LOS denotes Level-of-Service calculated using the operations method described in *Highway Capacity Manual*

The conclusions of the level-of-service analysis for this intersection are:

1. For cumulative (without project) conditions, all movements except the southbound through movement will operate at level-of-service D during morning peak hour. The southbound through movement will operate at level-of-service A. During the afternoon peak hour, all movements will operate at level-of-service C or better.

2. For Scenario 1 conditions, the impact of project generated traffic is insignificant. The northbound through movement has a final volume-to-capacity ratio greater than 1.0 for morning peak hour conditions. The ratio is the same as for cumulative (without project) conditions. The project does not add any traffic to this movement and, therefore, has no impact. During the afternoon peak hour, all traffic movements will operate at level-of-service C or better.

3. For Scenario 2, the intersection is modified from a "T" intersection to a four-way intersection, which requires modification of the traffic signals to accommodate the additional traffic movements. To accommodate anticipated traffic at acceptable levels-of-service, a northbound separate right turn lane should be constructed. Without this improvement, the northbound movements will operate at level-of-service D.

4. During the afternoon peak hour, all movements will operate at level-of-service C or better.

*Komohana Street at Project Entrance*

A level-of-service analysis was performed for the intersection of Komohana Street at the project's entrance and is summarized in Table 9. The level-of-service analysis was performed for Scenario 1 cumulative plus project conditions because this intersection will not be constructed for cumulative conditions or Scenario 2 cumulative plus project conditions. As shown, traffic exiting the project will operate at level-of-service D during the morning and afternoon peak periods. Left turns into the project will operate at level-of-service A during both peak periods.

A level-of-service analysis was also performed for this intersection with a separate northbound left turn lane. There was no change in the level-of-service of any movements. This means that provision of a separate left turn lane would not improve the level-of-service at this intersection.

**Table 9 Level-of-Service Analysis for 2010 Peak Hour Conditions[(2)]**
**Komohana Street at Project Entrance**

| Intersection and Movement | | Scenario 1 Cumulative Plus Project V/C | Delay[1] | LOS[2] |
|---|---|---|---|---|
| AM Peak Hour | Northbound Left & Thru | 0.07 | 8.6 | A |
| | Eastbound Left & Right | 0.11 | 26.8 | D |
| PM Peak hour | Northbound Left & Thru | 0.02 | 13.6 | A |
| | Eastbound Left & Right | 0.40 | 30.7 | D |

NOTES:
(1) Delay is average delay per vehicle in seconds
(2) LOS denotes Level-of-Service calculated using the operations method described in Highway Capacity Manual





**Summary and Conclusions**

1. The proposed project is a new USDA Pacific Basin Agricultural Research Center (PBARC) and Institute of Pacific Island Forestry (IPIF) to be constructed adjacent to the University of Hawaii at Hilo in Hilo, Hawaii. The project will be located along the west side of Komohana Street between Puainako Street and Nowelo Street. The proposed research center will have a gross floor area of 76,000 square feet. This area will include office, administration and laboratory areas. In addition to the proposed research center, there will be a 24,000 square foot office building for the IPIF adjacent to the PBARC facility. There will be a visitors center on the site. For purposes of this study, it was assumed that the visitors center would operate during the off-peak hours only.

2. The proposed USDA PBARC will generate 94 trips during the morning peak hour and 82 trips during the afternoon peak hour. The USDA IPIF will generate 30 trips during the morning peak hour and 26 during the afternoon peak hour. The total USDA project will generate 124 trips during the morning peak hour and 108 during the afternoon peak hour.

3. The project-related trips were distributed and assigned for two access and egress scenarios. The first scenario provides driveway along the west side of Komohana Street approximately midway between the proposed Puainako Street Extension and Nowelo Street. The second scenario provides the driveway at the intersection of Komohana Street at Nowelo Street.

4. The impact of project generated traffic at the intersection of Komohana Street at Puainako Street is expected to be insignificant. No mitigation measures are required for this intersection.

5. For Scenario 2, the intersection of Komohana Street at Nowelo Street is modified from a "T" intersection to a four-way intersection, which requires modification of the traffic signals to accommodate the additional traffic movements. To accommodate anticipated traffic at acceptable levels-of-service, a northbound separate right turn lane should be constructed. Without this improvement, the northbound movements will operate at level-of-service D.

6. Traffic exiting the project at the driveway along Komohana Street will operate at level-of-service D during the morning and afternoon peak periods. Left turns into the project will operate at level-of-service A during both peak periods.

   A level-of-service analysis was also performed for this intersection with a separate northbound left turn lane. There was no change in the level-of-service of any movements. This means that provision of a separate left turn lane would not improve the level-of-service at this intersection.T

2002-11-08-HI-FEA-

# FINAL ENVIRONMENTAL ASSESSMENT

# FOR

# USDA PACIFIC BASIN AGRICULTURAL RESEARCH CENTER PROJECT

T.M.K: (3) 2-04-001: portion of 122
HILO, HAWAII

OCTOBER 2002

USDA UNITED STATES DEPARTMENT OF AGRICULTURE

# FINAL ENVIRONMENTAL ASSESSMENT

# FOR

# USDA PACIFIC BASIN AGRICULTURAL RESEARCH CENTER PROJECT

T.M.K: (3) 2-04-001: portion of 122

HILO, HAWAII

## OCTOBER 2002

*APPLICANT:*


Pacific Basin Agricultural Research Center
Agricultural Research Service
U.S. Department of Agriculture
P.O. Box 4459
Hilo, Hawaii 96720


*PREPARED BY:*


SSFM INTERNATIONAL

501 Sumner Street, Suite 501
Honolulu, Hawaii 96817

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# LISTING OF FIGURES

# LISTING OF TABLES

# LISTING OF APPENDICES

# LISTING OF APPENDICES

# CHAPTER 1
# INTRODUCTION

## 1.1 PURPOSE FOR ENVIRONMENTAL ASSESSMENT

The U.S. Department of Agriculture (USDA), Agricultural Research Service's (ARS) Pacific Basin Agricultural Research Center (PBARC) is proposing to develop a new facility in the Hilo district of the Island of Hawaii. This new research center complex will include state-of-the-art facilities allowing the PBARC to consolidate most of their existing research activities at this new site. In addition, the USDA, Forest Service, Pacific Southwest Research Station's Institute of Pacific Islands Forestry (IPIF) will also be developing a new facility for its existing research and technical assistance activities on the project site. These new research facilities being proposed by both the PBARC and IPIF are collectively referred to as the USDA Pacific Basin Agricultural Research Center (PBARC) Project in this document.

This PBARC Project would be developed on a 30-acre parcel situated along Komohana Street west of the University of Hawaii at Hilo (U.H.-Hilo). The Tax Map Key for this property is (3) 2-04-001: portion of 122. Figure 1.1 shows the project's location and general vicinity in the town of Hilo. The ARS PBARC complex would be developed on approximately 25 acres of this 30-acre property while the IPIF facility would be developed on the remaining approximately 5 acres.

The new PBARC complex would allow for the consolidation of some existing ARS facilities and research laboratories which are presently located in Hilo, Honolulu (Oahu), and Kapaa (Kauai). Similarly, the new IPIF facility would allow for the consolidation of offices and research activities at this new site which are currently located in two buildings sharing space with the State Department of Land and Natural Resources, Forest and Wildlife Division in Honolulu and on the Island of Hawaii. Chapter 2 provides a more detailed discussion of this project. Table 1.1 provides a summary of pertinent information associated with this project.

**Joint Federal And State Environmental Document**

The 30-acre project site is owned by the State of Hawaii and is under the jurisdiction of the Department of Land and Natural Resources (DLNR). This property would thus be leased to the USDA Agricultural Research Service from DLNR to allow for development of the PBARC complex and IPIF facility. As a result, development of this PBARC Project would involve the use of State lands making it subject to the environmental documentation requirements prescribed under Chapter 343, Environmental Impact Statements, Hawaii Revised Statutes (State of Hawaii 1998) and Title 11, Chapter 200 (Environmental Impact Statement Rules) of the State Department of Health's Administrative Rules (State of Hawaii 1996).


**PROJECT LOCATION MAP**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

**Figure 1.1**

*Source:*
*Delorme 3D Topo Quad*
*ArcView GIS*

## Table 1.1 Summary Information

| | |
|---|---|
| ***Project Name:*** | USDA Pacific Basin Agricultural Research Center Project |
| ***Applicant:*** | Pacific Basin Agricultural Research Center<br>U.S. Department of Agriculture, Agricultural Research Service<br>P.O. Box 4459<br>Hilo, Hawaii 96720<br>Contact: Dr. Paul Moore, Acting Center Director |
| ***Authorized Agent:*** | SSFM International, Inc.<br>501 Sumner Street, Suite 502<br>Honolulu, Hawaii 96817<br>Contact: Mr. Ronald A. Sato, AICP |
| ***State Accepting Authority:*** | Department of Land and Natural Resources, State of Hawaii |
| ***Federal Agency:*** | U.S. Department of Agriculture, Agricultural Research Service |
| ***Project Description:*** | A new research complex is proposed on the property which will include state-of-the-art facilities for both the PBARC and IPIF divisions of USDA. These new facilities would also allow PBARC and IPIF to consolidate some of their operations and research activities at this site which are now spread out over several islands and locations. The PBARC complex is planned to have about 122,575 square feet of floor area comprised of four main components which are: 1) Administration Complex, 2) Laboratory Facilities, 3) Insectary and Greenhouse Complex, and 4) Central Utilities Plant. The IPIF complex would have about 30,200 square feet of floor area consisting of three primary components which are: 1) a main Office/Laboratory Building, 2) Field Support Building, and 3) Head House and Shade Houses. |
| ***Project Location:*** | The project site is located in the South Hilo District of the Island of Hawaii. The 30-acre property is located on undeveloped area situated along Komohana Street generally across from the intersection of Nowelo Street. |
| ***Land Ownership:*** | The property is owned by the State of Hawaii. It is part of larger property that has been transferred to the University of Hawaii under Governor's Executive Order 3814. The 30-acre project site will remain under the State, DLNR, which will execute a lease to USDA, ARS. |
| ***Tax Map Key:*** | (3) 2-04-001: portion of 122 |
| ***State Land Use:*** | Agricultural District |
| ***County General Plan:*** | University Use |
| ***County Zoning:*** | A-1a, Agriculture District, 1-acre minimum lot |
| ***SMA Designation:*** | Not situated within the Special Management Area. |

Construction of the PBARC complex and IPIF facility would involve the use of Federal funds making this project subject to environmental requirements prescribed under the National Environmental Policy Act (NEPA). These developments are not "Categorically Excluded" under the NEPA compliance regulations for both the ARS (7 CRF, Chapter V) and USDA National Resources Conservation Service (7 CFR, Chapter VI) of which the IPIF is a division. Therefore, an Environmental Assessment has been prepared for this project.

Subsequently, a joint Federal and State Environmental Assessment document has been prepared for this PBARC Project to comply with both State and Federal documentation and processing requirements. A Draft Environmental Assessment (Draft EA) was prepared and published in the June 8, 2002 issue of the State Office of Environmental Quality Control's *The Environmental Notice*. That Draft EA was prepared in conformance to both State and Federal regulatory requirements to address the probable impacts on the surrounding environment resulting from the PBARC Project. This Final Environmental Assessment (Final EA) has subsequently been prepared by incorporating and addressing public comments received on the published Draft EA.

A published Draft EA and subsequent Final EA prepared after public review under the State environmental procedures are not necessary under the ARS and National Resources Conservation Service NEPA compliance regulations since only a single Environmental Assessment document is required. However, since a joint environmental assessment document is being prepared to comply with both State and Federal procedures, this Final EA would be used in issuing a Decision Notice by the lead Federal Agency. Based upon the assessment results documented in this Final EA, a Finding of No Significant Impact (FONSI) is warranted for this project.

**Proposing Agency And Accepting Authority**

The USDA ARS is serving as the lead Federal Agency, or Administrator, responsible for the Environmental Assessment's preparation in compliance with NEPA documentation and processing requirements. This project involves a multiple agency action by both the ARS and Forestry Service. However, the ARS will serve as the lead Federal Agency since they will be leasing the 30-acre property directly from the State DLNR. ARS will grant to the Forest Service the right to construct, occupy, and maintain their IPIF facilities on a 5-acre site within the 30-acre property.

Since this project is Federally funded, it is considered a Federal Action subject to Section 106 consultation under the National Historic Preservation Act and the Advisory Council on Historic Preservation's implementation procedures prescribed under 36 CFR, Part 800 (NARA 2000). Under these regulations, the Section 106 consultation process can be integrated with an environmental document prepared under NEPA. Therefore, the "Agency Official" responsible for conducting this consultation will be the USDA ARS, and this consultation effort has been integrated with this environmental review process.

Under the State environmental review process, this project is considered an "Applicant Action" because a department of the State of Hawaii or County of Hawaii is not initiating it. As a result, the USDA PBARC will serve as the Applicant initiating this process. The State DLNR will serve as the "Accepting Authority" for this Environmental Assessment as the authorized representative for the Governor of the State of Hawaii.

## 1.2 BACKGROUND INFORMATION

**Pacific Basin Agricultural Research Center**

The Agricultural Research Service is the principal in-house research agency of the USDA. It is one of the four component agencies of the Research, Education, and Economics mission area. The ARS conducts research to develop and transfer solutions to agricultural problems of high priority and provides information access and dissemination to: 1) ensure high-quality, safe food and other agricultural products; 2) assess the nutritional needs of Americans; 3) sustain a competitive agricultural economy; 4) enhance the natural resource base and the environment; and 5) provide economic opportunities for rural communities and society as a whole.

ARS research is organized into 22 National Programs which are grouped under three main categories which are: 1) Animal Production, Product Value and Safety; 2) Natural Resources and Sustainable Agricultural Systems; and 3) Crop Production, Product Value and Safety. The Pacific Basin Agricultural Research Center, or PBARC, is part of the Pacific West Area program (based in California) of this National Program. The majority of research programs conducted under PBARC fall under the Crop Production, Product Value and Safety category of the National Program.

The PBARC is a virtual research laboratory of the ARS, cooperating with scientists from Pacific Basin institutions of higher learning, private organizations, other U.S. states, and foreign government agencies that are conducting agricultural research in the Pacific Basin (CBD 1999). The mission of this center is to develop basic and applied information to strengthen agriculture in Hawaii and the Pacific Basin in an environmentally acceptable and sustainable manner by:

- Managing and developing tropical plant genetic resources;
- Developing new technologies and germplasm for improving crop productivity by reducing physiological and disease constraints;
- Developing and demonstrating appropriate strategies for managing crop pests;
- Providing economically viable technologies for controlling quarantine pests; and
- Ensuring product quality and safety, and increasing economic returns (PBARC 2002).

Consequently, the PBARC is comprised of five separate units which are: 1) Tropical Plant Genetic Resource Management Unit, 2) Tropical Plant Physiology, Disease, and Production Unit, 3) Tropical Plant Pests Research Unit, 4) Postharvest Tropical Commodities Research Unit, and 5) Tropical Aquaculture Management Unit. Research activities conducted by these units are occurring in several facilities located on islands of Kauai, Oahu, and Hawaii. The Tropical Aquaculture Management Unit is operated by the Oceanic Institute located in Waimanalo on the Island of Oahu. This aquaculture unit is not be part of this new PBARC complex to be constructed in Hilo.

**Institute of Pacific Islands Forestry**

The Institute of Pacific Islands Forestry, or IPIF, is one of six major field stations of the California-based Pacific Southwest Research Station of the USDA Forest Service. The Forest Service is one of two agencies under the USDA's Natural Resources and Environment with the other agency being the Natural Resources Conservation Service. Both these agencies assist with rural development and help communities with natural resource concerns such as erosion control, watershed protection, and forestry.

The USDA Forest Service manages public lands in national forests and grasslands, and is also the largest forestry research organization in the world. Through the land and resource management planning process, this agency addresses the sustainability of ecosystems by restoring and maintaining species diversity and ecological productivity to provide recreation, range, water, timber, fish, and wildlife. Through technical and financial assistance, this agency assists States and private landowners in promoting rural economic development, improving the natural environment of cities and communities, and practicing good stewardship on the nation's private forest land (USDA 2000).

The IPIF, established in 1957, provides forestry research and technical assistance on natural resource management to Hawaii and several island groups in the western Pacific. The Institute's mission is to develop and implement knowledge needed to restore, protect and sustain upland and wetland forest of the Pacific for purposes of conservation and utilization (Leo A. Daly 2001).

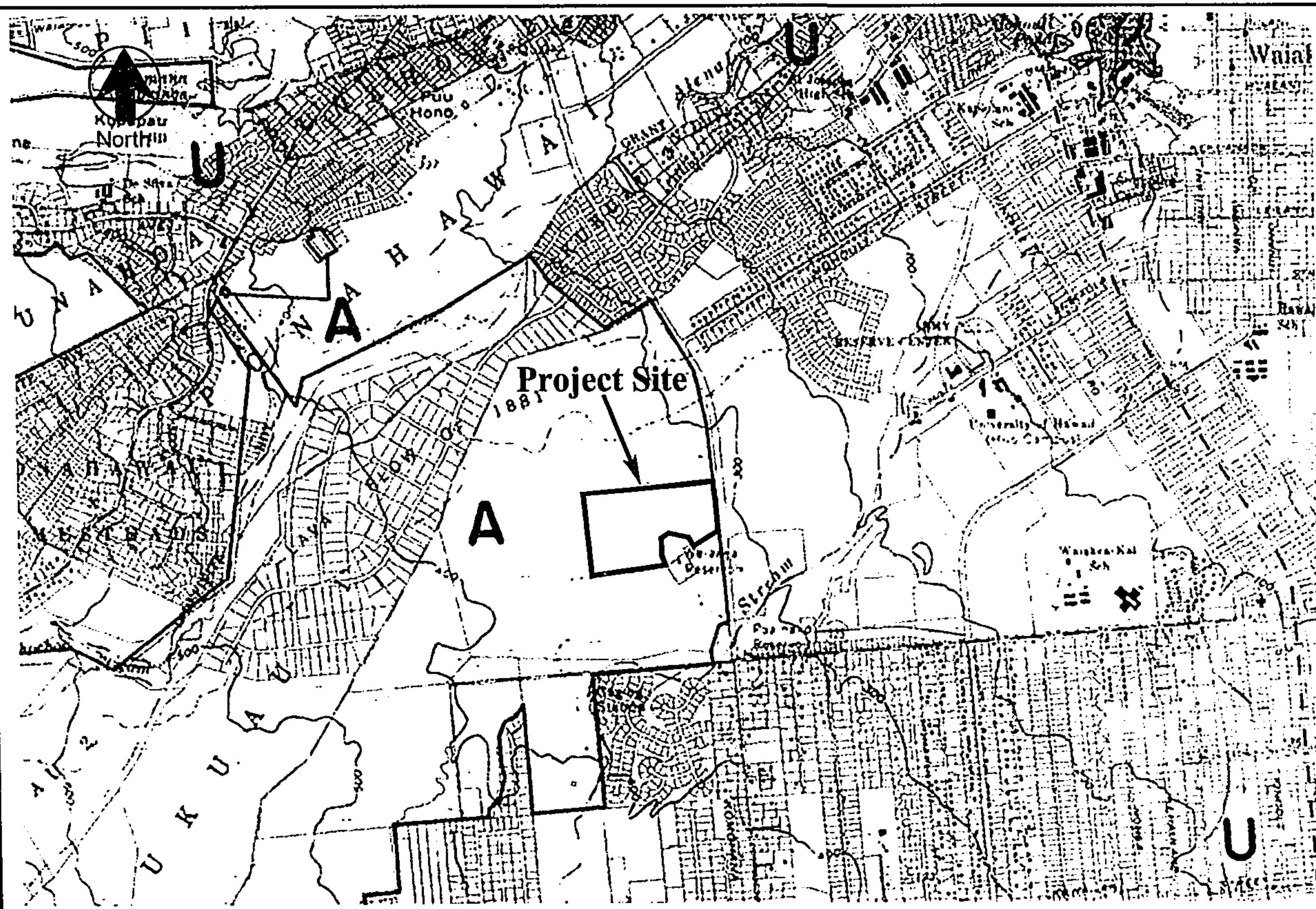
The IPIF is organized into four interdisciplinary teams whose activities are facilitated by a single support services team which are: 1) Invasive Plant Species; 2) Restoration of Ecosystem Processes; 3) Tropical Forested Wetlands; and 4) Forest Management Services. IPIF facilities and staff are located on the islands of Oahu and Hawaii within the State along with Yap in the Federated States of Micronesia. Program activities are sponsored by research grants, State and private forestry interests and International Programs interests.

## 1.3 BACKGROUND ON EXISTING LAND USE DESIGNATIONS

### 1.3.1 State Land Use District

Under Chapter 205, Hawaii Revised Statutes (HRS), all lands in the State of Hawaii are classified into four major land use districts which are referred to as State Land Use Districts. These four land use districts are the Urban, Rural, Agricultural, and Conservation districts. The boundaries of these districts are shown on maps referred to as State Land Use District Boundary Maps.

The State Land Use Commission's (LUC) Land Use District Boundary Map for Hilo (Map H-66) indicates that the project site is located within the State's "Agricultural District." Figure 1.2 shows the project site in relation to this State Land Use District Boundary Map. As shown on this figure, the Agricultural District boundary generally follows Komohana Street near the project and includes the larger undeveloped parcel of which the 30-acre property is located within.




# STATE LAND USE DISTRICT MAP

Figure 1.2

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source:*
*State Land Use Commission,*
*ArcView GIS*

### 1.3.2 County of Hawaii General Plan

The *County of Hawaii General Plan* adopted under Ordinance 89-142 serves as a policy document for the long-range comprehensive development of the island of Hawaii (County 1989). Under the *General Plan's* Land Use Pattern Allocation Guide Map (LUPAG Map), the project site is designated as "University Use." Figure 1.3 shows the project site in relation to this LUPAG Map along with the area designated for University Use. As shown, this area designated for use by the University includes its current campus along with additional property planned for the expansion of the campus. This includes the present 116-acre University Park expansion area and the large property west of that across Komohana Street, which includes the 30-acre project site.

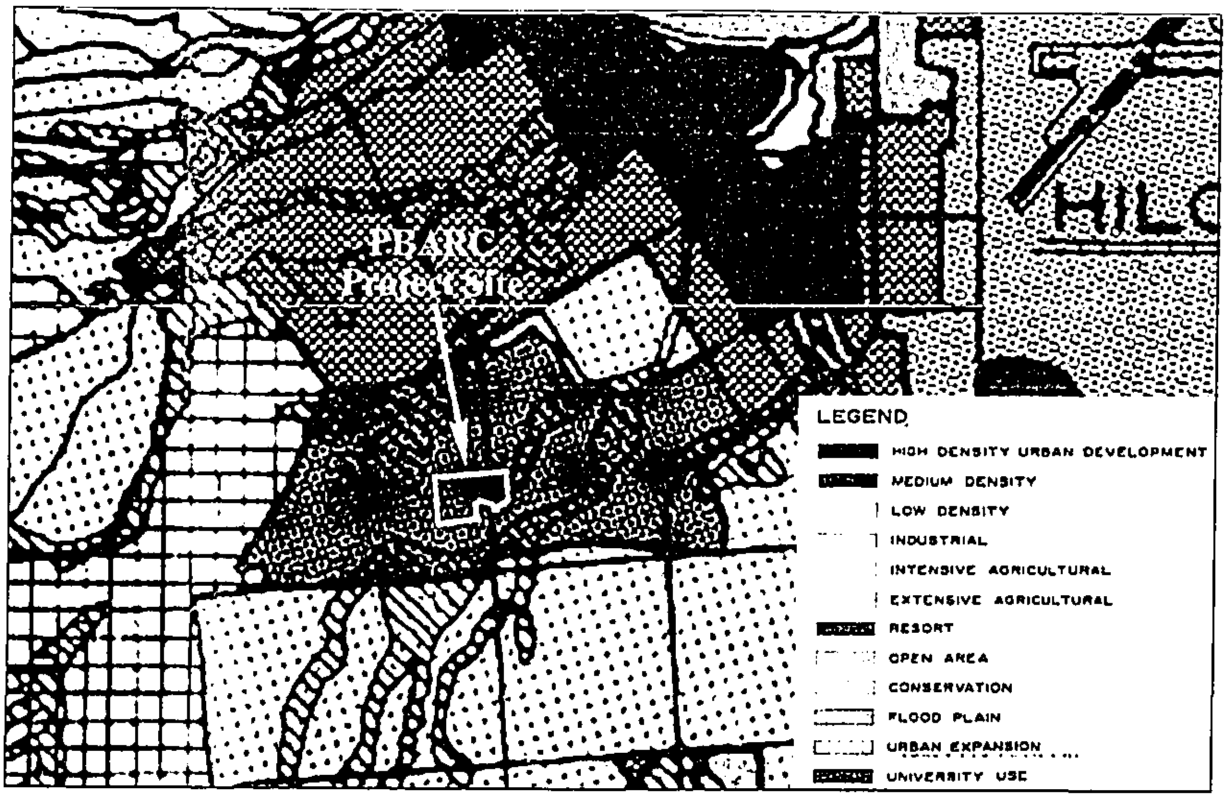
The County is presently undergoing public review of an update to this *General Plan*. Under the current LUPAG Map being proposed as part of this update, the project site continues to be designated as "University Use" along with the immediate surrounding area already designated for this land use. Figure 1.3 included a copy of this updated LUPAG Map for the project area.

### 1.3.3 *County of Hawaii Zoning District*

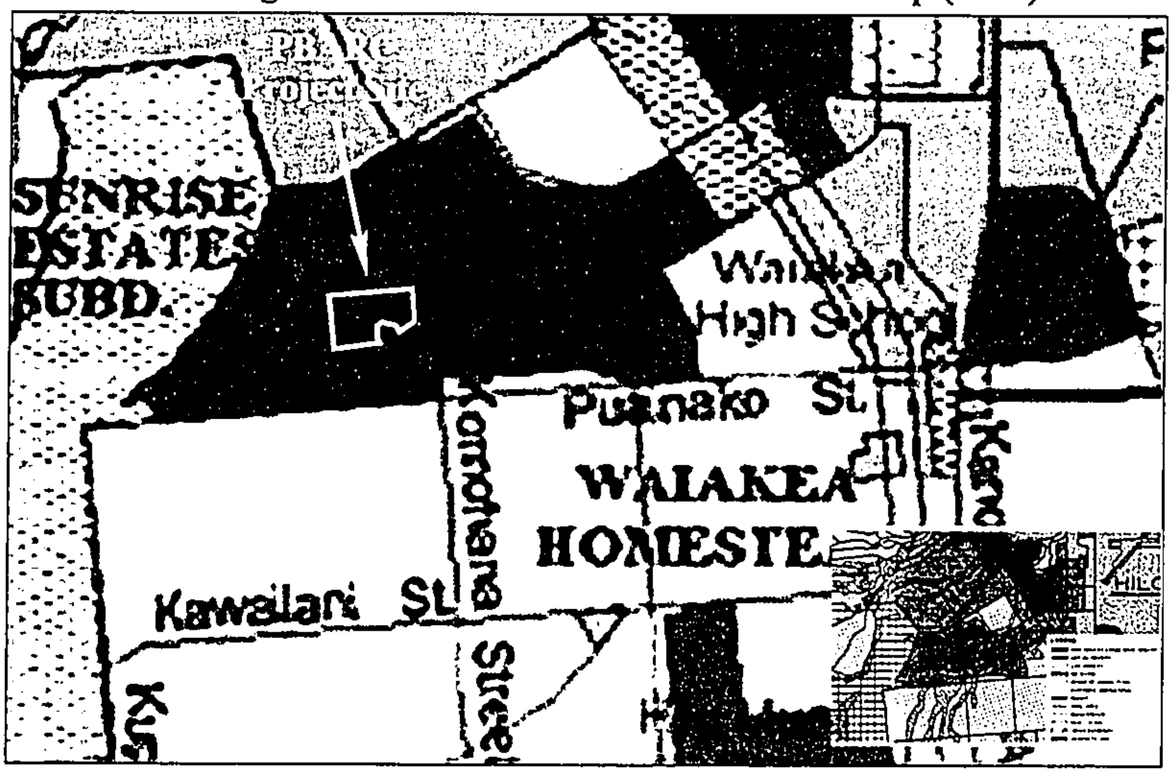
The PBARC Project is located within the Hilo District of the Island of Hawaii. As a result, the County's Hilo District Zoning Map was reviewed to identify current zoning district classifications for surrounding areas. Based upon this zoning map, the 30-acre project site is zoned Agricultural District, with a minimum 1-acre building lot (A-1a). Figure 1.4 shows the project site in relation to the County's zoning districts.

### 1.3.4 Special Management Area

Under Chapter 205A (Coastal Zone Management), HRS, the County is given authorization to regulate land uses located within the established Special Management Area for the Island of Hawaii. Review of the County of Hawaii's Special Management Area Map for the Hilo District determined that the project site is located outside of the SMA boundary in this area. This was confirmed based upon a November 9, 2001 letter from the County Planning Department which is included in Appendix B.




Existing Land Use Pattern Allocation Guide Map (1989)



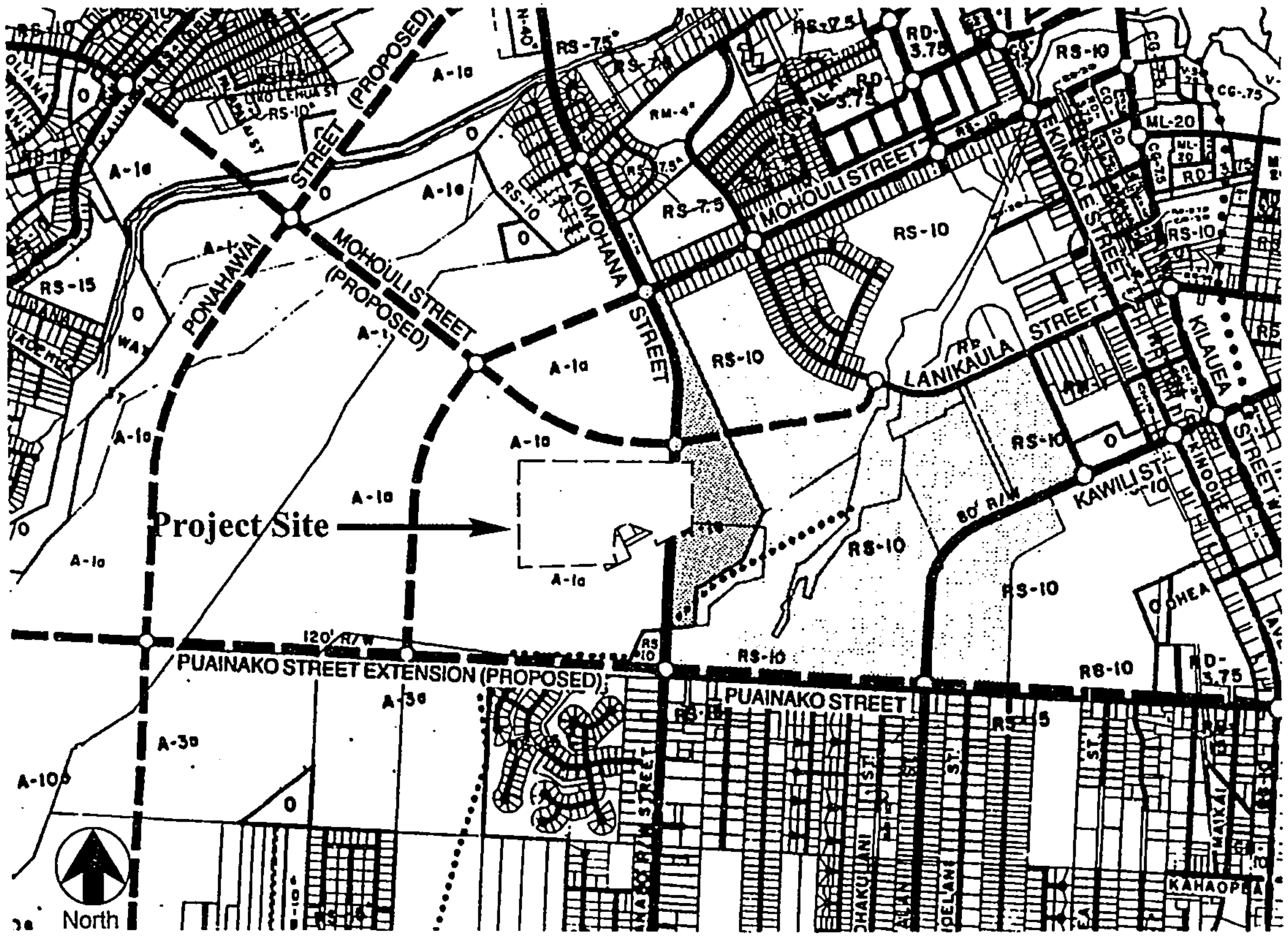

Proposed Land Use Pattern Allocation Guide Map (2002)

## GENERAL PLAN LAND USE PATTERN ALLOCATION GUIDE MAP

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

**Figure 1.3**

*Source:*
*General Plan*
*County of Hawaii*




## HILO DISTRICT ZONING MAP

USDA Pacific Basin Agricultural Research Center
USDA ARS & Forest Service

**Figure 1.4**

*Source: University of Hawaii at Hilo Long Range Development Plan (1996)*

# CHAPTER 2
# PROJECT DESCRIPTION

## 2.1 PROJECT LOCATION AND VICINITY

The USDA Pacific Basin Agricultural Research Center Project site is located on the eastern end of the Island of Hawaii in the Hilo District. Under the County's *General Plan*, this district is divided into the North and South Hilo Districts. The project site is situated within the South Hilo District which generally includes the communities extending along the coastline from Hakalau on the north to Panaewa on the south, and inland (mauka) up to the Hilo and Waiakea Forest Reserves.

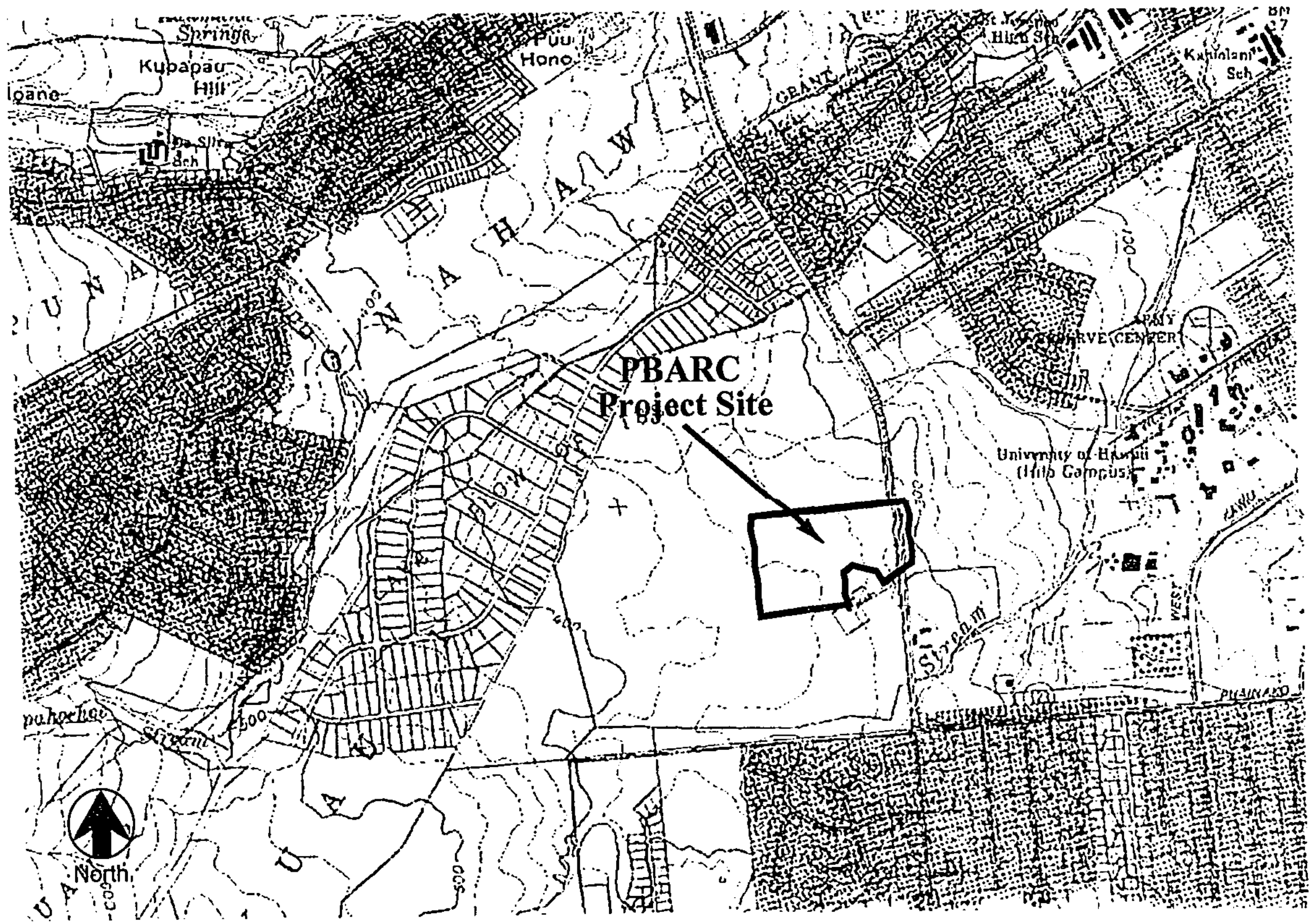
The project is generally situated near the urban center of the town of Hilo which serves as the governmental headquarters for the County of Hawaii and business center for east Hawaii. The 30-acre project site is located within a larger property bordered by West Puainako Street and the Kawailani subdivision to the south, Komohana Street to the east, and the Sunrise Ridge Estates subdivision to the north and west. Figure 2.1 shows the project site's location and surrounding vicinity in greater detail.

West Puainako Street and Mohouli Street are major County roadways providing vehicular access in the east/west direction in the vicinity of the project site. Komohana Street is a County roadway providing vehicular access in a north/south direction, and would provide direct access to the project site.

### 2.1.1 Existing Surrounding Uses

Although the project site is undeveloped, the surrounding area can be characterized as urban. This urbanized area consists of several residential subdivisions, the U.H.-Hilo campus and expansion area, and the commercial and business district of downtown Hilo all of which are located within a 2-mile radius. The project site is located in an area where the expansion of the University campus is occurring growing in a westward direction towards Komohana Street from its current location.

The current University expansion area is a 116-acre property located along Komohana Street at the Nowelo Street intersection that is referred to as the University Park. This development has four astronomical observatories which includes the Gemini Observatory and Subaru Telescope National Astronomical Observatory of Japan. The Komohana Agricultural Complex, which is part of the College of Tropical Agriculture and Human Resources of the U.H.-Manoa, is also located in this development along Komohana Street. Other developments planned for this property include the Mauna Kea Astronomy Education Center, additional lots for research and technology uses, and areas for the expansion of the University campus.




PROJECT VICINITY MAP

Figure 2.1

*Source:*
*DeLorme 3-D Topo Quads, GIS*

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

The area immediately west of the project site is undeveloped which further extends along a corridor traveling in a southwest direction. South of the project area below West Puainako Street are several residential subdivisions making up the communities of Kawailani and Waiakea. Some of these subdivisions include Komohana Gardens, Komohana Estates, and Kawailani Ridge. The area north of the project area also consists of residential subdivisions extending from Hilo town inland in a southwest direction. These include the Sunrise Ridge Estates located immediately north, Pacific Heights, and Komohana Heights.

### 2.1.2 Project Site Description

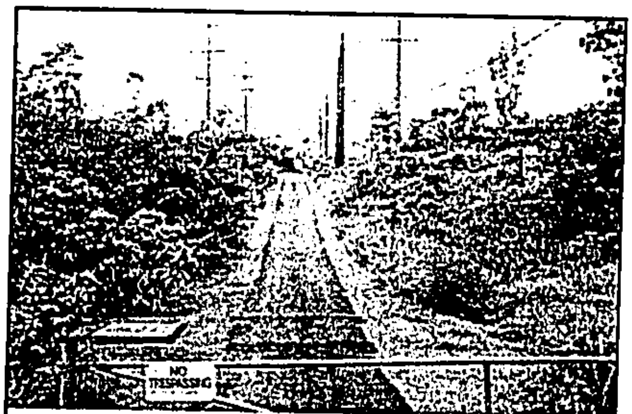
**Property Ownership**

The project site consists of a 30-acre parcel that is identified as Tax Map Key (TMK) (3) 2-04-001: portion of 122. This parcel 122 is a large property of about 292 acres that is owned by the State of Hawaii. In 1998, this 292-acre property, along with other properties in the area, was transferred to the University of Hawaii from DLNR under the Governor's Executive Order 3814. Figure 2.2 shows the lot map established for this PBARC Project site. A lease for the 30-acre property is being obtained by the USDA, ARS, from the State DLNR.

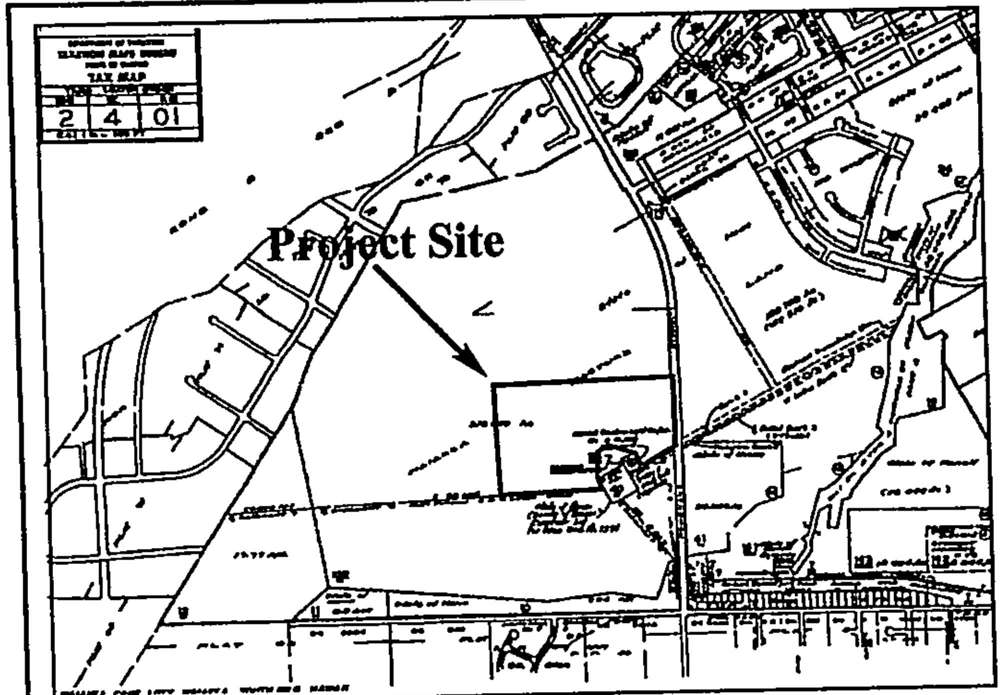
As shown, the PBARC property identified as Lot 2 has a somewhat rectangular shape with the exception of the southern portion of the property. Perpetual non-exclusive easements for an electrical transmission line and water line border the southern portion of this property. The Waiakea Reservoir site and Hawaii Electric Light Company, Inc.'s substation are situated along the southeastern end of the property. Lot 3 is a preservation area being set aside by the University, and consists of about 1.42 acres situated between the PBARC property and reservoir and substation.

**Description Of Property**

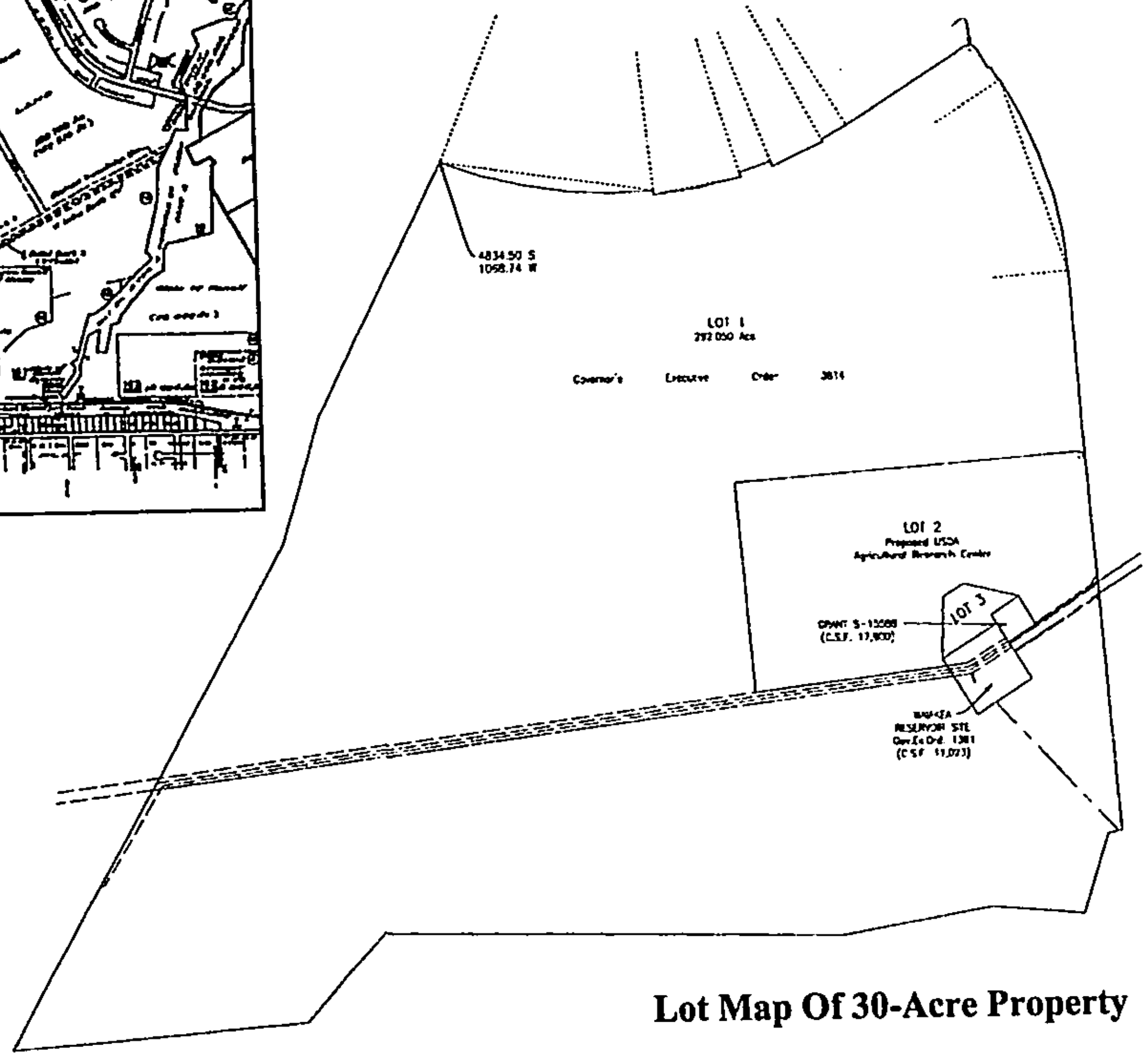
The project site is currently undeveloped and covered with native-dominated ohi'a/uluhe forest over the majority of the property. This forest represents a fairly early stage in plant succession on wet lava flows and does not support a rich diversity of native plant species. This vegetation type is fairly common on the geologically young lava flows in the Puna and Hilo region. Along the southern boundary of the project site, vegetation consists of a weedy mixture of species where it has been disturbed from construction of the existing water reservoir and electrical substation (Char 2001). Figure 2.3 provides an aerial photograph of the project site (taken in June 1999), and photographs of the project site and boundaries are included in Appendix A.



PBARC Property from Access Road Gate




Tax Map Key Showing Property




North

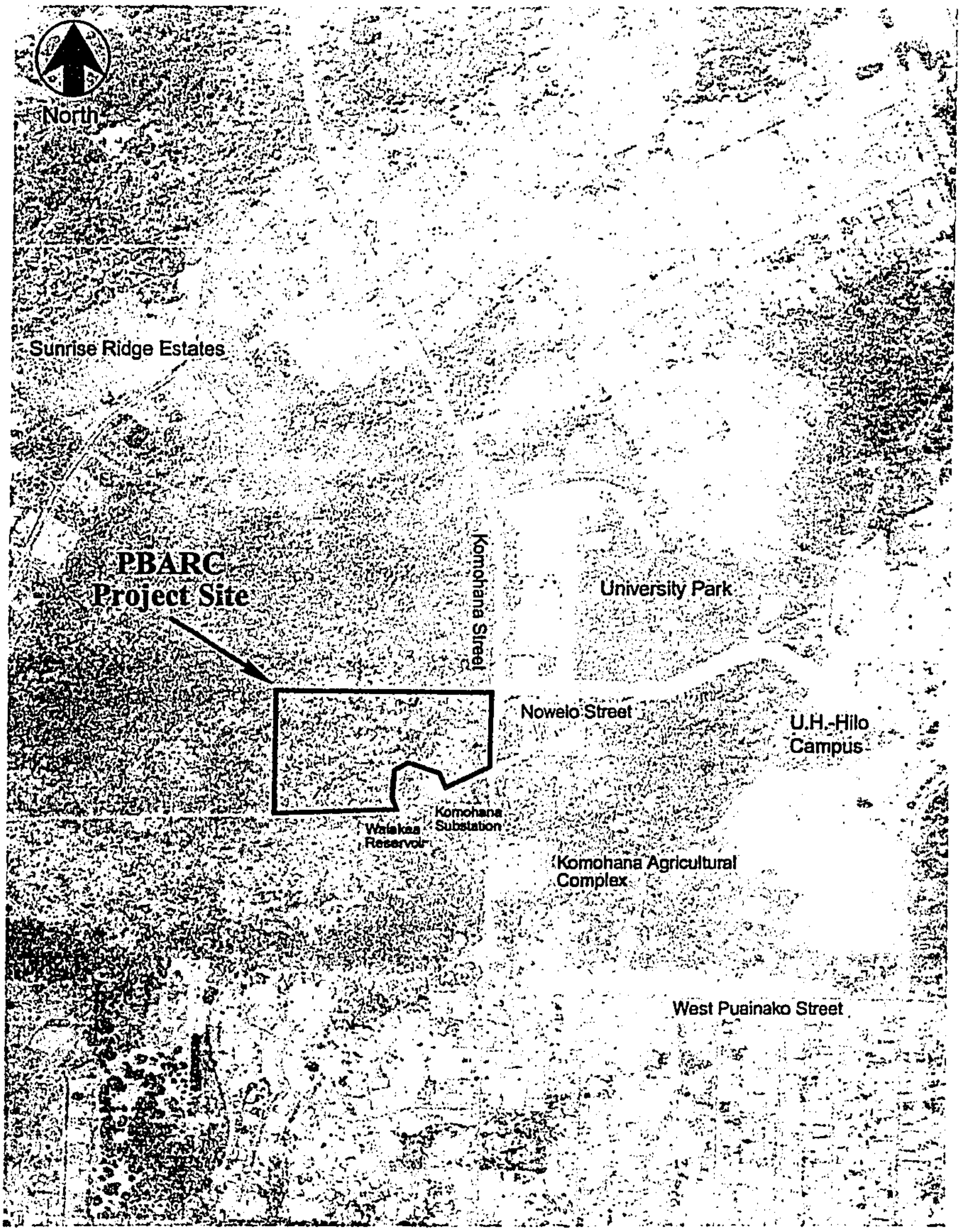
Lot Map Of 30-Acre Property

## LOT MAP AND TMK OF PROPERTY

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

**Figure 2.2**

*Source:*
*ControlPoint Survey, Inc. &*
*State of Hawaii*




**AERIAL PHOTOGRAPH OF PROPERTY AND SURROUNDING USES**

**Figure 2.3**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source:*
*Air Survey Hawaii, Inc.*
*(June 1999)*

SSFM INTERNATIONAL

According to the lava flow age maps, the project area substrate consists of 750 to 1,500 years old lava flow. The topography of this property is generally undulating with a gradual slope occurring in the eastern direction (makai). Soils on the project site consist of pahoehoe lava flow and Panaewa very rocky, silty clay loam in surrounding areas. Typically, soil is scant, existing in intermittent pockets throughout the pahoehoe flow. Elevation of the property ranges from about 330 to 370 feet above mean sea level (CSH 2000).

A north-south oriented former unimproved road alignment, with associated bulldozer push piles and berms are present through the approximate center of the property. Although completely overgrown with vegetation, parallel tire tracks are still visible in some areas. Based on vegetative overgrowth and modern garbage scattered along the road, it appears this road alignment may have been utilized as recently as 20 years ago. The rusted out remains of a car was also found along this road alignment. Along the Komohana Street portion of the property, there is a stockpile of "armor rocks" (huge boulders) most likely related to construction and excavation associated with Komohana Street. Modern rubbish was found throughout much of the project area (CSH 2000).

## Property Background Information

The initial property first considered for this PBARC Project consisted of a 40-acre rectangular-shaped property situated along Komohana Street. This property consisted of about 20 acres located north of the existing water reservoir and electrical substation, and 20 acres extending south from these facilities. Chapter 3 includes a figure showing this initial 40-acre property being considered by USDA, ARS. PBARC had planned to initially develop only the northern 20-acre portion of this property for their new complex because the existing water reservoir, electrical substation, and utility easements essentially cut this 40-acre property in half.

Prior to conducting a topographical survey of this property, an archaeological inventory survey was conducted of the 20-acre parcel. Based upon this archaeological survey, an historic site was identified (Site 50-10-35-22080) in the southern portion of the property which required establishing a preservation area after meetings held with the State Historic Preservation Division. This area was identified as Lot 3, and will set aside as a preserve and maintained by the U.H.-Hilo. Greater discussion of this site is provided in Chapter 4 of this document.

Because of the existing site constraints (utility easements, reservoir, substation) and the preserve area, a new property for this project was considered and discussed between USDA, ARS, and the University. This discussion led to adding another approximately 10+ acres to the west of the original 20-acre parcel resulting in the currently proposed 30-acre PBARC project site. Consequently, a lease for this 30-acre property is now being developed between USDA, ARS, and the State DLNR.

## 2.2 USDA PBARC AND IPIF EXISTING FACILITIES AND ACTIVITIES

### 2.2.1 Existing USDA PBARC Facilities

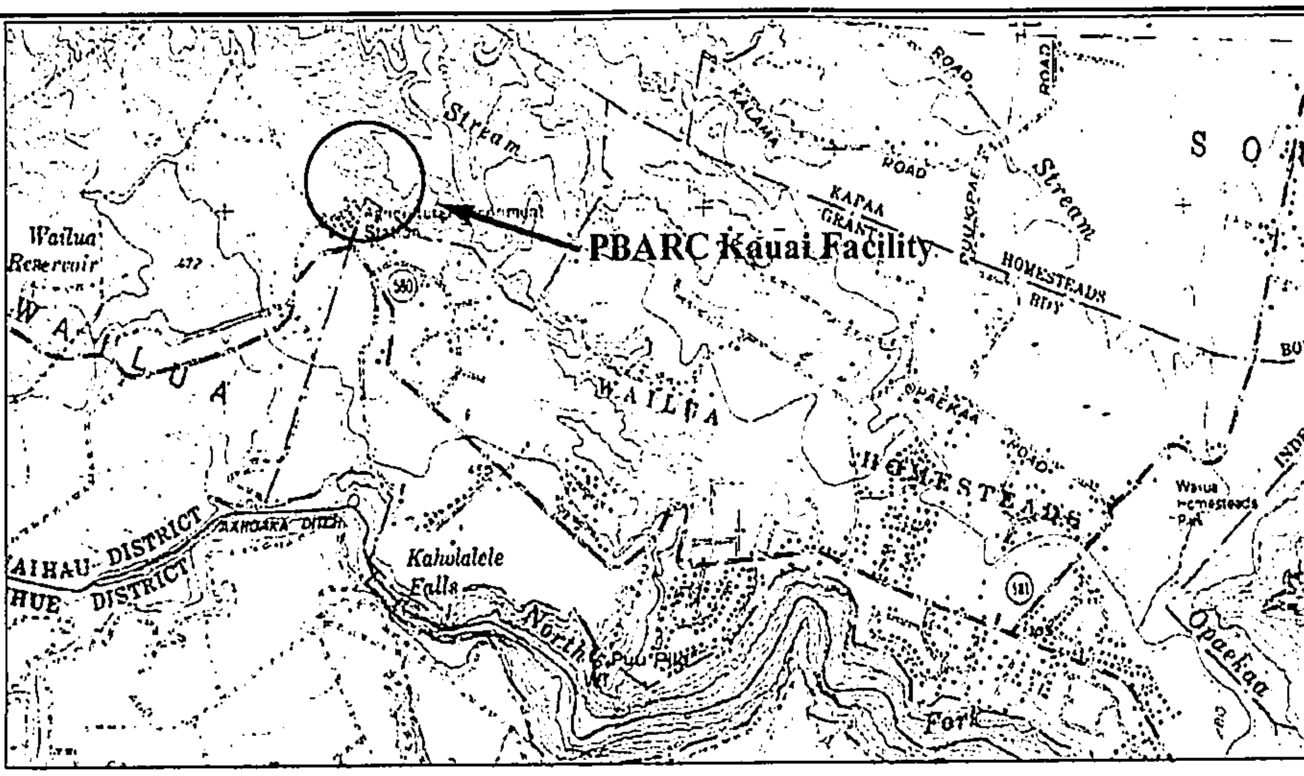
The USDA PBARC has a total of five facilities presently operating on various islands within the State of Hawaii. There are two facilities located on the island of Oahu of which one is located on the University of Hawaii at Manoa (U.H.-Manoa) campus and the other is located at the Hawaiian Agricultural Research Center in Aiea. On the Island of Hawaii, facilities for PBARC's various units along with the National Clonal Germplasm Repository are located on Stainback Highway just outside of Hilo town. The Administration Office for PBARC is located in a commercial building in Hilo town. The last facility is located on the Island of Kauai in the town of Kapaa along Kuamoo Road. Greater discussion of these existing facilities and current activities are provided below. Figures 2.4 and 2.5 show the locations of these existing PBARC sites.

***Island Of Oahu Facilities***

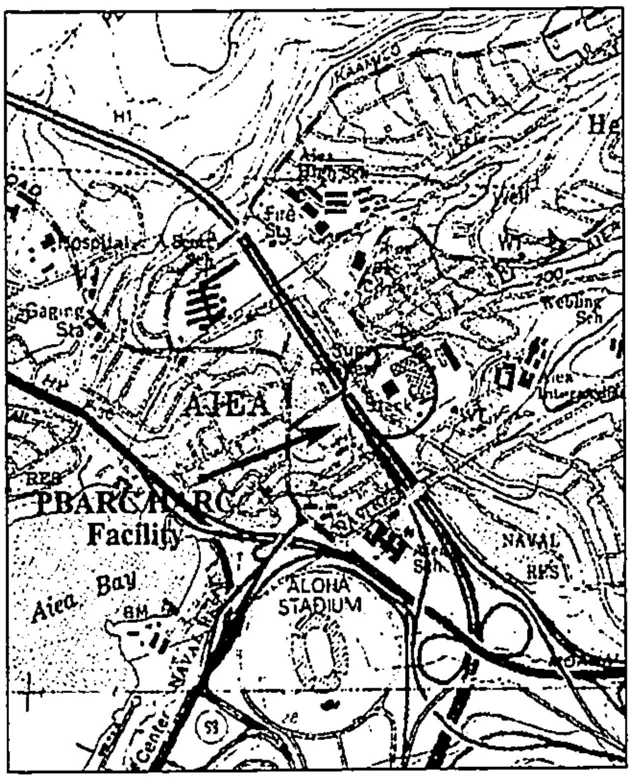
A PBARC facility is located in Aiea within the Hawaii Agricultural Research Center (HARC) building that has a total of approximately 60,000 square feet. The PBARC, under a Memorandum of Understanding, occupies about 4,600 square feet of space of this total, and another 3,100 square feet of space is shared with the Hawaii Agricultural Research Center (USDA 1998). The Tropical Plant Physiology, Disease, and Production Unit (TPPDP Unit) of PBARC operates out of this facility. This TPPDP Unit operates under a cooperative agreement with the HARC as the Cell and Molecular Biology Research (CMBR) Unit (PBARC 2002). This TPPDP Unit has a staff of about 8 persons working out of it.

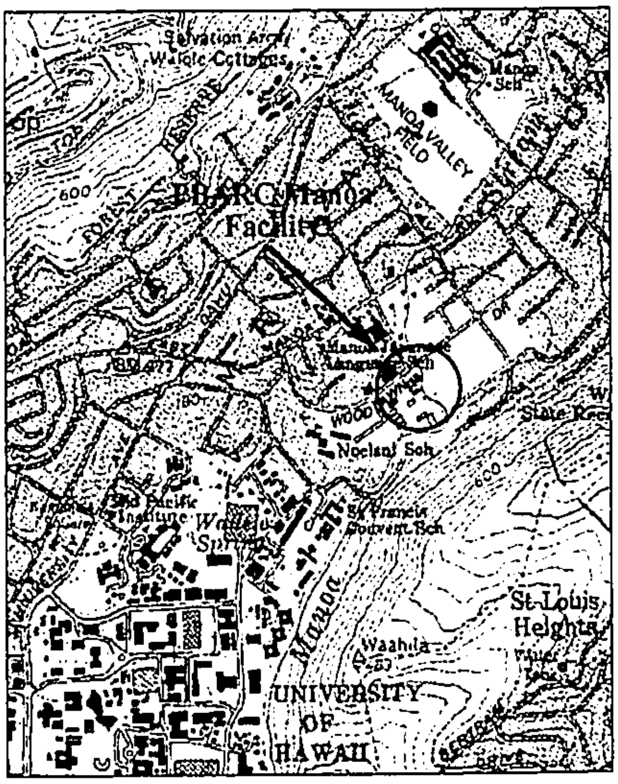
The second PBARC facility is located in Manoa Valley on about 0.8 acres of land situated along Woodlawn Drive. The Tropical Plant Pests Research Unit (TPPR Unit) operates out of this facility which was officially dedicated in 1987 as a cooperative project between the USDA ARS and University of Hawaii (PBARC 2002). This property is owned by the University of Hawaii and leased to PBARC. These facilities consist of a total of seven buildings. There are four main buildings associated with this facility which are connected by two smaller buildings along with a separate maintenance workshop.

This facility predominantly conducts insect rearing activities for PBARC's fruit fly research program. The majority of the structures are made of prefabricated steel, and the workshop is a wood frame and siding structure. This facility includes approximately 10,296 square feet of laboratory area, 1,300 square feet of storage space, 462 square feet for the maintenance workshop, and a 340-square foot storage shed (USDA 1998). Appendix A includes photographs of this facility along with other PBARC facilities described. Approximately 20 persons work out of this facility.



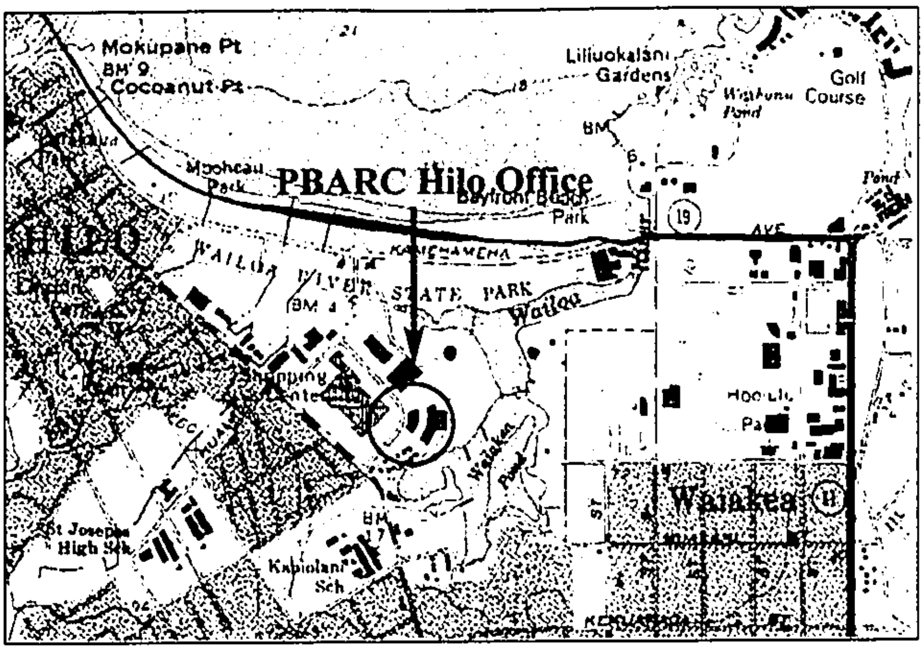

**PBARC Kauai Island Facility Location**



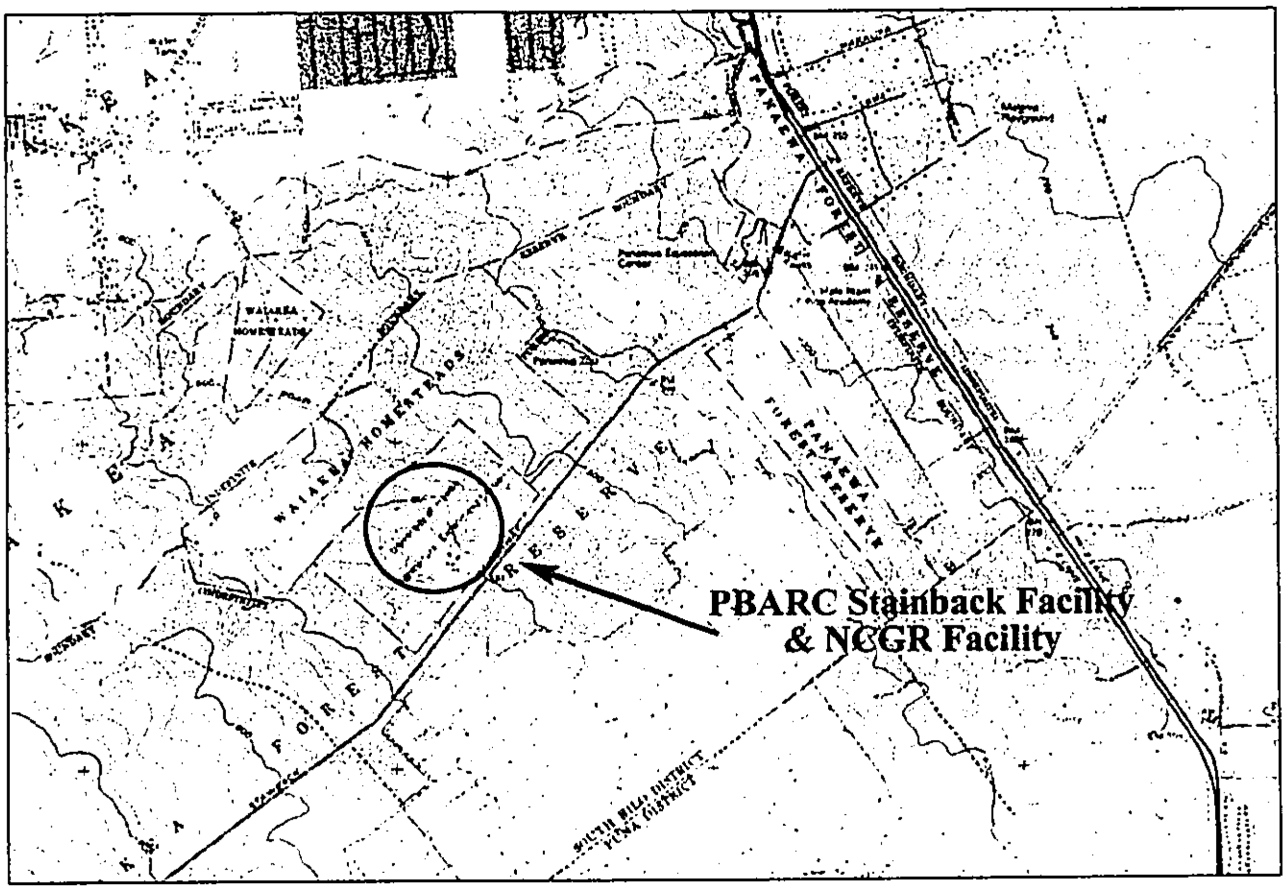




**PBARC Oahu Island Facility Locations**

| PBARC KAUAI AND OAHU FACILITY LOCATIONS | Figure 2.4 |
|---|---|
| *USDA Pacific Basin Agricultural Research Center*<br>*USDA ARS & Forest Service* | *Source:*<br>*Delorme 3D Topo Quad* |




PBARC Hilo Town Office Site




PBARC Stainback & NCGR Facilities Location

| PBARC HAWAII ISLAND FACILITY LOCATIONS | Figure 2.5 |
|---|---|
| *USDA Pacific Basin Agricultural Research Center*<br>*USDA ARS & Forest Service* | *Source:*<br>*Delorme 3D Topo Quad* |

**Island Of Hawaii Facilities**

The PBARC presently has two sites on the island for its facilities which are both located in the district of Hilo. The first site is the Administration Office for PBARC which is located on the second floor of the Hilo Lagoon Annex building along Aupuni Street. This office is being leased from the landowner, and is used as the headquarters for the operations and administration of PBARC activities statewide. This headquarters has a staff of 8 persons.

The second PBARC site on the island is known as the Hilo Hawaii Stainback Facility (Stainback Facility). This Stainback Facility is situated in the upper (mauka) area of Panaewa town on Stainback Highway. It is located on about 5 acres of an approximately 200-acre property owned by the University of Hawaii. USDA ARS is leasing the 5-acre portion of the property for its facilities and activities. This site has several facilities which serve the Tropical Plant Genetic Resource Management Unit, the Tropical Plant Pests Research Unit, and the Postharvest Tropical Commodities Research Unit. This Stainback Facility currently has a staff of about 24 persons consisting of 9 scientific staff and the remaining comprised of technicians and administrative staff.

These facilities are housed in eight main buildings, about 6 portable trailers having about 500 square feet each, and a few Matson containers of about 200 square feet each. The combined area for the eight buildings is about 15,500 square feet (USDA 1998). Due to a shortage of space, these Matson containers and trailers are used for lab and office space, storage, and an insectary. Six of the buildings are prefabricated metal structures while the other three are of wood frame construction with metal roofs. Appendix A includes some photographs of these buildings. Three of the buildings are 30 to 35 years old, however, two of them were renovated within the past 3 years.

The National Clonal Germplasm Repository (NCGR) is located adjacent to this Stainback Facility on an approximately 3-acre site. This NCGR also has an additional approximately 33 acres under cultivation as field plots as part of their activities. These field plots are situated on various plots within the entire 200-acre property owned by the University of Hawaii. This facility consists of a 1,500 square foot laboratory and office, a 540 square foot headhouse, a 1,800 square foot greenhouse, a 3,000 square foot screen house, and several other small temporary or permanent sheds and work areas (USDA 1998). One of the buildings renovated at the Stainback Facility is also used as a laboratory for the program. This NCGR facility has a staff of eight persons. Appendix A includes photographs of facilities for both the NCGR and the Stainback Facility.

**Island Of Kauai Facilities**

The PBARC facility on the Island of Kauai is located on the eastern end of the island in the upper Wailua district. This property is situated along Kuamoo Road in the Wailua community a considerable distance inland just before the Wailua Reservoir.

This facility consists of a 1,000 square foot prefabricated steel main laboratory structure, a 1,000 square foot prefabricated steel shop building, a 528 square foot trailer used as storage space, and a 128 square foot chemical storage shed. Additionally, there are two 100 square foot offices and square foot chemical storage shed. Additionally, there are two 100 square foot offices and a 200 square foot laboratory belonging to the University of Hawaii that are being used. These buildings are situated on approximately 4 acres of land currently leased from the University of Hawaii at Manoa (USDA 1998). Appendix A includes some photographs of these buildings. This facility has a staff of about six persons.

### 2.2.2 PBARC Research Programs

The PBARC is made up of five separate units conducting a variety of research activities at their various facilities. These units are the: 1) Tropical Plant Genetic Resource Management Unit, 2) Tropical Plant Physiology, Disease, and Production Unit, 3) Tropical Plant Pests Research Unit, 4) Postharvest Tropical Commodities Research Unit, and 5) Tropical Aquaculture Management Unit. Background information on these five research units is provided below.

<u>Tropical Plant Genetic Resource Management Unit</u>

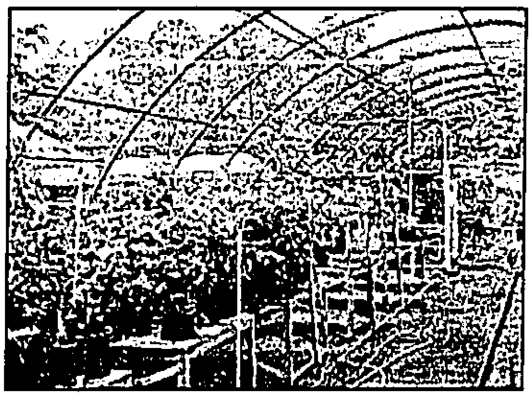
The mission of this Tropical Plant Genetic Resource Management Unit, or TPGRM Unit, is to collect, identify, evaluate, maintain, utilize, preserve, and distribute important clonal germplasm for designated tropical fruit, nut, beverage, and ornamental crops (PBARC 2002). This unit's main research areas are to:

1. Develop molecular tools to direct future tropical germplasm collection activities;
2. Identify patented varieties and unique genes associated with desirable traits;
3. Develop high quality, value, and efficient production systems for tropical crops; and
4. Serve as a major center for research and development of tropical germplasm.

This unit was dedicated in 1987 as a cooperative project between the USDA, ARS and the U.H.-Manoa, and was responsible for seven designated crops. In 1989, the unit was federalized and became part of the National Plant Germplasm System which increased its responsibility to 13 crops. The National Clonal Germplasm Repository at the PBARC Stainback Facility is part of this program. These designated crops include pineapple, breadfruit, papaya, lychee, macadamia, rambutan, pulasan, passion fruit, and guava (PBARC 2002).

The focus of this unit's research projects for the State of Hawaii is to develop the highest quality crops, allow for consistent and predictable production, and achieve something special for every month of the year. They approach this by identifying five targeted crops for the next 10 years, and working with the U.H., Hawaii Agricultural Research Center, and other USDA, ARS, scientists on all aspects of research. They would like to start promoting the tropical fruit industry to the State's visitor industry by advocating we have the best quality, safest, and cleanest fruit in the world (ARS 2001). Some of the current programs being conducted by this TPGRM Unit include:

- <u>Ginger Bacterial Wilt</u>. This disease has resulted in losses of up to 45 percent of the annual ginger crop in Hawaii. This research project is working with U.H., HARC, USDA, ARS, and ginger farmers along with other industry interests to address this problem. Areas of potential are for clean seed production, interactions of bacteria wilt with other bacteria in the ginger plant, and methods for improving disease management.



- Culture and Management of Kaimana Lychee. The flowering management by manipulating the time of pruning and fertilizer applications in high rainfall areas is being studied.
- Lychee Selection. Research is being done on germplasm introduction, evaluation and selection for better color, flavor, and productive variety for Hawaii.
- Introduction, Selection, Evaluation, and Production of Tea. The production of high quality tea through the introduction, selection, and evaluation of tea germplasm is being studied. This also includes research of adopting and modifying propagation, culture management, and processing procedures (PBARC 2002).

In addition, this Unit has several cooperative agreement projects with the University of Hawaii and HARC. Some of these projects include:

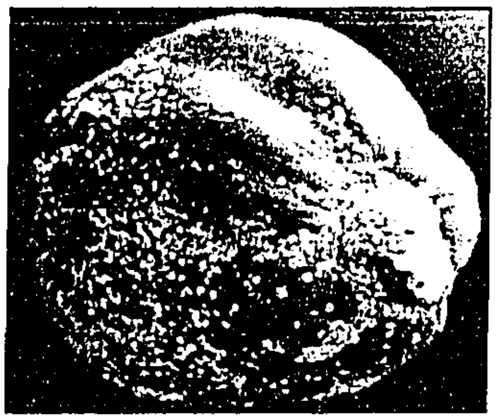
- Research with U.H.-Hilo to develop an Institute for Agricultural Marketing and Education to facilitate information and distribution of crop production, marketing and distribution of tropical fruits, vegetables, and ornamental crops, and to provide educational and research opportunities for students in Hawaii.
- Research with HARC to further characterize germplasm of pineapple, macadamia, and papaya using DNA marker techniques.

**Tropical Plant Physiology, Disease, and Production Unit**

The mission of this Tropical Plant Physiology, Disease, and Production Unit, or TPPDP Unit, is to identify and characterize molecular, physiological, and biochemical factors that limit disease susceptibility, increase productivity, and develop new technologies that enhance the production of tropical crops (PBARC 2002). This unit's main research areas are to:

1. Conduct research on integrated cropping systems;
2. Minimize development and spread of new virulent strains of plant pathogens;
3. Characterize the molecular biology, physiology, and genetics of host/pathogen interactions; and
4. Identify DNA markers linked to plant virulent or disease resistant genes (ARS 2001).

The continuous growing season of the tropics allows pests and pathogens to maintain high, crop damaging populations that need to be controlled to succeed in growing crops. Failure to maintain adequate, year-round pest and disease control measures results in reduced yields, lower quality, and loss in the ability to export crop commodities. The safest and least costly method to control pest and pathogens is to grow resistant varieties. However, genetic resistance is frequently inadequate resulting in the use of pesticides which can harm the environment. Moreover, pesticides can lose effectiveness when the pest or pathogen develops resistance to them.



To address this, plant genetic resistance to pests and pathogens needs to be characterized in tropical crops and their wild relatives so that the genes encoding resistance can be added to improve cultivars and reduce pesticide use. A better understanding of the genetics of plant resistance to assist traditional breeding is thus being developed. Therefore, this unit is conducting research to integrate cropping systems, pesticide use strategies, and management of genetic resistance to minimize the development and spread of pathogens and pests. Current research projects conducted by this unit include:

- Research of Hawaiian papayas transformed with genes for resistance to Japanese papaya leaf distortion mosaic virus, and for resistance to several strains of papaya ringspot virus.
- Transformation of sugarcane for insect resistance using Bt, and transformation of sugarcane with trehalose synthesis genes.
- Virus elimination by culturing taro meristems.
- Virus protection of transgenic Kamiya papayas with short, medium, or long coat protein gene and replicate gene constructs (PBARC 2002).

**<u>Tropical Plant Pests Research Unit</u>**

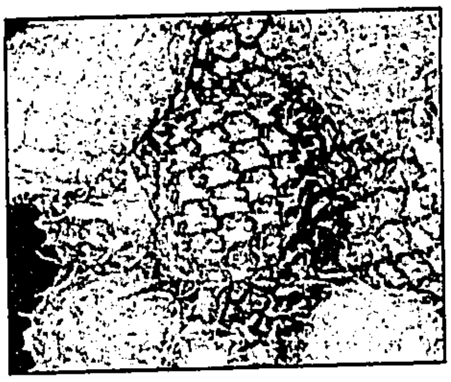
The mission of this Tropical Plant Pests Research Unit, or TPPR Unit, is to identify, develop, and implement environmentally acceptable strategies for the management of tropical crop pests. This unit's main research areas are to:

1. Identify and characterize the biology and population dynamics of pests of tropical crops.
2. Determine the interaction of crop pests with host phenology, reservoir foliage, and natural enemy complex which impact growth and abundance of pest populations.
3. Identify behavioral semiochemicals and biotic factors that regulate growth and development of pest populations in tropical crops.

4. Improve existing methods and develop new technologies utilizing attractants, repellents, and environmentally acceptable toxicants and insect growth regulators to control pest populations on host plants.
5. Develop biologically-based control technologies utilizing parasitoids and natural enemies to suppress pest populations.
6. Develop model and implemental local and area-wide strategies to control tropical crop pests, reduce pesticide usage, and minimize pest resistance in tropical crops (PBARC 2002).

**Postharvest Tropical Commodities Research Unit**

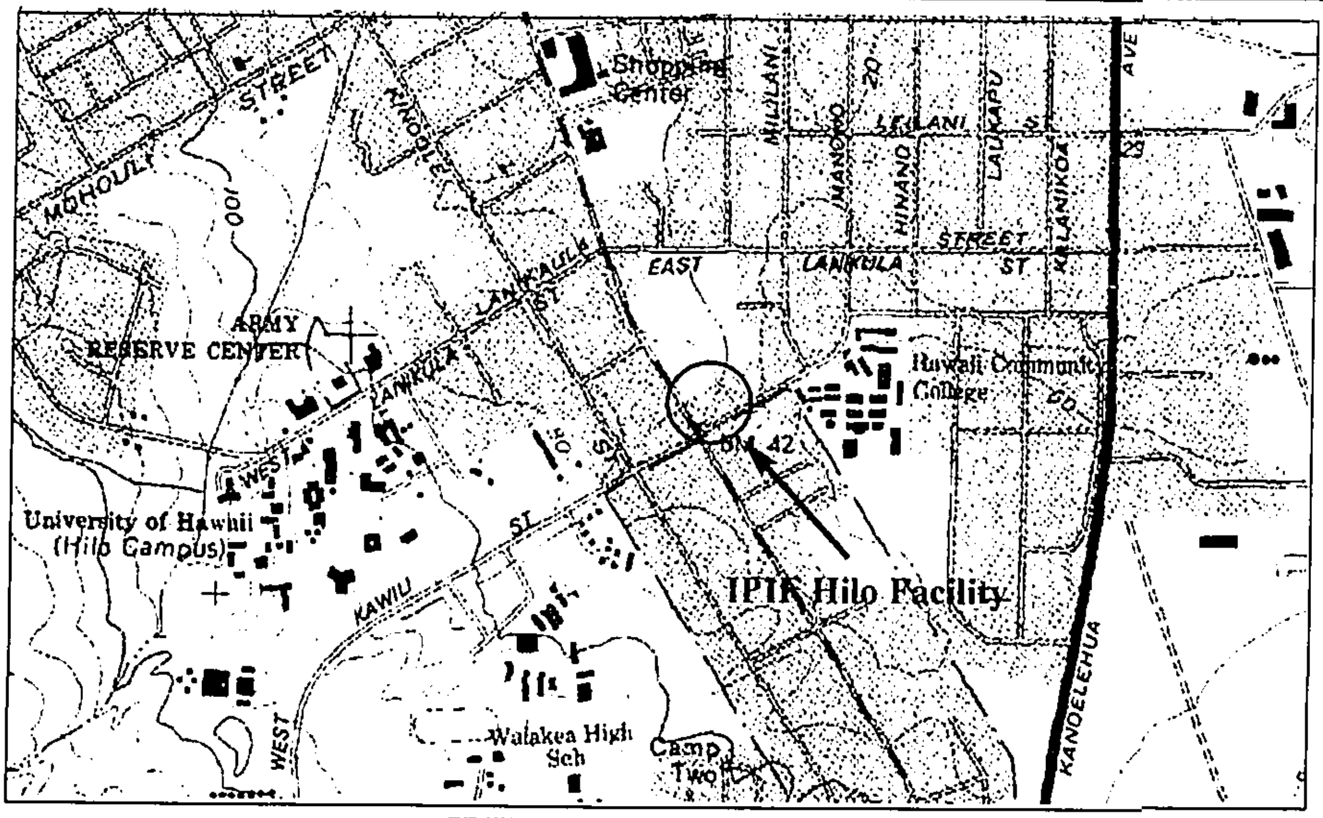
The mission of this Postharvest Tropical Commodities Research Unit, or PTCR Unit, is to provide environmentally sound, economically viable systems, treatments, and processes that control quarantine pests, ensure product quality, food safety, and increase product value. This unit's main research areas are to:



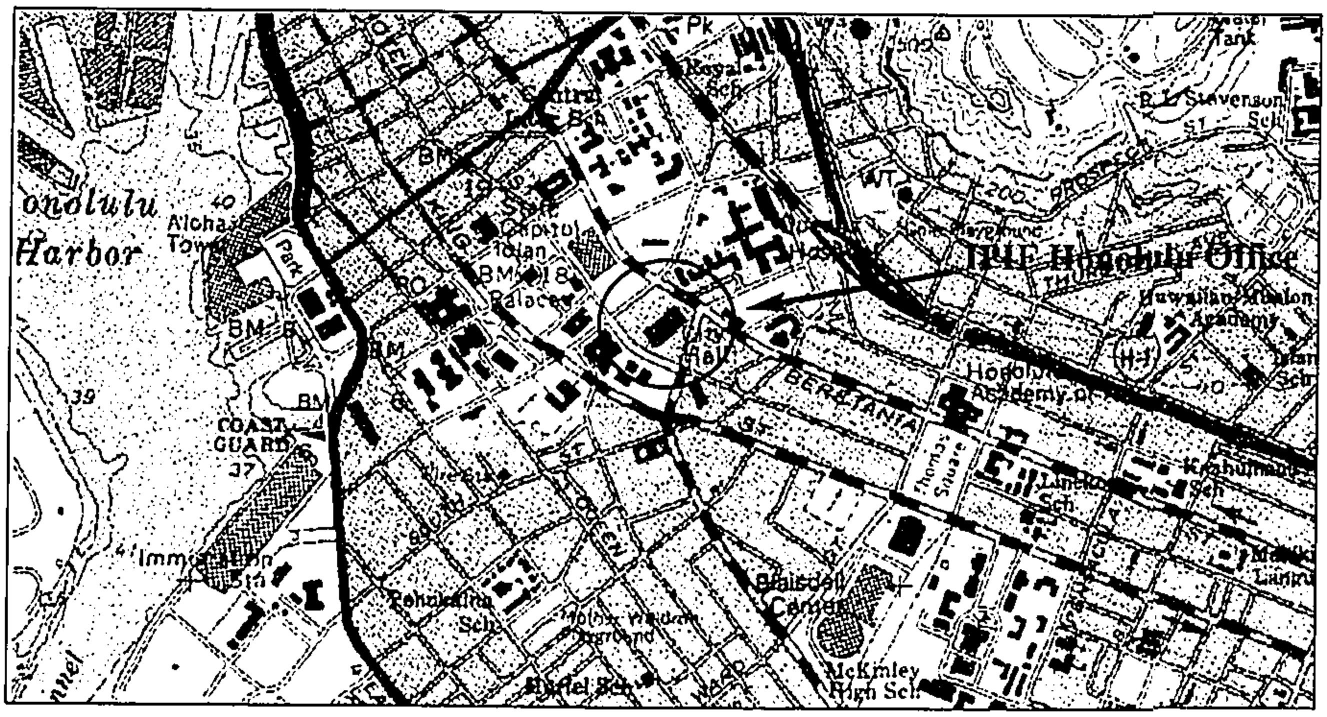
1. Develop and commercialize postharvest treatments of systems that ensure product quality and marketability, while controlling quarantine pests to meet regulatory standards for opening or maintaining export markets.
2. Improve or develop processes and products that enhance quality and add value to export commodities.
3. Conduct research on handling, storage, packaging, and transportation systems that enhance commodity quality and facilitate market access.
4. Provide reliable methods, processes, and strategies to identify, count and control microorganisms in agricultural products; and to use tools to identify critical control points and assessment factors for hazard analysis (PBARC 2002).

### 2.2.3 Existing USDA IPIF Facilities

The Institute of Pacific Islands Forestry, or IPIF, is one of six major field stations of the California-based Pacific Southwest Research Station of the USDA Forest Service. The Institute provides forestry research and technical assistance on natural resource management to Hawaii and several island groups in the western Pacific. IPIF has three facilities located within the State of Hawaii. One facility is located in downtown Honolulu on the Island of Oahu and the remaining two facilities located on the Island of Hawaii. Most of its employees are located in the Honolulu office with other staff located on the Island of Hawaii. This institute also has offices in Yap and Kosrae of the Federated States of Micronesia (Leo A Daly 2001). Figure 2.6 shows the general location of their offices within the State of Hawaii.




IPIF Hilo Facility Location




IPIF Oahu Facility Location

# IPIF OAHU AND HAWAII FACILITY LOCATIONS

**Figure 2.6**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source: Delorme 3D Topo Quad*

**Island Of Oahu Facility**

The IPIF is located on the third floor of the State Building (Kalanimoku Building) on Punchbowl Street. Under conditions specified in a Memorandum of Understanding initially executed in 1957, the IPIF is provided with about 4,434 square feet of office space that is being shared with the Division of Forestry and Wildlife (DOFAW), DLNR. This office is presently used only for program administration and general office space for IPIF. Photographs of this existing facility are included in Appendix A.

**Island Of Hawaii Facilities**

On the Island of Hawaii, the IPIF has two facilities with one located in Hilo and the other at Hawaii Volcanoes National Park. Their Hilo facility is located in the DOFAW office along East Kawili Street. State district administrators anticipate they will need the IPIF to vacate their Hilo facility within 5 to 10 years (Leo A Daly 2001).

Most of the staff there are associated with the Invasive Plant Species Team. This facility is used for laboratory research, data analysis, greenhouse for field tests, and provides personnel support for IPIF programs. This facility consists of 1,968 square feet of office, laboratory, and green-house space in the DOFAW baseyard. Inside, this facility has four small office spaces, a small equipment area and laboratory.

The second IPIF facility on the island is located in Hawaii Volcanoes National Park. The Bio control Unit, which is part of the Invasive Plant Species Team, is housed at this facility. The National Park Service provides office space, a shade house, and an insect quarantine space at this location. Although space is limited, there are no indications that the National Park Service plans to terminate this mutually beneficial arrangement. Consequently, there are no plans to move this facility at this time.

### 2.2.4 Existing USDA IPIF Research Programs

Established in 1957, the IPIF's mission is to develop and implement knowledge needed to restore, protect, and sustain upland and wetland forests of the Pacific for purposes of conservation and utilization. In fulfilling this mission, the IPIF promotes and supports a variety of environmental related activities with direct ecological and economic benefit for Hawaii which include:

1. Staging area for field research, including preparation and repair of field equipment.
2. Collecting, storing, drying, and analysis of samples collected in the field.
3. Growing of native plant for purposes of research on forest restoration.
4. Teleconferencing with other Forest Service personnel on the mainland, the Honolulu office and other Pacific Island locations.
5. Educational programs for students and the public to increase awareness of the importance and fragility of Hawaii's ecosystems.
6. Hosting national and international researchers and forest industry officials to share discoveries and developments, or to collaborate on research projects (Leo A. Daly 2001).

The Institute is organized into four interdisciplinary teams having researchers, ecologists, and technicians within each team whose activities are facilitated by a single support services team consisting of administrative and computer technicians.

<u>Invasive Plant Species</u>

The mission of the Invasive Plant Species team is to provide new information on: 1) the ecology of invasive plant species; 2) impacts of invasive species on forest health, management, and restoration especially in the native ecosystems of Hawaii and the Pacific Islands; and 3) ways in which populations of invasive plants might be limited by development of biological control agents and effective management. This information is used to promote their control, foster public education, and inform the development of public policy on their management.

Recent estimates suggest that almost 900 species of exotic plants have become naturalized in the Hawaiian Islands, of which 90 species pose significant threats to native ecosystems. These species include canopy and subcanopy trees, vines, grasses, and understory shrubs and herbs. Because the State of Hawaii is unique in its high percentage of endemic plant species, its diversity and the integrity of native ecosystems are vulnerable to the impact of aggressive alien plants. Alien weeds also threaten the productivity of managed forests and the ability to restore degraded landscapes. Thus, IPIF scientists have been important partners with both the public and private sectors in weed research and management programs since 1983 (IPIF 2001). Some of the current programs being conducted include:

- <u>Impacts of Alien Plants on Forest Restoration</u>. The control of alien weeds often entails extensive efforts in the restoration of sustainable native ecosystems. In addition, forest restoration efforts are often impeded by growth of invasive weeds. Thus, research of the regeneration of native species under different combinations of alien species control, substrate manipulation, and ungulate reduction are being conducted in a dry forest reserve and a degraded montane forest reserve.
- <u>Population Dynamics of Forest Weeds</u>. Comparative demographic and experimental studies on the widespread tropical understory weed *Clidemia hirta* are aimed at understanding factors limiting its abundance in its area of origin to more effectively target particular life history stages for control in its area of introduction here in the State.

This research team also facilitates greater statewide coordination of private and public sector activities to increase the effectiveness and efficiency of forest weed control. Some current efforts include the following:

- <u>Management of Alien Species</u>. Efforts focus on statewide coordination to improve funding for the control of noxious weeds. The Forest Health Coordinator has helped cooperating agencies secure federal funding and local matching funds for forest weed control. Efforts are conducted with the State DOFAW, DLNR, and other agencies to better identify and coordinate grant opportunities for forest health funding.

- Development of a Network of Island-Based Invasive Species Committees. Efforts focus on forming island-based groups on Maui, Oahu, Hawaii, and Kauai.
- Coordination of Operation Miconia. Operation Miconia is a multi-agency effort to control and eradicate the weed tree *Moconia calvescens* on the Island of Hawaii (IPIF 2001).

Another component of this Invasive Plant Species team is the Biocontrol Unit which is currently based at Hawaii Volcanoes National Park on the Island of Hawaii. This Biocontrol Unit's purpose is to develop means for limiting the growth of invasive species in native forested ecosystems.

**Restoration of Ecosystem Processes**

The goal of the Restoration of Ecosystem Processes team is to provide a scientifically sound basis for the reconstruction and function of damaged ecosystems that are self-supporting and resilient to subsequent change at least to some degree. After decades of deforestation, there is increasing interest in restoring native forest ecosystems to conserve native biodiversity, provide wildlife habitat, and restore important ecosystem processes such as watershed protection. There is also interest in using non-native species to restore forest ecosystem function to degraded lands that will no longer readily support native communities.

Consequently, this team's research is providing information on how different species interact with each other and their environment during ecosystem development, as well as on specific requirements of tree species being used in restoration efforts. The impacts of past land rehabilitation actions on subsequent recovery of biological diversity and restoration of ecosystem processes are being examined in Hawaii plantations that are dominated by native or introduced species. Some current research projects include the following:

- Problems specific to re-establishment of *Metrosideros-Acacia* forests on rangelands for endangered species habitat are being studied at high elevation sites.
- Native Forest Ecosystem Restoration. The Hakalau Forest National Wildlife Refuge on the Island of Hawaii was established to protect endangered forest birds and rare or endangered plants. Research is being conduct to restore about 5,000 acres of this refuge from non-native grassland to native forest as an essential step for recovering and protecting the threatened and endangered species.
- Role of Plantations in Restoration of Ecosystem Processes. The restoration of severely degraded landscapes can be accomplished by the establishment of alien trees which are often more tolerant of harsh site conditions than are native species. Tree plantations can facilitate re-establishment of native plant species through effects on soil fertility and water relations, forest floor structure, and understory microclimate (IPIF 2001).

## Forest Management Services

The primary focus of the Forest Management Services team is to secure adequate funding for American-affiliated islands in the USDA Forest Service's State and Private Forestry Program area. Team members work with island forestry leaders and others to rationalize a new method of allocating and distributing State and Private Forestry program funds. This team emphasizes six primary programs of support which are identified below.

- Restoration. The main advance has thus been increasing and broadening involvement of island communities in the management of forests.
- Stewardship. Forest stewardship projects are continuing to be expanded on all islands.
- Forest Health. This team has focused on control of *Imperata cylindrica* with a project on Yap, and with the publication of a field manual.
- Economic Diversification and Development. The Hawaii Forestry and Communities Initiative (HFCI) continues to attract partners and implement actions of the Hawaii Tropical Forest Recovery Plan.
- Inventory, Planning, and Monitoring. More progress is being made in this area to create site-specific inventory data and plans.
- Public Information and Involvement. The Urban and Community Forestry and Forest Stewardship programs and networks developed through HFCI are beginning to implement the goal of supporting and operating an information center jointly with the State Division of Forestry and Wildlife, DLNR (IPIF 2001).

## Tropical Forested Wetlands

The Tropical Forested Wetlands team conducts research on ecosystem services provided by mangrove forests. Growth rates of important tree species, seedling growth and survivorship patterns, and sediment accumulation rates, along with the consequences of harvesting both firewood and mangrove crabs, are being measured in mangrove forests to provide a basis for long-term forest management policies. Team scientists are responsible for providing wetland expertise to a diversity of Pacific islands with the majority of studies located in the Federated States of Micronesia (FSM). As a result, ecological processes related to tropical forested wetlands as well as links with surrounding ecosystems can be assessed within a manageable spatial framework. Some of this team's research activities include the following:

- The island of Kosrae, FSM, has served this team as a baseline for examining characteristics of a largely intact mangrove stand and the ways in which people use wetlands. This continues to be the center of research efforts, but this team is now expanding projects to other islands within the FSM.
- Ponape Agriculture and Trade School. The team is working with this school's staff on several educational modules that will incorporate principles of natural resource ecology and management, based on mangrove research plots, into the curriculum.

- In Hawaii, the team has documented the rates of production of litter, and of propagules in particular, in invasive stands of *Rhizophora mangle* which were introduced to the State in the early 1900s. By investigating early regeneration requirements, scientists hope to lead control efforts since mangroves are encroaching upon native Hawaiian historical sites and critical habitat for endangered shorebirds (IPIF 2001).

## 2.3 PROJECT NEED AND OBJECTIVES

The need for developing the USDA PBARC and IPIF facilities can be summarized under the following main issues: 1) several existing research facilities have deteriorating building conditions which need repair or replacement; 2) many facilities lack sufficient space to accommodate existing and future staff demands; 3) permanent and consolidated facilities are needed to allow these agencies to better plan, fund, and staff projects and improve efficiency of operations; and 4) modernized facilities are needed to sustain current and future research efforts which support opportunities arising within the State's growing diversified agriculture industry. Therefore, the proposed PBARC project is needed to provide new consolidated state-of-the-art facilities serving both PBARC and IPIF research activities and staff requirements.

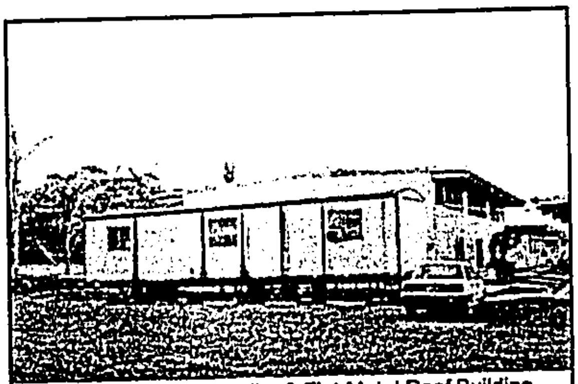
### 2.3.1 Limitations With Existing PBARC Facilities

**Conditions Of Existing Facilities**

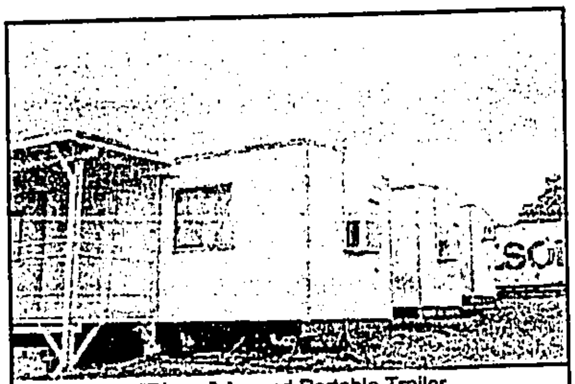
The condition of existing facilities at the PBARC Stainback Facility located outside of Hilo town is generally poor. Most of these facilities suffer from varying degrees of deterioration and damage due to age, weather (rotting and rust), and termite damage. Furthermore, many of the facilities (trailers and Matson containers) being used are normally temporary structures and thus not suitable for serving as permanent high quality research facilities. As a result, the existing condition of this Stainback Facility is deficient in supporting PBARC's research activities.

Photographs of buildings and structures associated with this Stainback Facility are provided in Appendix A. A brief description of some of the problems associated with these facilities is provided.

- Relatively flat metal roofs on metal buildings are particularly prone to rusting at seams and overlap areas. Rust is also occurring on several of the exterior walls associated with these buildings.
- The Matson containers, trailers, and sheds being used are suffering from moderate to extreme rust damage.


Rusting Portable Trailer & Flat Metal Roof Building

- Wooden trailers brought to this facility from their Kauai facility appear to have suffered significant weather damage both prior to and subsequent to this move.
- On a few trailers, a plastic covering is being used to keep moisture out of the structure's rotting wood resembling a "diaper" around the trailer's back.
- Flooding has occurred in the past at a particular building area threatening the interiors of buildings. Concrete drainage gutters were recently installed but have not yet been tested by a large rain.


"Diaper" Around Portable Trailer

- Concerns have been expressed regarding inadequate jack studs being used to support some of the wooden buildings.

The PBARC facility in Manoa Valley is in relatively good condition due to maintenance of facilities. However, the buildings are about 30 years old so existing utilities serving it are in need of an upgrade. In particular, the electrical utilities and water lines are not sufficient to accommodate their activities. As a result, this has forced staff to adapt to the available electrical loads by using smaller air conditioners, balancing work to not overload the system, and not bringing in new desired equipment. Water pressure is somewhat low, resulting in adjustments to their activities. Another minor constraint is a lack of available parking space on the site forcing staff to park on streets or on open areas of the property.

**Shortage Of Available Space**

There is a severe shortage of space for PBARC staff at the Stainback Facility resulting in bringing temporary facilities such as portable trailers and Matson containers on site for use as offices, storage, and laboratories. Even with these temporary facilities, there still is not enough space to provide scientists and technicians with enough room to effectively conduct their daily activities or store items. Furthermore, these trailers and Matson containers do not serve as sufficient permanent facilities to properly support the various research activities being conducted by staff.

The lack of adequate space for staff creates severe limitations for PBARC in planning and conducting research work. Additional staff cannot be brought in to conduct new or support existing research studies due to the shortage of available space. The condition of these facilities further constrains their ability to conduct research since equipment and storage cannot be adequately accommodated. Staff does not have office space in these trailers to conduct their work nor do they have sufficient laboratory space. Also, flexibility is needed to prepare for and conduct new studies at the Stainback Facility because the existing staff may have to be substantially increased to conduct a new research study. However, the space constraints inherent in the existing facility limit the staff's ability to take on new research projects.

At the National Clonal Germplasm Repository adjacent to the Stainback Facility, space constraints are also evident although they are not as severe as compared to the Stainback Facility. One of the existing buildings at the Stainback Facility was recently renovated to serve as additional laboratory and office space for this program to help alleviate space constraints. Equipment theft has also been a problem in the past at the NCGR due to deficient security associated this facility, however, new fencing and an alarm system has been added to try to alleviate this.

The PBARC facility in Manoa Valley is faced with two constraints which are: 1) a need for more space to accommodate its staff's research activities, and 2) the need for a new facility due to the pending reclamation of the property by the U.H.-Manoa. The existing facility is also short of space needed to conduct necessary research activities, which has constrained its staff's ability to conduct activities or plan for future research. The space shortage has limited the staff's ability to: 1) increase production of existing research activities, 2) hire additional staff, 3) bring in new equipment, and 4) take on new research projects.

As noted above, the U.H-Manoa has indicated an intention to reclaim this property for other uses. The current lease expires this year and would need to be extended again on a short-term basis due to an unavailable relocation site. As a result, the ARS is faced with potentially losing its lease resulting in the need to find a replacement location for this PBARC facility. This pending relocation also limits the ability of PBARC to fund improvements for existing facilities since the investment would not be economically feasible. Given the shortage of existing available facilities, the pending relocation of this facility further exacerbates existing problems with facilities.

**Need For Permanent Facility**

The PBARC is limited in its ability to properly plan for, fund, and conduct research studies because it does not own any of the facilities used to house its various programs. The facilities being used by PBARC are all leased space from the State with the exception of their Administrative Office in downtown Hilo which is being leased from the private building landowner. These facilities are thus subject to economic conditions occurring within the State which has occasionally resulted in them being displaced.

Another problem is that these facilities are spread out over several locations and islands which reduce the staff's ability to efficiently conduct and coordinate research activities. As an example, meetings with scientists and other staff need to be conducted at the Administrative Office in Hilo town due to space constraints at the Stainback Facility. This decreases inefficiency in operations due to time wasted by staff traveling between locations.

There are also limitations in the transport of products between facilities. For example, products generated at the PBARC facility in Manoa are shipped to the Stainback Facility for research. However, such products often get damaged in transit which, in turn, affects the quality and effectiveness of research activities. Communication among scientists, technicians, and other support staff is also constrained due to the separation of facilities on different islands. Thus, with a new consolidated facility, more efficient communication and coordination could be conducted where staff can easily and immediately inspect operations for problems or changes, or better communicate needed changes occurring within the laboratory or field. Therefore, a new facility allowing for the consolidation of facilities and operations is needed.

Since the U.H.-Manoa is planning to reclaim the PBARC's Manoa facility for its own campus facilities and activities, this facility will need to relocate to another location. The lease for this facility has already been extended three times, and is about to expire again this year. Given the uncertainty of the facility's status once the current lease expires, PBARC staff currently cannot plan research studies for this facility. If the facility is forced to move upon the expiration of the lease, planning and research efforts will be further delayed as it is not known where the future facility would be located, nor what the condition of the infrastructure and buildings would be at the new location. Consequently, PBARC needs to have its own permanent facilities, which are owned by USDA, so that staff can better plan and secure funding for their activities, adequately equip their facilities, and recruit additional staff to conduct research activities.

### 2.3.2 Limitations With Existing IPIF Facilities

The problems and limitations associated with existing IPIF facilities are similar to those experienced by PBARC. The primary problem is a shortage of space with which to accommodate the operations and research activities of various IPIF programs. The overall lack of space limits the types and amount of research that can be performed at its facilities, and negatively impacts the ability of IPIF programs to recruit scientific collaborators. Additionally, State of Hawaii fiscal difficulties are also creating increased pressure on IPIF to find other accommodations.

__Space Limitations With Current Facilities__


Crowded Conditions in Hilo IPIF Office

The IPIF Honolulu office is currently limited to only administration and operational activities due to its space being located within the existing State building. As a result, laboratory experiments and other related research activities can't be conducted there which limits the staff's use of the space and divides this facility's operations with the Hilo facility. This split in operations results in most of the scientists operating out of the Honolulu office while the field work is done on the Island of Hawaii. This makes the coordination and efficiency of IPIF operations difficult.

The Hilo facility is very limited in space with about 11 persons presently working in a facility that has space designed for only 5 to 6 persons. Photographs of the cramped operating conditions are included in Appendix A. This lack of space is the biggest problem at this facility which directly impacts the ability of IPIF staff to conduct research, perform data analysis and laboratory work as well as provide personnel support.


Hilo IPIF Lab and Conference Room

Due to these space constraints, the existing laboratory has to be used as temporary office space and conference room, particularly when visiting scientific collaborators are hosted by the facility. Other important functions which cannot be accommodated due to the space shortage include: an adequate laboratory to conduct tests; a meeting room; sufficient storage space for specimens, data collections, and reference material; sufficient space for field, office, and laboratory equipment; and sufficient greenhouse space. Much of their laboratory work also has to be sent out for analysis rather than being performed at their facility due to insufficient space. Furthermore, the State DOFAW is also in need of additional space and could possibly request the use their building, further exacerbating the situation.

IPIF needs more staff to support its research activities being conducted; however, there isn't any more space available to accommodate them. IPIF administrators foresee gradual growth of 5 to 10 percent a year in staff to accommodate the facility's increasing scope of operations and activities. Also, further space is needed to accommodate national and international scientific collaborators who, together with the facility's staff, conduct important and mutually beneficial research at this facility. Furthermore, the facility currently lacks enough space with which to accommodate post-doctoral researchers who perform valuable research and analysis, and summer interns from the University of Hawaii who assist with research projects. Thus, existing conditions directly limit the staff's ability to conduct research activities, expand research programs, hire more staff as needed, and host scientific collaborators as well as post-doctoral researchers.

**Implementing TheTropical Forestry Plan's Recommendations**

The present IPIF facilities do not fully support this program's capability for expanding research, collaborating with other agencies, and supporting the USDA Forest Service's mission. The Forest Service's tropical forestry mission is to increase knowledge and technology for the protection, conservation, and wise use of all U.S. tropical forests and for tropical forests globally. In pursuing this mission, the Tropical Forestry Plan proposes 25 various recommendations to promote the recovery of endangered tropical ecosystems.

To achieve these recommendations, the Tropical Forestry Plan describes staffing and facilities needs in order for the IPIF to implement fully an integrated research and management services program addressing Task Force priority recommendations. It called for staffing of 43.5 scientists, professionals, technicians, and support personnel by the year 2000. Currently, IPIF has a staff of about 30 persons due to space constraints. It also proposed building a new, strategically located facility to provide research staff with laboratories, green houses, offices and storage space (Leo A Daly 2001). Thus, the project is needed to allow IPIF to fully implement the Plan recommendations.

### 2.3.3 Support For State's Agricultural Industry

The State's agriculture industry is transforming from large-scale plantation farming (sugarcane and pineapple) to diversified agriculture operations conducted on smaller farms. The emergence of diversified agriculture is thus creating opportunities for this industry. However, there are several constraints and challenges requiring the need for improved research activities that are conducted by both PBARC and IPIF. Thus, improved research facilities are needed to support these activities.

**Transformation Of Plantation Farming**

Since the late 1800's, agriculture in the State of Hawaii has been centered on large-scale plantation farming consisting of sugarcane and pineapple. Recently, these industries have suffered precipitous declines, due in part to increasing production costs, competition from abroad, and declining U.S. government price supports (USDA 1998). This substantial decline in large-scale sugarcane and pineapple production has significantly changed the State's agricultural industry.

Sugarcane production in the 1900's occurred on all islands and involved a total of about 220,000 acres of land producing between about 8,000,000 to 11,000,000 tons of sugar annually. In 1999, this total had decreased to only about 62,000 acres of land for sugarcane production on the islands of Kauai and Maui producing about 2,891,500 tons that year. Pineapple had about 76,700 acres of land in production at its peak in 1957 and has steadily decreased to only about 19,900 acres in 1997 (HARC 2000).

The thousands of acres of sugarcane which have been taken out of production has resulted in the displacement of more than 3,500 sugar workers state-wide having a large negative impact on the State's economy (USDA 1998). Since 1972, the overall number of wage and salary jobs in the agriculture industry decreased by 4,000 workers from about 11,200 (1972) to 7,200 in 1997 (BOH 1999).

**Emergence Of Diversified Agriculture**

The State of Hawaii's agricultural industry has consequently been going through a period of changing agricultural systems. Smaller farmers are now replacing much of the corporate large-scale agricultural productions of the past. This non-plantation agricultural sector has capitalized on large plantation closures to become a small but leading growth industry. Former sugar and pineapple lands throughout the State are being transformed into small and medium-sized farms by agricultural entrepreneurs taking advantage of the first opportunity in nearly a century to gain access to these prime agricultural lands (BOH 1999).

This change in the State's agricultural system is resulting in the growth of diversified agriculture. The term "diversified agricultural" used in this document refers to agricultural activities in the State of Hawaii other than sugarcane or pineapple. Diversified agriculture thus includes activities such as macadamia nuts, floriculture and nursery products (cut flowers, orchids, foliage, etc.), coffee, taro, fruits and vegetables, livestock ranching, and aquaculture.

Many of the displaced plantation workers have thus entered into tropical fruit, vegetable, and ornamental crop production on farms that are small in comparison to the size of typical U.S. mainland family farms. Many farmers in Hawaii make a living producing ornamentals, fruits, or vegetables on only a few acres of land. Commodities produced are mostly for local consumption, although some products, including bananas, ginger, papaya, and various ornamental plants and flowers are exported (USDA 1998). The emergence of diversified agriculture in the State is helping to change and strengthen the agricultural industry as a whole. Table 2.1 shows the change in farms values by agriculture system from 1981 to 2000.

**Table 2.1 State of Hawaii Farm Values**
**1981-2000 ($1,000 dollars)**

| Year | Sugar (unprocessed cane) | Pineapples (fresh equivalent) | Diversified Agriculture | Total Farm Values |
|---|---|---|---|---|
| 1981 | 207,500 | 89,745 | 192,257 | 478,502 |
| 1982 | 230,800 | 94,364 | 182,104 | 507,268 |
| 1983 | 266,900 | 100,376 | 201,138 | 568,414 |
| 1984 | 256,200 | 89,928 | 204,389 | 550,517 |
| 1985 | 233,800 | 99,720 | 231,197 | 564,717 |
| 1986 | 233,800 | 99,720 | 231,197 | 564,717 |
| 1987 | 218,000 | 99,286 | 240,012 | 557,298 |
| 1988 | 209,900 | 107,402 | 256,660 | 573,962 |
| 1989 | 210,300 | 98,310 | 276,438 | 585,048 |
| 1990 | 213,800 | 106,365 | 275,789 | 595,954 |
| 1991 | 174,900 | 107,775 | 268,707 | 520,227 |
| 1992 | 153,700 | 102,100 | 264,427 | 520,227 |
| 1993 | 163,000 | 79,850 | 271,094 | 513,944 |
| 1994 | 160,100 | 78,890 | 273,826 | 512,816 |
| 1995 | 127,700 | 87,360 | 288,530 | 503,590 |
| 1996 | 108,100 | 95,914 | 306,207 | 510,221 |
| 1997 | 85,500 | 91,721 | 327,456 | 504,677 |
| 1998 | 87,400 | 92,776 | 329,886 | 510,062 |
| 1999 | 86,800 | 101,448 | 342,846 | 531,094 |
| 2000 | 62,646 | 101,530 | 357,279 | 521,455 |

Notes: Aquaculture included beginning in 1993
Source: Hawaii Agricultural Statistics Service (2001)

Total farm level revenue rose 3 percent in 1999 to an 8-year high of $531 million on the strength of pineapple and diversified agriculture. In 2000, farm level revenue totaled $521 million which represents 2 percent less than in 1999, but still the second highest total in the past 9 years. The diversified sector continues to expand posting farm level revenues at $342 million in 1999 and a record $357 million in 2000 (HASS 2001). This reflects a considerable change from 1981 when total farm value was $478 million of which sugarcane comprised $207 million and diversified agriculture only $192 million.

By exploiting niche crop opportunities, Hawaii's agriculture industry is now becoming an increasingly diverse mix of specialty crop and livestock products both for export and import substitution, and of medium and large-scale orchard producers such as coffee, macadamia nuts, and cocoa (USDA 1998). Increasingly, the future of diversified agriculture and aquaculture is being defined at the frontiers of biotechnology. The world's largest seed companies have utilized genetic engineering and other techniques for crop improvement to raise Hawaii's seed industry to parity with crops such as coffee. Agro-forestry and traditional forest-product industry growth are other potentials (BOH 1999).

**Diversified Agriculture Challenges**

It is clear that agricultural diversification is urgently needed in the State to fill the void left by the decline in sugarcane and pineapple production. Opportunities exist to expand and strengthen this portion of the State's agriculture industry, and there is ample fallow land available from former sugarcane and pineapple lands. However, there are several obstacles that must be overcome before agricultural diversification in the State can prosper. These obstacles are:

1. Adaptation of crops to Hawaii's environment. High-value crops must be identified and adapted to the State's climatic and soil conditions. Many of these potential crops exist in the National Clonal Germplasm Repository, but they require evaluation and genetic research before they can be released commercially.
2. Ability to resist plant diseases. Plant diseases must be controlled by developing resistant crop varieties through either classical plant breeding, genetic engineering, or through the use of other disease control strategies.
3. Development of pest management systems. Environmentally sound area-wide pest management systems must be developed to allow farmers to efficiently produce high quality crops that can effectively compete in the world marketplace. Hawaii has a multitude of insect and other arthropod pests, but limited tools to control them.
4. Quarantine treatment development for export. For many crops, quarantine treatments must be developed to permit their export. Hawaii is subject to a Federal quarantine on the movement of most agricultural products to the U.S. mainland. All affected commodities must be treated in such a way to remove or kill important plant pests. These strict quarantine restrictions have prevented the development of a diversified agricultural export industry in Hawaii.

   The lack of export markets has severely limited the development of a tropical fruit industry in Hawaii. Although heat, cold, and irradiation treatments have been developed to kill fruit flies in a number of tropical fruits, there are still many commodities for which treatments are not available and many import pests other than fruit flies for which treatments are needed. Development of treatments to allow export of commodities produced in Hawaii is clearly essential to agricultural diversification (USDA 1998).

Clearly, there are many problems identified that can severely limit the production of diversified agricultural crops and the growth of this industry. Most of the production and processing problems are readily solvable by modern research approaches. Solutions will require the combined efforts of the USDA ARS, USDA IPIF, Hawaii Agricultural Experiment Station and Extension Service, and other private and public research organizations within the State and the Pacific Basin. Without solutions to these problems, the development of small farm diversified agriculture in the State of Hawaii will be greatly curtailed.

**Need For Further Research Activities**

Many problems exist as Hawaii's agriculture industry transitions from its past sugar and pineapple plantations into future diversified agriculture. Leading the way to this future must be a strong, cutting-edge research program. Advantages to the farmer from research are short-lived, therefore, the farmer is dependent upon a continuous flow of new research results (ARS 2001).

Besides the USDA PBARC and IPIF, there are other private and public research organizations located in Hawaii that serve as excellent research and technical resources. These include the State Department of Agriculture, University of Hawaii at Manoa, University of Hawaii at Hilo, Oceanic Institute (aquaculture), and the Hawaii Agricultural Research Center (HARC) that was formerly the Hawaiian Sugar Planters Association (USDA 1998). Thus, research activities conducted by PBARC and IPIF greatly support and complement the efforts conducted by these other institutions.

Agriculture in the State of Hawaii does not compete with other states, but its competition does come from other tropical areas in the Pacific Basin. Many of the countries competing with Hawaii have lower standards of living, lower costs of production, and in most cases higher levels of government research commitments. The advantage that Hawaii has is the perception that its products are of the world's highest quality. For example, root ginger grown in Hawaii brings $20 to $40 for a 30-pound box while Chinese ginger brings only $6 to $12 for a 30-pound box. In order for the advantage to remain, further research is required to ensure that Hawaii's products are of high quality and safe (ARS 2001).

In other situations, the State must develop niche products such as Kona coffee, which is one of the world's highest quality coffees that can only be grown in a defined region on the Island of Hawaii. Niche markets are hard to develop and research is required to help define the uniqueness of the products and to identify new crops that can be produced for these markets.

Today, Hawaii imports over 90 percent of the food consumed. Thus, agricultural income could be greatly enhanced if the State could produce a larger percentage of the food consumed locally. Diseases and insects limit the production of food crops. Thus, research is needed to assist the new family farmers in dealing with such pests. Organically grown products bring a premium price when they are consumed in the State or when they are exported to other parts of the world. Research on area-wide control of insects thus has a real possibility in reducing the amount of insecticide applied directly to crops, and should aid in both traditional and organic production (ARS 2001).

Production of tropical fruits has a great potential and research is needed on the initiation of flowering on tropical trees. For the most part, only fresh produce is sold to other markets. Research is also needed on the development of value-added products. For example, only 6 to 7 out of every 10 harvested papayas met the quality standards to sell fresh produce while the remainder is discarded as waste. Hence, many possibilities exist to use these waste papayas in value-added products.

Because the islands of the State are volcanic in origin, many climatic zones exist, and each of these zones has unique production possibilities. Research is needed to relate the climatic zones to production potentials that can do much toward the development of diversified agriculture and niche products. Thus, research is needed to develop the full potential of the many aspects of this area.

Along with the research needs of Hawaii and the Pacific Basin, the ARS through PBARC has a further responsibility to support its sister agency the USDA Animal and Plant Health Inspection Service (APHIS) in its responsibilities to provide quarantine measures to reduce the risk of exporting diseases and insects from Hawaii to other parts of the world. The ARS also needs to assist APHIS in its mission to raise sterile fruit flies for release in California and other states to control the Mediterranean fruit fly. This responsibility also takes a prominent role at the forefront of PBARC research activities (ARS 2001).

### 2.3.4 Objectives Of Proposed Project

Development of the new PBARC complex and IPIF complex would support the ability of these agencies to better conduct and expand their current research programs. As previously discussed, the facilities utilized by these programs suffer from several deficiencies and constraints which limit the ability of scientists to efficiently conduct activities. Therefore, the proposed project would provide state-of-the-art, consolidated, and permanent facilities to serve both existing and future PBARC and IPIF research activities and staff requirements. These research programs would benefit the State's economy by addressing challenges affecting the growth and development of our diversified agricultural industry as it transitions away from plantation farming.

<u>Objectives Of PBARC Complex</u>

Development of the new PBARC complex would allow this agency to better fulfill its mission which is to:

1. Improve the economy and well-being of the State and Pacific Basin societies by strengthening the agricultural sectors to provide future generations with enhanced opportunities in agriculture;
2. Strengthen small farm profitability by increasing the efficiency of farming practices consistent with the preservation of the environment;
3. Develop crop varieties to promote agricultural diversification for expanding market exports; and
4. Develop pest and post-harvest technologies that satisfy quarantine requirements, improve product quality and shelf life, and promote crop export.

This complex would provide immediate relief for PBARC personnel by providing them with new state-of-the-art facilities in which to conduct their research work thereby addressing the deficiencies associated with existing facilities and allowing them to acquire new or additional equipment. The new buildings would also provide considerably more space alleviating the significant space shortage experienced at existing facilities. PBARC would then be able to hire additional staff to support or expand existing research programs and take on new research projects. Finally, administrators and staff would be better able to plan and fund new research as the new complex would provide the flexibility to hire additional staff or meet other facility requirements.

The new PBARC complex would also be a permanent facility owned by the USDA. As a result, staff would be able to properly plan for, and more importantly fund, research studies since they would not be restricted by short-term leases, potential displacement, or other restrictions associated with the current buildings. Operations would also be more centralized and consolidated at this new complex allowing personnel to operate more efficiently in such areas as communication, arranging meetings, or resolving modifications with research activities.

Economic benefits to the State's agricultural industry would also be realized with the project because the results of research studies will support the growing diversified agricultural industry. The return per acre in Hawaii is tremendous, averaging between $3,000 to $40,000 net (ARS 2001). The potential investment and return in agricultural production is about 5 times the amount spent for research activities. Diversified agriculture would especially benefit from expanded research efforts because tropical crops have not been the focus of extensive research and therefore, much is left to be learned about them.

Hence, the success of the State's diversified agriculture industry is dependent upon its ability to address several challenges which include: 1) the adaptation of crops to Hawaii's environment, 2) the ability to resist plant diseases, 3) developing environmentally sound pest management systems, and 4) addressing quarantine treatment to allow export of agricultural products. This project would support PBARC's efforts in finding solutions which are readily solvable by modern research approaches. Research results would also support and complement the efforts conducted by other agricultural organizations such as State Department of Agriculture, U.H.-Manoa, U.H.-Hilo, Oceanic Institute (aquaculture), HARC, and USDA's Animal and Plant Health Inspection Service.

**Objectives Of IPIF Complex**

The present IPIF facilities in Honolulu and Hilo do not fully support this agency's capability for expanding research, performing collaboration with other agencies, and promoting the Forest Service's mission. Therefore, construction of a new IPIF complex is part of the overall facility program to strategically locate IPIF staff and resources to accomplish its mission as defined in the 1995 Tropical Forestry Plan. As already discussed, the vision of the Tropical Forestry Plan includes construction of new facilities to accommodate most of the Institute's current scientific, professional, and technical staff and new employees.

This new IPIF complex would provide immediate relief for personnel by providing new state-of-the-art facilities to conduct their research work, thereby addressing the severe space deficiencies associated with existing facilities. The new complex would also provide considerably more space for staff to conduct research and office activities, and would allow them to hire additional staff to support or expand existing research programs and take on new research projects. IPIF personnel would be better able to plan and fund new research studies since they would have the flexibility to hire additional staff or meet other facility requirements. These improvements would thus support the staff's efforts to accomplish IPIF's mission as defined in the 1995 Tropical Forestry Plan.

## 2.4 DESCRIPTION OF PROJECT

The Pacific Basin Agricultural Research Center project will consist of new state-of-the-art research facilities constructed for both the PBARC and IPIF on a 30-acre project site. This site would be leased directly from the State DLNR to the USDA, ARS. The ARS will grant to the Forest Service the right to construct, occupy, and maintain their IPIF facilities on a 5-acre site within the 30-acre property. Figure 2.7 shows the conceptual site plan for this entire 30-acre project site.

### 2.4.1 ARS Pacific Basin Agricultural Research Center

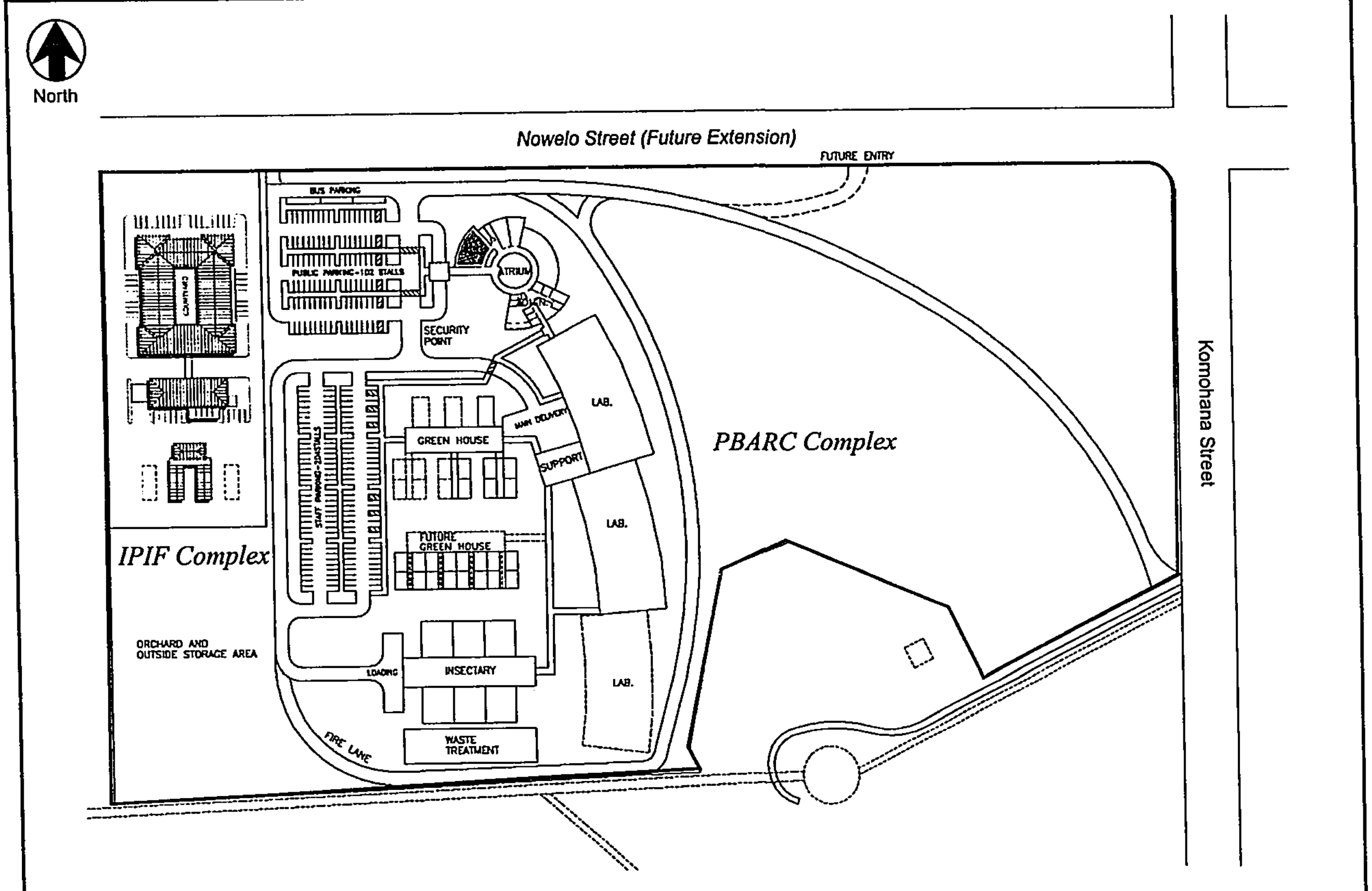
The USDA Agricultural Research Service's new Pacific Basin Agricultural Research Center complex is planned to be located on about 25 acres of the entire 30-acre project site since about 5 acres would be used for the IPIF complex. This complex will be sited on the higher elevations associated with the property overlooking the U.H.-Hilo astronomical facilities below on Aohoku Place in the U.H.-Hilo's University Park. The new PBARC complex will allow for the consolidation of some existing facilities and research laboratories which are now located on various islands. Figure 2.8 shows the preliminary conceptual Site Plan for this PBARC complex.

**<u>PBARC Facilities Description</u>**

This new PBARC complex is planned to have a total of approximately 122,575 square feet of floor area. This complex will be comprised of five main components which are: 1) Administration Complex, 2) Laboratory Facilities, 3) Insectary Complex, 4) Greenhouse Complex, and 5) Central Utilities Plant (RMAAI 2001). A summary of the square footage associated with these components is provided below.

**Floor Area Summary of PBARC Complex**

| | Description | Floor Area (sf) |
|---|---|---|
| 1. | Administration Complex | 16,000 |
| 2. | Laboratory Facilities | 60,000 |
| 3. | Insectary Complex | 24,000 |
| 4. | Greenhouse Complex | 13,225 |
| 5. | Central Utilities Plant | 9,350 |
| | Total Floor Area | 122,575 |

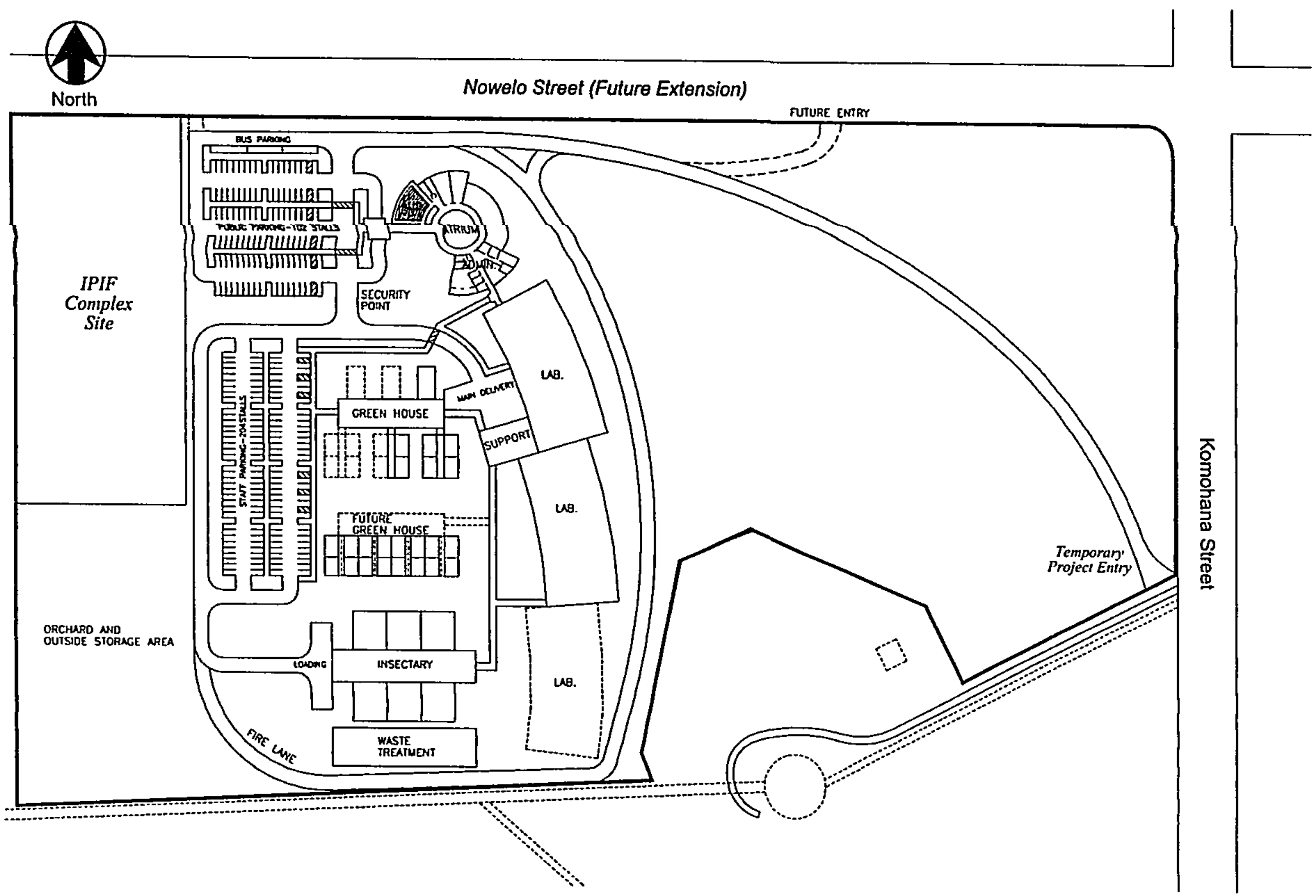



# PRELIMINARY CONCEPTUAL SITE PLAN FOR PBARC PROJECT

USDA Pacific Basin Agricultural Research Center
USDA ARS & Forest Service

**Figure 2.7**

*Source:*
*Richard Matsunaga & Assoc.*
*Leo A. Daly*




# PBARC COMPLEX PRELIMINARY CONCEPTUAL SITE PLAN

USDA Pacific Basin Agricultural Research Center
USDA ARS & Forest Service

**Figure 2.8**

Source:
Richard Matsunaga & Assoc.

This PBARC complex is planned to be designed utilizing single-story buildings associated with the administration building and laboratory facilities. The insectary, and greenhouse facilities are also planned to be single-story but may have taller ceiling heights. Figure 2.9 includes a preliminary perspective drawing of this complex. The height of these buildings and accessory facilities would be within the 45-foot height limit applicable for the site under the County's zoning district standards for the Agricultural District. Remaining undeveloped areas on the project site may either be left undeveloped, or used for orchards, field plots, or demonstration gardens as part of research activities conducted by PBARC along with the IPIF.

The entrance to this PBARC complex would be from a driveway connecting with the future planned extension of Nowelo Street. As shown on the PBARC preliminary conceptual Site Plan, Nowelo Street would be extended from its current intersection with Komohana Street in a western direction. However, until Nowelo Street is extended, a temporary driveway entrance may be provided from an existing private access road from Komohana Street serving the adjacent County water reservoir and HELCO substation. This would serve as the interim driveway to the site since the County will not allow any new driveway connections to Komohana Street unless it is a controlled traffic intersection. The current option being considered is having Nowelo Street improved and extended a short distance now to allow a driveway to connect with this extension. The University is currently working with the County to expedite the extension of Nowelo Street.

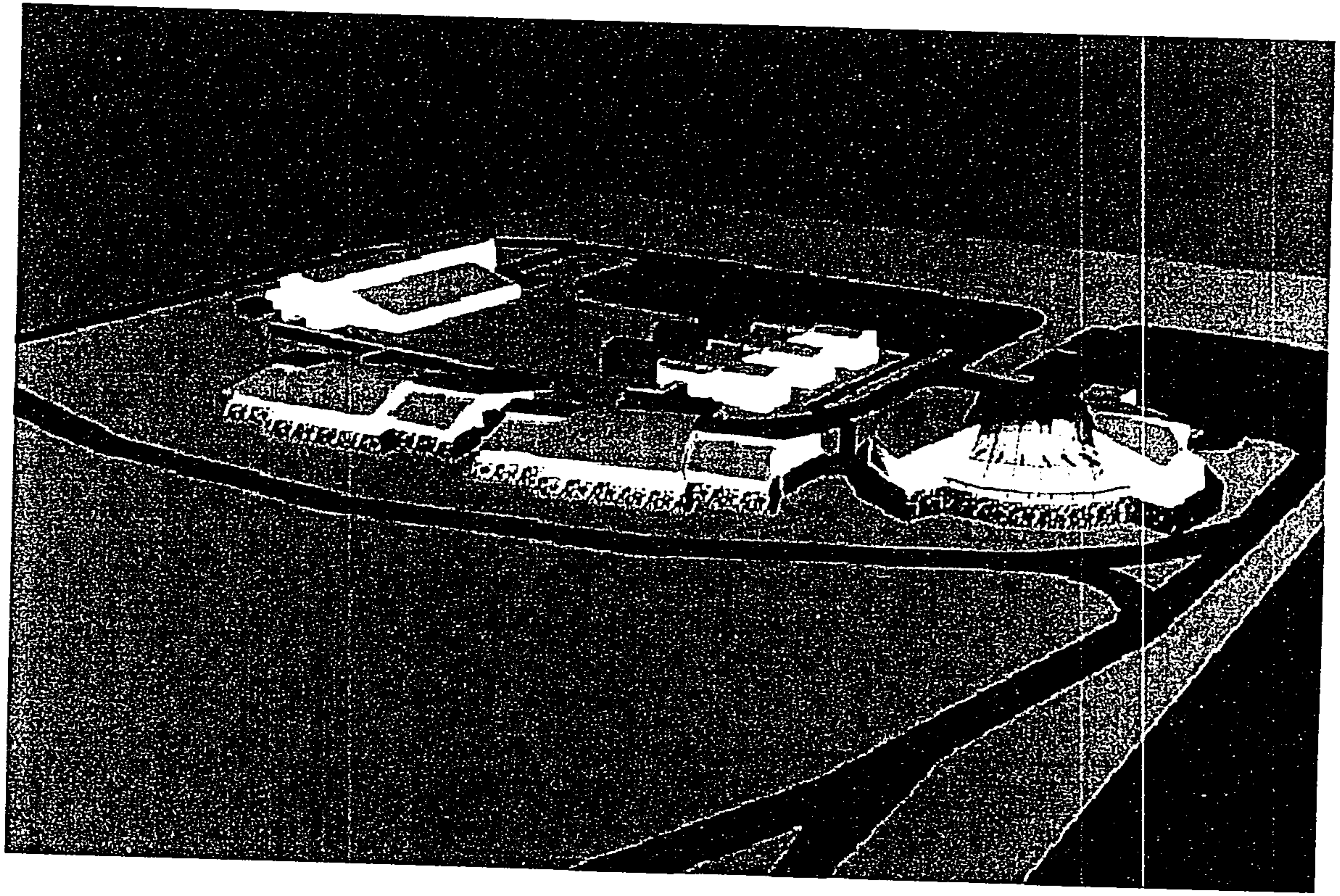
As shown on the Site Plan, there would be parking lots for both PBARC staff and visitors. About 100 stalls is planned to be provided for visitor parking along with several stalls for buses. Parking for PBARC staff would include a separate lot with secured entry and about 200 parking stalls. Deliveries to the laboratories, greenhouse and insectary will use this same secured entrance.

This facility would also have a security system incorporated in its design. Various forms of security being considered include some type of fencing for the facility, motion detectors and alarms, on-site security, cameras, and card readers at doors and gates (RMAAI 2001). The actual design to be conducted for this complex would determine specific building and other facility design details.

Administration Complex

A main component of this complex is the Administration Complex, which would consist of administration facilities and office space totaling about 16,000 square feet of floor area. An auditorium with about 150 seats would be provided as part of this Administration Complex. An arboretum is also being considered for possible inclusion as part of this complex's main entry design features. This arboretum could serve as part of the facility's main entrance and function as a public gathering area as well as an arboretum featuring plants and representing Pacific Island cultures.

This preliminary building concept for this complex may include a transparent (glass) cinder cone structure, evocative of the volcanic origins of the Island of Hawaii. The glass cone could provide visitors with views of the environment and panoramic views of Hilo town and Hilo Bay. A reception and information station would be located at the entrance to greet visitors and provide information. Other accessory facilities may include a daycare center and lunch room for staff.



**PERSPECTIVE VIEW OF PBARC COMPLEX**

**Figure 2.9**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source:*
*Richard Matsunaga & Assoc.*

SSFM INTERNATIONAL

Administration facilities provided in this complex would include several offices for PBARC staff. This would include offices for the Director, administration staff, support personnel, building maintenance, and a conference room for about 12 people. A telecommunications room would serve as the main telecommunications system location providing connection to the research wings of this entire facility including laboratories, greenhouses, and the insectary (RMAAI 2001).

Laboratory Facilities

Laboratory Facilities are planned to consist of up to three large buildings as shown on the Site Plan having a total of about 60,000 square feet of floor area. This Laboratory complex is planned to have offices for about 35 scientists, 18 technicians, and include a conference room. The facility would include 16 wet labs and 16 work areas for research staff and technicians, and provide for shared space supporting these laboratories such as equipment and storage rooms, cold and warm rooms, and other accessory facilities. A Support Building would also be provided for these Laboratories to provide loading and receiving docks, an electrical workshop, storage for field equipment, plant and soil processing rooms, and a freezer storage room.

Insectary, Greenhouse And Utility Plant Facilities

The Insectary Facility is planned to have about 24,000 square feet of floor area. Office space would be provided for a manager, two staff persons, and a conference room. The main areas of this facility may include a central mixing and settling area, storage areas for equipment, and insect rearing modules designed in conformance with State APHIS requirements. Other space would be provided for waste collection and wash down of equipment.

The Greenhouse Facility is planned to have a total of about 13,225 square feet of floor area. The three main components of this facility are anticipated to be a headhouse, growth room, and greenhouses. The headhouse would include rooms for plant and soil processing, storage of fertilizer, pesticides, etc., and a manager's office. The growth room would have work space along with the growth room, and the greenhouse would include several greenhouse zones with connecting corridors. These facilities would be designed to conform to State APHIS Insect Facility Guidelines.

The Central Utility Plant would have a generator room, chiller room, cooling towers, electrical room, telephone room, and other accessories needed to service the PBARC complex. The total floor area for this utility plant would be about 9,350 square feet (RMAAI 2001).

Wastewater Treatment Plant

An industrial wastewater treatment system will be provided on the project site to treat wastewater from the insectary to meet disposal requirements. The fly-rearing process results in high biochemical oxygen demand level wastewater containing solids which need to be screened, removed, and then treated. A total land area of about 10,000 square feet is planned for this wastewater treatment system located adjacent to the insectary on the southern portion of the project site. Biological treatment would likely be based on the Sequencing Batch Reactor (SBR) technology, which is a process well-suited to the wastewater stream from the insectary and is used successfully at the CDFA facility in Waimanalo on the Island of Oahu (LCG 2001).

SBR treatment is performed in batches (i.e., not a continuous, flow-through process) and consists of five basic phases during a single treatment cycle: 1) tank fill, 2) aeration, 3) sludge settling, 4) supernatant decant, and 5) sludge withdrawal. Two SBR tanks, each capable of holding about 30,000 gallons in total volume, is planned to be provided. Sludge removed from the SBR tanks would be drained to a covered sludge drying bed approximately 500 square feet. An operations building will house a blower room and provide workspace for operations and maintenance, ancillary equipment, and storage. Further details of this wastewater treatment system are discussed in Chapter 6 under Wastewater Facilities.

Operation of the treatment plant will likely be managed by one day-shift employee for approximately 2 hours per day. Daily duties will include removing and cleaning the basket screen, operation of the SBR treatment cycles, record-keeping, and housekeeping. Periodic duties will include preventive maintenance and dried sludge disposal.

The primary method for effluent disposal currently planned would be water recycling. Treated recycled water could be used to irrigate demonstration gardens, ornamental plants, field plots, landscaped areas, and other undeveloped portions of the property. Irrigation facilities and landscaping plans will be developed in greater detail during the design phase of this project. A secondary disposal method being considered is a connection to the County sewer system. However, there is no available County sewer line adjacent to the site at this time. Availability of a sewer line connection would also be developed during the project's design and coordination with both the County and U.H.-Hilo.

**Landscaping Concept**

The PBARC facility would be landscaped incorporating development concepts that will be refined during the project's design. These concepts include: 1) establishing an overall sense of unity and harmony throughout the complex; 2) develop exterior spaces that provide enjoyment for both users and visitors; 3) utilize landscaping for functional purposes such as screening, shade, wind control, etc.; 4) consider long-term maintenance and water conservation principles; and 5) use native plant materials wherever possible and appropriate.

There are three major landscape zones that are planned to be designed: 1) the entry and arrival area, 2) administrative offices and parking areas, and 3) general property. A visually distinctive landscape is planned to create a sense of identity and arrival at the main entrance of the facility. The primary feature will be the facility's sign complemented with entry walls and the arrangement of palms or accent trees. Colorful and accent shrubs and ground covers will further enhance this entrance. Street frontages and the entry driveway would be landscaped with street trees or other appropriate landscaping to complement the surrounding environment.

The entrance to the Administration complex would be accentuated with plantings of tropical materials including palms, shrubs, and ground covers. Canopy-type trees are planned for all public parking areas to provide shade and screening. The remainder of the facility may be landscaped with a simple palette of low maintenance plantings. Inorganic material such as gravel, cinder, or mulch may be used as ground cover. Wherever possible, plant materials related to research activities would be incorporated into the landscaping design. An irrigation system would be provided for all landscaped areas using a separate water source dedicated for this use. If feasible, non-potable water from the on-site wastewater treatment system would be utilized. Native and drought tolerant plants would be used for landscaping as much as possible (RMAAI 2001).

**Consolidation Of PBARC Operations**

With development of this new PBARC complex in Hilo, many of the existing PBARC activities and research programs would be consolidated at this new complex. The current administrative office in Hilo town would be relocated to this new facility along with research facilities at the Stainback Facility. The National Clonal Germplasm Repository would be provided with additional facilities at the new PBARC complex, however, the field station and field plots would likely continue to operate on the current 200-acre University property.

On the Island of Oahu, the PBARC research program at the HARC facility in Aiea would continue. The facility in Manoa Valley may be relocated to the PBARC facility in Hilo allowing the U.H.-Manoa to utilize that property. If this Manoa facility and programs are relocated to the new PBARC site, those current PBARC staff would have the option to relocate to Hilo or transfer to a different Federal employment position in Honolulu. The PBARC site at Kapaa on the Island of Kauai would likely continue to be used as a technical work site for large scale field tests.

Research activities conducted at the new PBARC complex would be the same as those already being conducted at their current facilities located on various islands within the State. These research activities are centered on crop production, protection, and export issues that will facilitate enhanced production of agricultural commodities for local and export markets. Such research activities are intended to remove quarantine barriers and providing opportunities for farmers to grow and market high-value crops. Research areas are based upon the strategy of diversifying agriculture in Hawaii, creating high-value niche markets for agricultural exports, and increasing productivity and profitability of smaller farms. Hence, these research activities would include:

1. Developing plant varieties of fruit, vegetable, and ornamental crops adapted to island conditions and enhancing the cultivation of these crops;
2. Developing either chemical or genetic control measures for soil-borne and foliar plant diseases of tropical crops;
3. Developing environmentally sound control measures for fruit fly and other arthropod pests to allow production of quality crops; and

4. Developing post-harvest handling, processing, and environmentally sound disinfestation technologies against quarantine pests to facilitate export of commodities; and
5. Conducting educational programs for students and the public on research activities and hosting national and international researchers to share research work, developments, and collaborate on research projects.

The research program conducted at PBARC would likely be a combination of long-term programs conducted by core scientists and short-term projects overseen by core scientists but carried out by post-doctorates or research associates. The core research programs should form the nucleus of the center and should be discipline oriented. Short-term research projects would be closely coordinated with the needs of the State and Pacific Basin commodity groups. These short-term projects would range from 2 to 4 years in duration. Projects would be oriented towards short-term solutions to production or processing problems related to the development of new diversified agricultural systems in Hawaii and the Pacific Basin (ARS 2001).

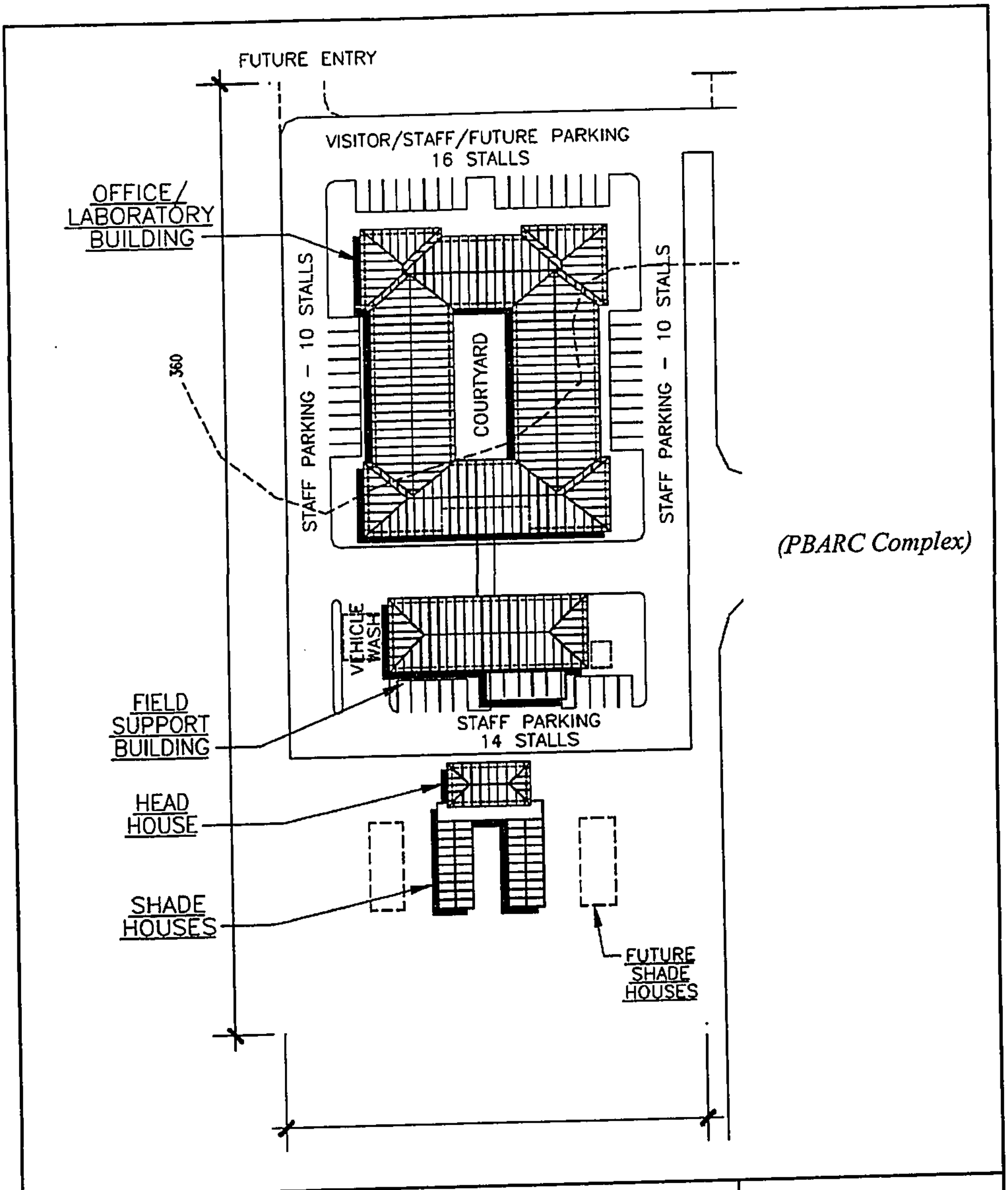
To fully utilize the new facilities, increased base funding will be obtained to support the research program expansion and additional scientist effort required. New positions created as a result of this new complex and increased research programs would include additional office staff, technicians, maintenance staff, etc. No permanent employees are being hired outside of Hilo right now due to the planned relocation of activities to the new PBARC complex. PBARC will try to recruit technicians and other supporting staff locally as qualified. Additional scientists will likely come from the U.S. mainland and University of Hawaii since they have a program supplementing USDA staff.

### 2.4.2 IPIF Pacific Southwest Research Station

The USDA Forest Service's new Institute of Pacific Islands Forestry complex is planned to be located on an approximately 5-acre portion of the entire 30-acre project site. Conceptually, this new IPIF complex would consist of three primary components which are: 1) a main Office/Laboratory Building, 2) a Field Support Building, and 3) a Head House and Shade Houses. Figure 2.10 shows a preliminary conceptual Site Plan for this new IPIF complex. This new IPIF complex is planned to have a total floor area of about 30,200 square feet allowing for the consolidation of existing staff and research activities. The actual floor area would be determined during the design phase of that complex. A summary of the square footage planned for these components is provided below.

**Floor Area Summary of IPIF Complex**

| | Description | Floor Area (sf) |
|---|---|---|
| 1. | Office / Laboratory Building | 18,500 |
| 2. | Field Support Building | 4,200 |
| 3. | Shade Houses And Head House Buildings | 4,800 |
| 4. | Miscellaneous Areas | 2,700 |
| | Preliminary Total Floor Area Planned | 30,200 |




**IPIF COMPLEX PRELIMINARY CONCEPTUAL SITE PLAN**

**Figure 2.10**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source: Leo A. Daly*

SSFM INTERNATIONAL

This complex is planned to be designed with single-story buildings, however, there are considerations for providing two-story buildings instead which would be determined during this facility's design. The height of these buildings and accessory facilities would be within the 45-foot height limit applicable for the site under the County's zoning district standards for the Agricultural District. Landscaping of buildings on this property utilizing native plant species would also be provided in accordance with County standards.

**Office/Laboratory Building**

The Office/Laboratory Building is planned to include research staff offices, administrative support areas, wet and dry laboratories, and associated laboratory support rooms. The facilities in this building are intended to support a wide array of environmental research presently conducted by IPIF staff. This building would have approximately 18,500 square feet of floor area.

Laboratories are used to determine physical and chemical properties of animals, plants, soils, and waters with equipment and instruments for drying, weighing, and otherwise processing specimens. Smaller group meetings and seminars may be held at the IPIF's conference facilities. Larger seminars or conferences held would utilize the PBARC's larger conference facility. An integrated communication system would provide all staff and visitors with access to the Forest Service network, the IPIF local area net, and the Internet on a daily basis. The facilities and resources would also be available to resident and visiting scientists and professionals collaborating on research projects of mutual interest.

**Field Support Building**

The Field Support Building supplements the Office/Laboratory facilities and all field activities conducted by IPIF. This building would include office space for two staff persons along with space for student interns or temporary hires. This support building would have a floor area of about 4,200 square feet. This building would also include ground level storage space for mechanized and non-mechanized equipment (e.g., cement mixer, water tank trailer, riding mower, etc.); a wood, metal and electrical workshop; air-conditioned storage space for small instruments, equipment and supplies; temperature room for soil, plant, and animal tissue processing; a designated storage room for containment of herbicides, fertilizers, etc.; and covered parking for government vehicles.

**Shade And Head House Buildings And Miscellaneous Areas**

The Head House functions as the preparation and storage area for the Shade Houses. Up to four Shade Houses (1,000 sf each) are planned for growing experimental plant materials and for conducting green house experiments. The Head House is planned to be connected to the Shade Houses by a covered walkway. About 4,800 square feet of area is planned for these buildings.

Field staff typically separate seeds from fruit, keep seeds under refrigeration, prepare potting media, sow seeds and plant cuttings. The Head House includes storage space for potting mixes and nursery supplies along with an air-conditioned office for two persons.

Miscellaneous areas planned for this new IPIF complex would add another approximately 2,700 square feet of space. This would include areas for covered parking, walkways, vehicle washing area, and emergency generator. Parking for a minimum of 50 vehicles is planned to be provided initially with space allocated for 10 additional spaces in the future.

**Consolidation Of Operations**

With development of this new IPIF complex in Hilo, most of the existing activities and research programs would be consolidated at this new complex. The existing Hilo office would be returned to the State DOFAW, DLNR, and staff relocated to the new IPIF complex. The existing Invasive Plant Species Team's Biocontrol Program at Hawaii Volcanoes National Park would continue there due to the favorable operational conditions with the National Park Service.

Preliminary plans for the IPIF's Honolulu Office are to reduce this office to about 1,050 square feet, and it may be converted to a new Forestry and Conservation Information Center (Leo A Daly 2001). IPIF would likely continue to keep a small staff of a few persons in this reduced Honolulu Office primarily for office and logistical purposes since research programs are coordinated with DOFAW. Existing IPIF staff in Honolulu would be able to choose whether to continue working with IPIF relocating to the new complex in Hilo or move to a different Federal employment position to remain in Honolulu.

New positions would also be created as a result of this new complex and would consist of additional office staff, scientists, technicians, building managers, and maintenance staff. This increase in staffing is described in the Tropical Forestry Plan for IPIF to implement fully an integrated research and management services program addressing priority recommendations. Thus, staffing would be increased almost 50 percent from the current approximately 30 persons to about 44 persons. IPIF will try to recruit locally on the Island of Hawaii to fill these new positions.

With this new complex, IPIF intends to continue promoting and supporting the variety of environmental related activities they are already conducting along with expanding research programs to better address agricultural needs. These activities would include:

1. Staging area for field research, including preparation and repair of field equipment;
2. Collecting, storing, drying, and analyzing samples collected in the field;
3. Conducting breeding of rare and endangered native plant specimens;
4. Teleconferencing with other Forest Service personnel in Hawaii, the United States, and Pacific Island locations;
5. Conducting educational programs for students and the public to increase awareness of the importance of Hawaii's ecosystem; and
6. Hosting national and international researchers and forest industry officials to share research work, developments, and collaborate on research projects.

The IPIF would coordinate their design plans with PBARC, which may include providing a visitor center at the PBARC complex that could serve both agencies since there isn't a need to have separate visitor centers. The IPIF normally conducts about onc to three small-scale workshops or conferences a year for researchers, scientists, and resource managers associated with their research field. The project would also allow IPIF to also hold larger conferences (up to 100 attendees), which the Institute occasionally hosts.

The IPIF already has relations with the U.H-Hilo where IPIF staff participates with professors in teaching related courses. IPIF also has a strong internship program with U.H.-Hilo, with many students currently enrolled. This new complex, which includes the consolidation of staff and research programs, would further support the interaction of IPIF staff with professors and students.

### 2.4.3 Development Schedule And Construction Cost Estimates

<u>PBARC Complex</u>

The PBARC complex has an estimated construction budget of approximately $41.8 million. However, this total could vary between $40.0 to $50.0 million depending upon the phasing schedule, final design plans, and funding availability. This PBARC facility is planned to be constructed in phases dependent upon available Federal funding, but would designed in its entirety. The environmental review process and design of the complex are being conducted during the 2001 to 2002 time period. Hence, construction of these facilities is planned to begin in the year 2003 and be completed sometime in the year 2007 subject to funding availability.

Upon completion of various facilities, a transition period would occur whereby facilities and staff are relocated to this new complex. Therefore, a study year of 2010 is being used to account for full occupancy of this facility.

<u>IPIF Complex</u>

The entire IPIF facility will be designed to include all facilities and presently has an estimated construction budget of $6.7 million. However, the actual construction budget for this complex would be determined upon the final design of facilities.

Construction of this entire IPIF complex could occur at one time if funding is available beginning in 2003 after completion of the environmental review process and design. However, if funding for the entire complex is not available, construction would occur over potentially two or three phases subject to available appropriations. Completion of this entire IPIF complex is planned to occur by the 2006 to 2007 timeframe, depending upon funding availability, with full occupancy occurring by the year 2010.

### 2.4.4 Listing Of Required Permits

A listing of required discretionary land use approvals and ministerial permits for this project is provided.

State of Hawaii Permits

1. National Pollutant Discharge Elimination System (NPDES) Permit.
2. Underground Injection Control Permit
3. Construction Noise Variance – Only if required

County of Hawaii Approvals and Permits

1. Plan Approval from Planning Department
2. Grubbing/Grading Permit
3. Building Permit

# CHAPTER 3
# ALTERNATIVES CONSIDERED

This chapter discusses alternatives associated with the PBARC Project that were identified and considered. Alternatives discussed include: 1) not implementing development of the project, otherwise referred to as the No Action Alternative, 2) proceeding with the Proposed Project, and 3) other Alternatives Considered but which have been eliminated. Based upon these alternatives considered, the discussion of probable impacts in the remaining chapters of this document will address those associated with the No Action Alternative and Proposed Project.

## 3.1 NO ACTION ALTERNATIVE

The No Action Alternative would entail not proceeding with development of the PBARC and IPIF complexes on the 30-acre project site. Under this scenario, the existing facilities used by PBARC and IPIF would continue being utilized along with their operational and staff constraints. This alternative would thus represent a future scenario "without the project." This "without the project" scenario provides a baseline of future environmental conditions to assess and evaluate probable impacts or changes resulting from the proposed project. A study year of 2010 is used for this No Action alternative to correspond to the projected construction completion and full occupancy of both PBARC and IPIF complexes.

Under this scenario, the 30-acre project site would remain undeveloped and essentially retain its existing physical environmental setting. Other known developments planned to be completed and operational in the immediate area were identified. These developments are predominantly associated with the University of Hawaii-Hilo campus and would include:

1. Development of further research and technology lots within the existing University Park site located across from the PBARC project site on the east side of Komohana Street;
2. Development of a multi-purpose sport and recreational complex within undeveloped lots in the University Park site; and
3. Development of the China-U.S. Center on a site located at the corner of Puainako Street and Kawili Street. This China-U.S. Center would be a comprehensive University center having a cultural center, student housing, and commercial plaza supporting the cultural exchange between the U.S. and China.

## 3.2 PROPOSED PROJECT

The Proposed Project would involve development of both the USDA PBARC and IPIF complexes on the 30-acre project site. These complexes would provide new facilities to support the current research programs and activities being conducted by PBARC and IPIF. It would also resolve current problems these agencies have with existing space shortages and facility deficiencies, and would better support the various research activities conducted by PBARC and IPIF staff.

Construction of these complexes would occur in phases beginning in the year 2003 and lasting until 2006 to 2007 depending upon available funding. Existing staff from these agencies would be relocated to the new facility from their current locations on the Island of Hawaii and elsewhere. Consequently, full occupancy of the project for study purposes in this document is the year 2010.

This new PBARC complex is planned to have a total of approximately 122,575 square feet of floor area. This complex will be comprised of four main components which are: 1) Administration Facilities, 2) Laboratory Facilities, 3) Insectary Complex, 4) Greenhouse Complex, and 5) Central Utilities Plant.

The IPIF complex is planned to be located on an approximately 5-acre portion of the entire 30-acre project site. This new complex would have a total floor area of about 30,200 square feet and consist of three primary components which are: 1) a main Office/Laboratory Building, 2) a Field Support Building, and 3) a Head House and Shade Houses.

## 3.3 OTHER ALTERNATIVES ELIMINATED FROM CONSIDERATION

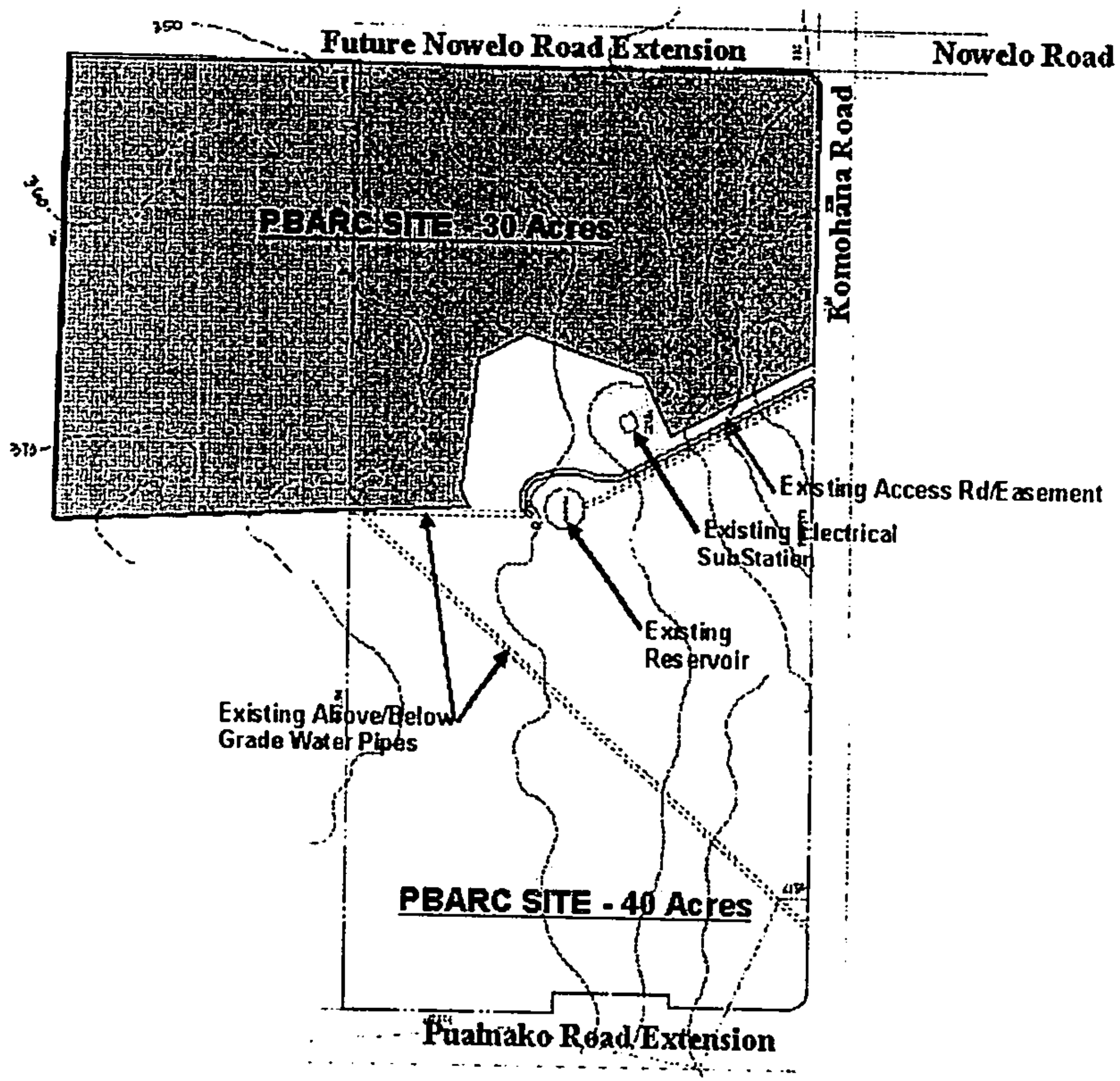
### 3.3.1 PBARC Alternative Site And Designs Considered

Alternatives for the PBARC complex were considered during the initial planning and site feasibility study conducted during development of the project's program of requirements. Alternatives considered at that time involved a different 40-acre project site configuration and alternative design schemes for the complex. These alternatives were subsequently eliminated from further consideration after initial reconnaissance surveys and further assessment of the property given existing site constraints. Consequently, the currently proposed 30-acre project site was selected along with the proposed conceptual Site Plan.

<u>Alternative Site</u>

This planning initially considered development of the project on a 40-acre parcel, which runs in a north-south direction along Komohana Street between the future extensions of Puainako Street and Nowelo Street. Figure 3.1 shows the initial 40-acre property considered along with existing constraints on the property. Due to these constraints on this property, a lease with USDA, ARS was not initiated, and an alternative project site was selected resulting in the currently proposed 30-acre property.

As shown on the figure, the project site is essentially cut in about half due to existing facilities already present. This includes a Hawaii Electric Light Company, Inc. substation, a County Department of Water Supply reservoir, and the access road leading to these facilities. In addition, there are electrical transmission lines along with above ground and underground water lines cutting through the center and lower (southern) section of the property. An archaeological inventory survey conducted for 20-acres of this property identified a historic site that was proposed for preservation further restricting the potential available area for the project.




**PBARC 40-ACRE PROPERTY SITE CONSTRAINTS**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

**Figure 3.1**

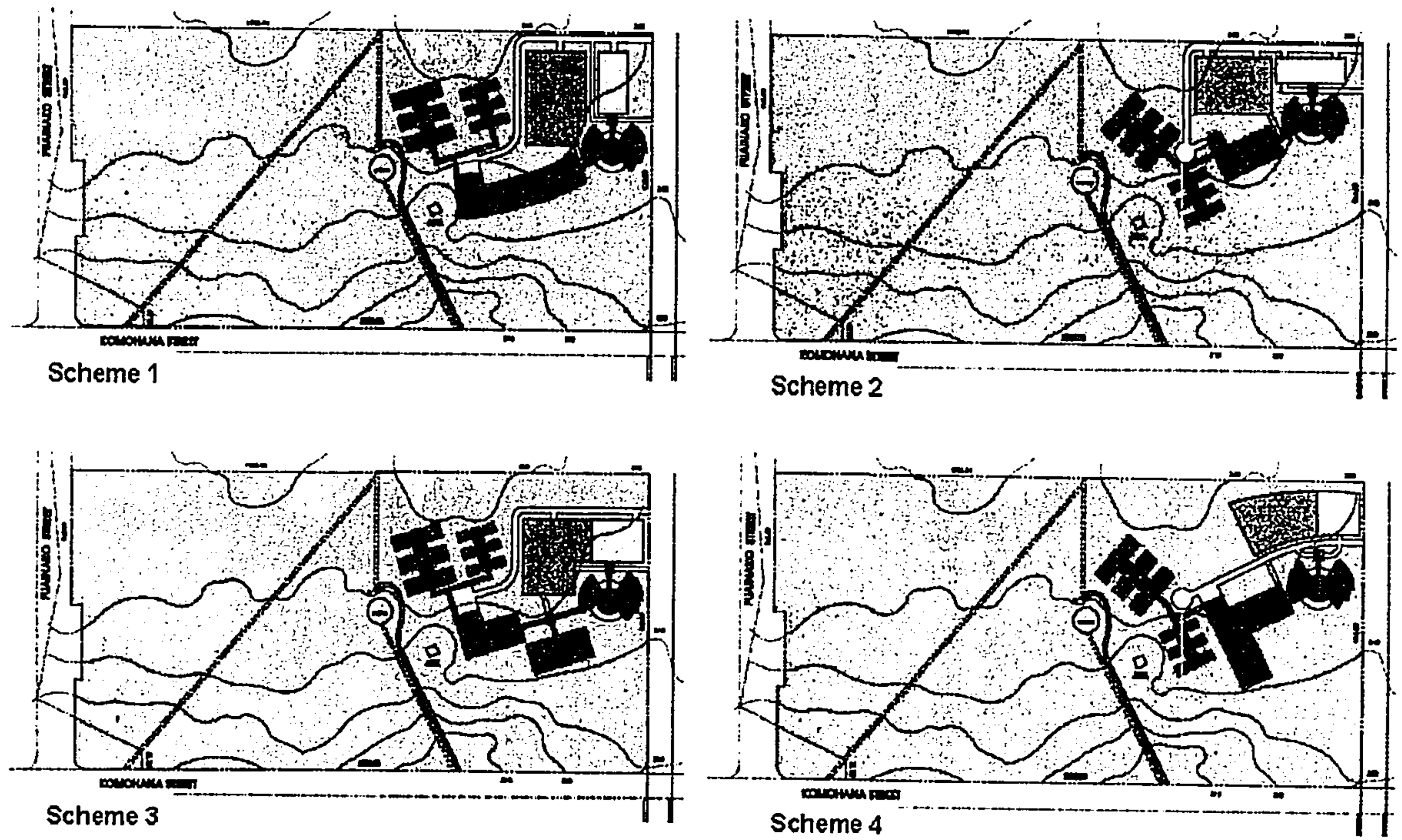
*Source:*
*Richard Matsunaga & Assoc.*

Therefore, it was determined that the 40-acre property was not suitable or economically practicable for the USDA ARS to develop and obtain a lease for. The electrical transmission and water lines cutting through the site would need to be relocated contributing to increased project costs. Furthermore, relocation of the water reservoir and/or electrical substation was not feasible since there were no immediately available sites on which to relocate them. In addition, the significant costs that would likely be associated with relocating these facilities affected the economical feasibility of the project. The archaeological site on the property would include a preservation easement further constraining the development of the site. Consequently, the U.H.-Hilo and USDA, ARS, determined that this 40-acre property was not suitable resulting in the need for an alternative site.

## Alternative Complex Design Schemes

Several alternative design schemes for the PBARC complex were established for consideration on the initial 40-acre project site. These four design schemes involved modifications to the locations of building facilities. Figure 3.2 graphically shows the conceptual design schemes considered for this facility. All of these schemes were eliminated from further consideration after review and consideration by USDA, ARS and PBARC. With the establishment of the new 30-acre project site, the proposed design scheme was developed which resulted from the input and evaluation associated with these alternative design schemes. A brief summary of these alternative design schemes is provided below:

1. Scheme 1. This was a one-story Laboratory building concept with the Insectary and Greenhouse located on the western side of the elongated Laboratory building. The Insectary would be tucked behind the other buildings. A road along the western side of the property would serve the parking lots and lead to the receiving dock at one end of the Laboratory building.
2. Scheme 2. This was a two-story Laboratory building concept with about 50 percent of the one-story Laboratory building scheme footprint. The complex is sited closer to the property corner since the Laboratory building size allows all of the other buildings to be closer together. The covered walkways are thus shorter. This scheme has the Greenhouse at the eastern side of the Insectary.
3. Scheme 3. This was a concept with two separate one-story Laboratory buildings. This is similar to Scheme 1 but breaks up the long Laboratory building and provides the opportunity, if required, for phasing of construction. The buildings are sited further down the slope toward Komohana Street.
4. Scheme 4. This is a one-story Laboratory building in an "L" shaped configuration. One wing of the building projects toward Komohana Street. The visitor, staff, and service access is through the same road with the Porte Cochere road branched off toward the main entry (RMAA 2000).




**PBARC DESIGN ALTERNATIVES CONSIDERED**

**Figure 3.2**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source:*
*Richard Matsunaga & Assoc.*

SSFM INTERNATIONAL

### 3.3.2 IPIF Alternative Site Considered

A site selection committee composed of IPIF personnel originally evaluated 13 sites around the State of Hawaii for the new IPIF complex. After evaluating these sites, this committee selected a 5-acre parcel in the U.H.-Hilo's developing technology park, referred to as the University Park. This University Park is situated along Komohana Street across from the proposed PBARC property. It presently includes several astronomy-related facilities and is programmed for future development within this property (Leo A Daly 2001).

However, in early 2000, the USDA Forest Service later decided to co-locate their new IPIF facility within the proposed 30-acre PBARC property. This 30-acre property was being planned for development by the USDA ARS, which is another division within the USDA. Therefore, co-locating both USDA agencies on this single property to be leased from the State was determined to be more appropriate by IPIF.

The proposed 30-acre site would continue to be strategically located in close proximity to the scientific community at University Park and the academic community at U.H-Hilo. This was an important reason for the Forest Service initially planning on a 5-acre parcel within the University Park property for the new IPIF complex. IPIF already has strong relations with U.H-Hilo where IPIF staff participates with professors in teaching related courses, and IPIF also has a strong internship program with the University. Thus, the new 30-acre PBARC property would continue to provide a strategic location to continue this relationship.

# CHAPTER 4
# PHYSICAL AND BIOLOGICAL ENVIRONMENT

This chapter discusses the existing physical and biological environment in the project area, and the probable impacts resulting from the proposed PBARC Project. Mitigative measures, if necessary, are also discussed.

## 4.1 CLIMATE, TOPOGRAPHY, AND SOILS

Climate on the Island of Hawaii, as well as within the State of Hawaii, can be characterized as having low day-to-day and month-to-month variability. Differences in the climate of various areas are generally attributable to the island's geologic formation and topography creating miniature ecosystems ranging from tropical rain forests to dryer plains along with corresponding differences in temperature, humidity, wind, and rainfall over short distances (Dept. of Geography 1998).

Temperatures in the Hilo area are very moderate with average daily minimum and maximum temperatures ranging from 66 degrees Fahrenheit (F) to 82 degrees. Average monthly temperatures recorded at Hilo International Airport in 1998, located about 1 mile east of the project area, averaged about 73 degrees and varied between an average of 70 and 76 degrees (NOAA 1998).

Rainfall in the Hilo district is substantial with an average of 129 inches per year. The annual rainfall recorded at Hilo International Airport in 1998 was about 109 inches which was 20 inches less than their annual average.

The entire state of Hawaii lies well within the belt of northeasterly trade winds generated by the semi-permanent Pacific high pressure cell to the north and east of the islands. Areas along the eastern coasts of the islands are particularly affected by the trade winds and are usually well-ventilated nearly year round. Although Hilo is situated along the eastern coast of island, the high mountains of Mauna Loa and Mauna Kea significantly modify the trade wind influence. Northeast trade winds typically occur during the day, while winds from the southwest typically occur during the night due to cold air drainage from the mountains. The mean annual wind speed at the airport is about 8 miles per hour (mph), and usually varies between about 4 and 12 mph during the day.

### 4.1.1 Topography

**Regional Geology**

The Island of Hawaii is the largest island in the Hawaiian Archipelago, and covers an area of approximately 4,000 square miles which is larger than the size of all other Hawaiian Islands combined. This island was formed by the activity of five shield volcanoes which are: 1) Kohala (long extinct); 2) Mauna Kea (some activity during recent geologic times); 3) Hualalai (last erupted in 1801 and is considered dormant); 4) Mauna Loa (still active); and Kilauea (still active).

The project site is situated at the eastern end of the island which is located on the lower, northeastern flank of the Mauna Loa Volcano. Mauna Loa Volcano appears to be made up of at least two huge shield volcanoes build around two separate eruptive centers. This Mauna Loa shield has been built principally by eruptions along two rift zones that extend south-west and east-northeast direction from the caldera. Rift zones are elongated areas of ground fissures where volcanic activity such as earthquakes and volcanic eruptions are concentrated. In contrast, few eruptions have taken place along the lower northeast rift zone (Macdonald, Abbott, and Peterson 1983).

**Topographical Features Of Project Site**

The topographic features of the surrounding area in the immediate vicinity of the project site consist of a gradually increasing slope traveling in an east to west direction. Figure 4.1 shows existing elevations in this project area. As shown, lower elevations of about 250 feet above mean sea level (msl) start from the U.H.-Hilo campus expansion area (University Park) increasing to 350 feet msl at the project site, and 400 feet msl to the west.

Similarly, the topography surrounding the project area is generally undulating with a gradual slope occurring in the western direction. Within the 30-acre property, elevations range from a low of about 335 feet on the eastern end to a high of about 365 feet on the western end.

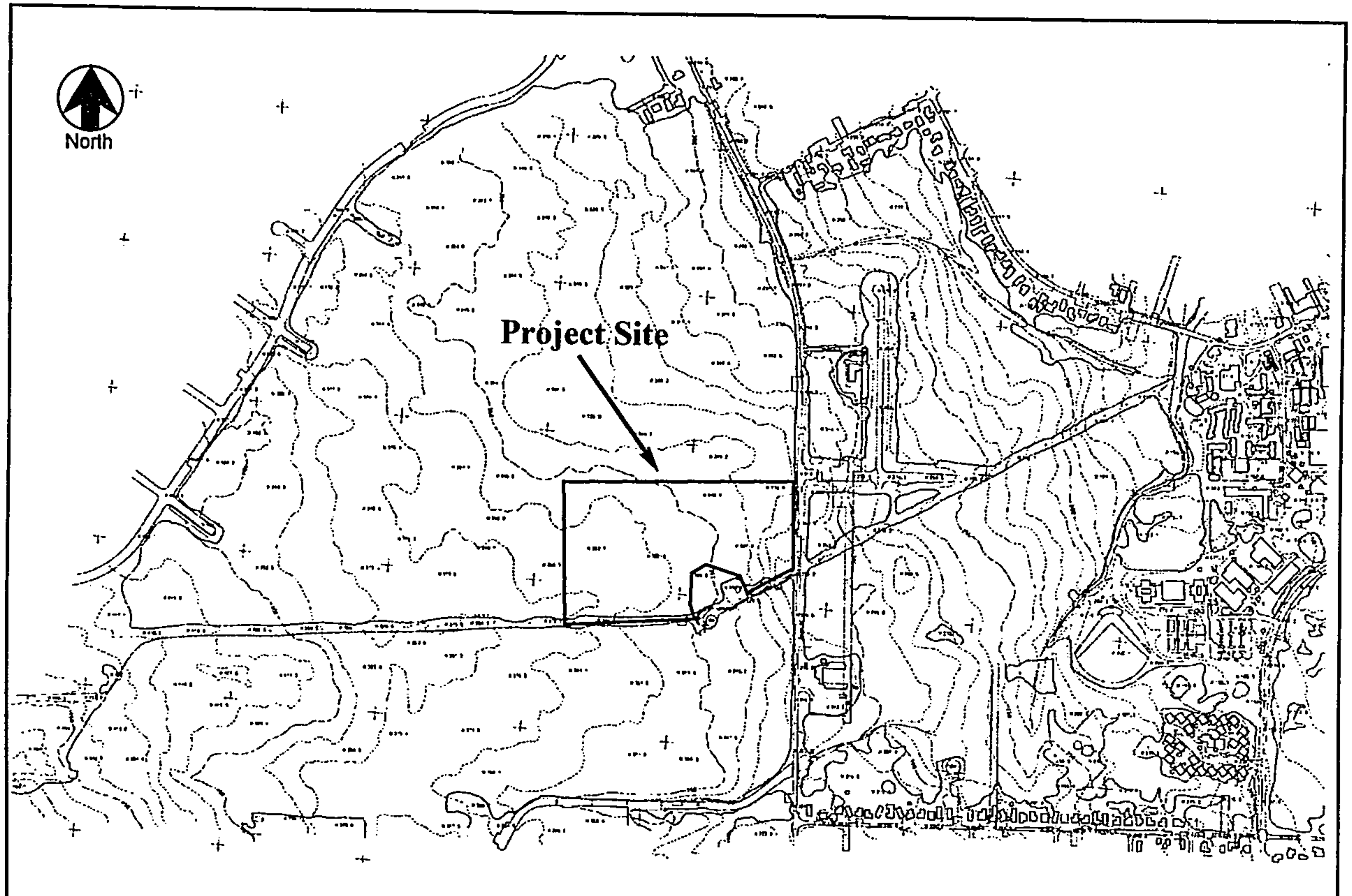
### 4.1.2 Soils

**SCS Soil Survey**

The U.S. Department of Agriculture, Soil Conservation Service's *Soil Survey of Island of Hawaii, State of Hawaii* includes general soil maps developed for this island based upon soil surveys taken (SCS 1973). These soil maps show the soil associations developed which are classified by soil series and soil phase.

Soils situated within the USDA PBARC project site consists of Pahoehoe lava flows. Figure 4.2 shows this soil type, Pahoehoe Lava Flows (rLW), in relation to the project site. Lava flows, Pahoehoe, have been mapped as a miscellaneous land type. This land type occurs at an elevation from sea level to 13,000 feet. Pahoehoe lava has a billowy, glassy, relatively smooth surface. However, some surface areas are rough and broken, with hummocks and pressure domes.

Pahoehoe lava has no soil covering. It is typically bare of vegetation, with the exception of mosses and lichens. In areas of higher rainfall, scattered ohelo berry, aalii, and ohia trees have grown in cracks and crevices. Flat slabs of Pahoehoe can be used as facing on buildings and fireplaces. Pahoehoe in areas of higher rainfall can contribute to the groundwater supply (SCS 1973).

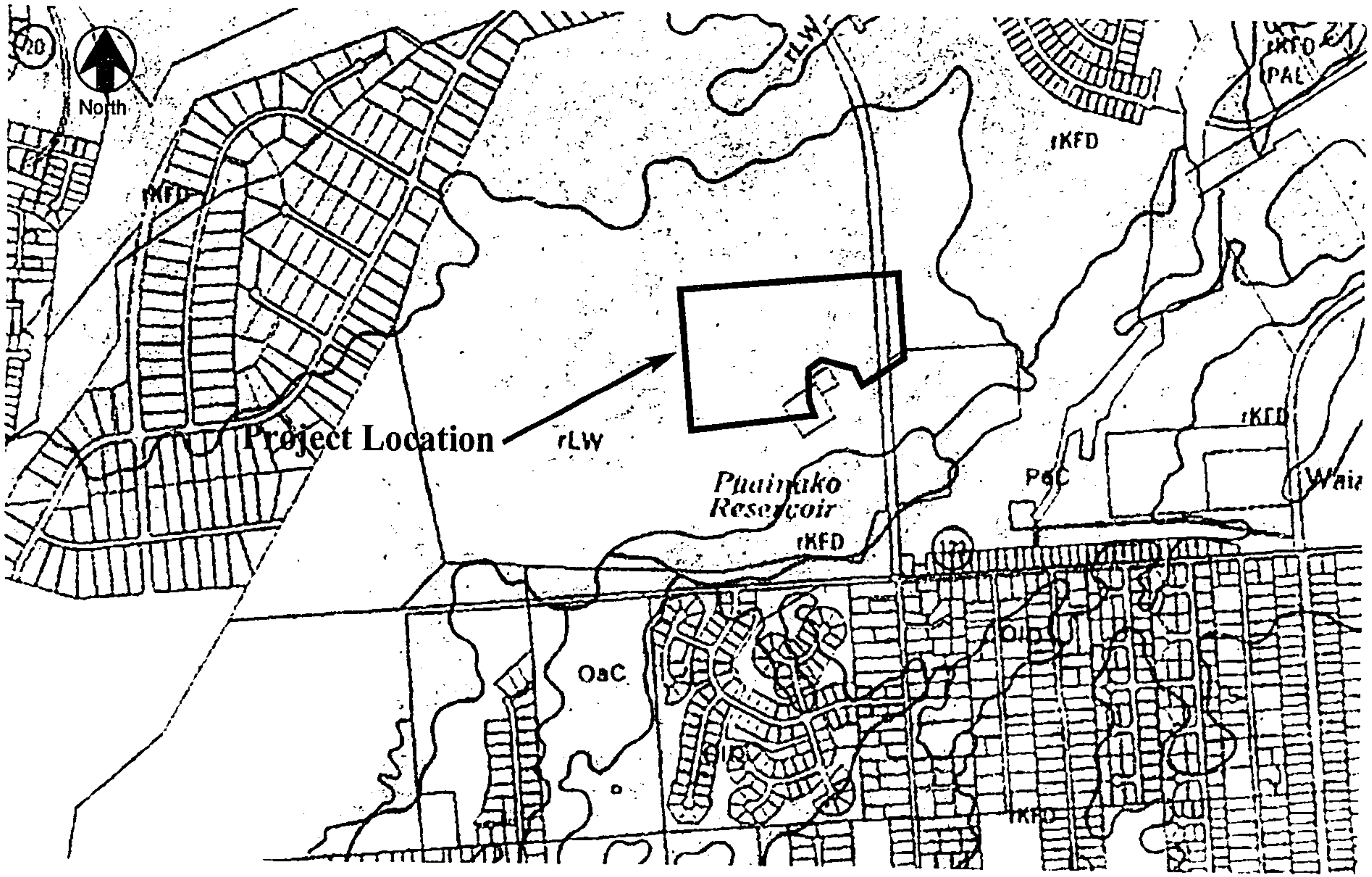



AERIAL TOPOGRAPHIC MAP OF AREA

Figure 4.1

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source:*
*R.M. Towill Corporation*




# SOIL CONSERVATION SERVICE SOILS MAP

**Figure 4.2**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source:*
*USDA Soil Conservation Service, GIS*

**Land Study Bureau**

The Land Study Bureau's *Detailed Land Classification - Island of Hawaii,* has compiled and interpreted information about the quality, location, and extent of lands adapted for various purposes (LSB 1965). The classification developed under this report establishes ratings for overall agricultural usage and for selected individual uses. Productivity ratings established under this study characterize the soil's agricultural suitability for both individual crops and overall suitability (master productivity rating). Suitability ratings vary from: A, very good; B, good; C, fair; D, poor; and E, very poorly suited.

The PBARC property consists of soil given an overall master productivity rating of "E" indicating it is very poorly suited for overall agricultural usage. Figure 4.3 shows this master productivity rating for the property. As shown on this figure, the soils within the property were given a productivity rating and land type number of "E306." The soil productivity rating for this property is described below:

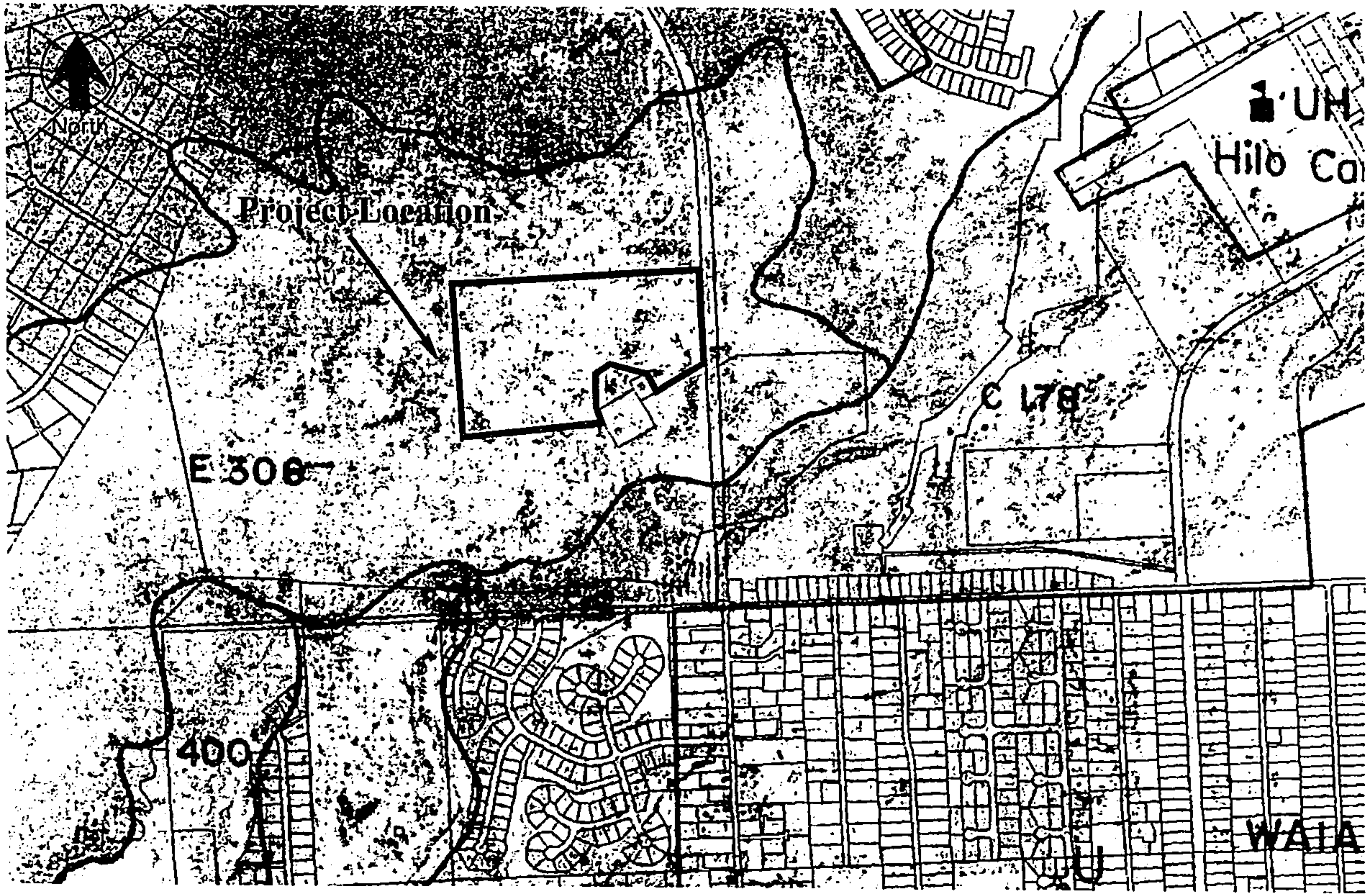
- E306 – The soil series was characterized as almost bare pahoehoe which have no soil material (depth). The color is brown to black and has pahoehoe as the parent material. Soils are moderately drained with slopes of 0 to 35 percent, and are unsuited for machine tillability. The suitability ratings for selected uses of individual crops were: e, for vegetables, sugarcane, and forage crops; d, for both orchard and grazing; and unsuitable for commercial forestry production (LSB 1965).

### 4.1.3 Short-Term Project Related Impacts

Short-term impacts would be associated with construction activities conducted for the PBARC Project. Under the No Action Alternative, the property would remain undeveloped, so there would be no short-term impacts associated with the site. Consequently, this section discusses the probable short-term construction related impacts resulting from the PBARC Project.

**Soil Erosion**

Construction of the PBARC and IPIC complex are not expected to have a significant impact on the existing topography or physical character of the 30-acre property. Construction activities would involve excavation and grading work along with construction of the new buildings and necessary infrastructure. The design of the research complexes would try to achieve a balanced cut and fill condition to minimize disturbances to the property's topography and soils as practical. The project's design would also try to preserve existing large trees to the extent possible. A Grading Plan will be prepared during the design phase of both the PBARC and IPIF complexes which would be submitted to pertinent agencies for their review and approval.




**LAND STUDY BUREAU**
**SOIL SUITABILITY RATINGS MAP**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

**Figure 4.3**

*Source:*
*Land Study Bureau,*
*GIS*

Construction of the site would inevitably involve land disturbing activities that may result in some soil erosion. However, this erosion potential should be relatively low since the soil disturbance is primarily limited to the western half of the property where the PBARC and IPIF complexes will be sited as shown on the preliminary conceptual Site Plan figure in Chapter 2. The eastern half of the property would likely be used for field plots, landscaping, demonstration gardens, or left undeveloped. In addition, the southwestern corner of the property would be used for orchards or potential storage area further reducing site work. As discussed under the soils section, the property consists of relatively recent Pahoehoe lava flow with limited soil cover as compared with other areas with older flows. Thus, the potential for soil erosion is further reduced.

Nevertheless, to minimize potential short-term erosion impacts during construction activities, various erosion control measures would be considered for implementation during the project's design. Erosion control measures which could be considered to further lessen short-term erosion impacts may include: use of temporary berms and cut-off ditches; use of temporary silt fencing and screens; thorough watering of graded areas after construction activity has ceased for the day and on weekends; or sodding or planting slopes immediately after grading work has been completed.

Proposed measures would be developed during the final design of this project, and would comply with the County's Erosion and Sedimentation Control regulations prescribed under Chapter 10 of the Hawaii County Code (County 1999). The appropriate measures will be included in an Erosion Control Plan prepared and submitted to the County for ministerial approval. Other mitigative measures would be specified as part of National Pollutant Discharge Elimination System (NPDES) permits obtained for the site as well. Grading activities will also be performed in accordance with permit provisions from the County and State Department of Health (DOH).

**Air Quality Emissions**

Short-term impacts on air quality in the immediate project area may result from construction activities. Two potential types of pollutants are fugitive dust emissions from vehicular movement and soil excavation, and exhaust emissions from on-site construction equipment. Fugitive dust emissions associated with grading and dirt-moving activities are difficult to estimate accurately. However, the EPA provides a rough estimate of 1.2 tons of uncontrolled fugitive dust emissions per acre per month under conditions of "medium" construction activity, moderate soil silt content (30%), and precipitation/evaporation (P/E) index of 50. Uncontrolled fugitive dust emissions from the project would likely be near that level or lower since the area receives a large amount of rainfall and generally has lower soil content due to the Pahoehoe lava present.

An effective dust control plan for the project construction phase would be implemented to minimize any air quality impacts. Emissions can be controlled by watering active work areas, using wind screens, keeping adjacent paved roads clean, and covering open-bodied trucks. Other dust control measures could include limiting the disturbed area at any given time and/or mulching or chemically stabilizing inactive areas that have been worked.

Open-bodied trucks would be covered at all times in motion if they are transporting materials that could blow away. Tire washing may also limit haul trucks tracking dirt onto paved streets from unpaved areas within the property. Paving of parking areas and/or the establishment of landscaping early in the construction schedule can also lower potential fugitive dust emissions.

Emissions from the engine exhausts of on-site mobile and stationary construction equipment would also have some impact on air quality. Nitrogen oxide emissions from diesel engines can be relatively high compared to emissions from gasoline-powered equipment. However, the standard for nitrogen dioxide is set on an annual basis and will not likely be violated by emissions from short-term construction equipment. Carbon monoxide emissions from diesel engines are low and should be relatively insignificant compared to vehicular emissions on nearby roadways.

Slow-moving construction vehicles traveling on roadways and commuting construction workers could also obstruct the normal flow of traffic, indirectly increasing overall vehicular emissions. This impact can be mitigated by moving heavy construction equipment during periods of low traffic volume and arranging schedules of commuting construction workers to avoid peak traffic hours in the project vicinity (B.D. Neal 2002). Thus, the potential impact from these vehicles would be mitigated by implementing these measures which would be further determined as part of the project's design. Measures developed would also be designed to make construction activities comply with the State Department of Health's (DOH) Administrative Rules Title 11, Chapter 60 (Air Pollution Control).

<u>Construction Noise</u>

The project would involve excavation, grading, and construction of new buildings and infrastructure that may generate significant amount of noise. Actual noise levels produced would depend on the methods employed throughout construction. Earthmoving equipment such as bulldozers and diesel-powered trucks would be the loudest equipment used during construction. Typical ranges of construction equipment noise vary between 70 and 95 dBA. Earthmoving equipment, such as bulldozers and diesel powered trucks, will probably be the noisiest equipment used during construction.

Noise from construction activities are regulated under Title 11, Chapter 46 (Community Noise Control) of the State DOH's Administrative Rules. Under these regulations, the existing project site and immediate surrounding areas fall under the Class C zoning district classification. The Class C classification applies to properties zoned agricultural, country, industrial, or of other similar land uses. Existing properties situated adjacent to the project site are zoned A-1a, Agricultural District, under the County's zoning map. As a result, the maximum permissible noise levels for these properties under this Class is 70 dBA at the property line during both daytime (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) hours (DOH 1996).

However, any noise impact from these construction activities would be relatively short-term and minor since there are no existing residences or noise sensitive uses in the immediate vicinity of the site. Nearest residences along Puainako Street are located over 1,500 feet away from the site. The nearest uses are the astronomical research facilities in the University Park along Komohana Street. Construction equipment would be equipped with mufflers as required under DOH regulations.

In cases where construction noise exceeds, or is expected to exceed, the maximum permissible noise level allowable to property line limits, a permit would be obtained from the DOH to allow these activities. This permit includes restrictions to help mitigate potential noise impacts resulting from short-term construction activities. Such restrictions would be followed by the contractor. Specific permit restrictions included as conditions under this permit for construction activities are:

- No permit shall allow construction activities generating noise levels beyond the maximum permissible sound level at the property line before 7:00 a.m. and after 6:00 p.m. of the same day, Mondays through Friday.
- No permit shall allow construction activities generating noise levels beyond the maximum permissible sound level at the property line before 9:00 a.m. and after 6:00 p.m. on Saturdays.
- No permit shall allow construction activities generating noise levels beyond the maximum permissible sound level at the property line on Sundays and holidays.

## 4.2 NATURAL HAZARDS

This section addresses those natural and urban-related hazards applicable to the project site. Of the potential natural hazards, earthquakes and lava flows, hurricane, and tsunami and flooding hazards are addressed. There are no other known potential urban-related hazards applicable to the property such as airport clear zones, nuisances, hazardous wastes, or other site safety issues associated with urban use since the property is undeveloped.

### 4.2.1 Earthquake And Lava Flow Hazards

#### Earthquake Hazards

Earthquakes in the Hawaiian Islands are primarily associated with volcanic eruptions resulting from the inflation or shrinkage of magma reservoirs beneath which shift segments of the volcano (Macdonald, Abbott, and Peterson 1983). Although difficult to predict, an earthquake of sufficient magnitude causing structural or other damage to the project's facilities or infrastructure may occur in the future. Most of the earthquakes that have occurred were volcanic earthquakes causing little or no damage. The seismic risk classification of the Island of Hawaii is a rating of Zone 4 (USGS 1997).

The Island of Hawaii experiences thousands of earthquakes each year, however, most are so small that they can only be detected by instruments. There are some strong enough to be felt, and a few cause minor to moderate damage. Most of this island's earthquakes are directly related to volcanic activity, and are caused by magma moving beneath the earth's surface. Earthquakes may occur before or during an eruption, or may result from the underground movement of magma that comes close to the surface. A few of the island's earthquakes are less directly related to volcanism. These originate in the zones of structural weakness at the base of the volcanoes or deep within the earth beneath the island (USGS 1997).

Recent Earthquakes On And Near Island Of Hawaii, 1962-1985 (USGS 1997)

The locations of larger damaging earthquakes of magnitude 6 or greater since 1868 on the Island of Hawaii have generally occurred on the southern half of the island primarily on the eastern end. The most recent large earthquake on this south flank occurred in June 1989 with a magnitude of 6.1. The largest earthquake near the Hilo area occurred in Honomu in 1973 and had a magnitude of 6.2.

Potential Impacts From Future Earthquakes

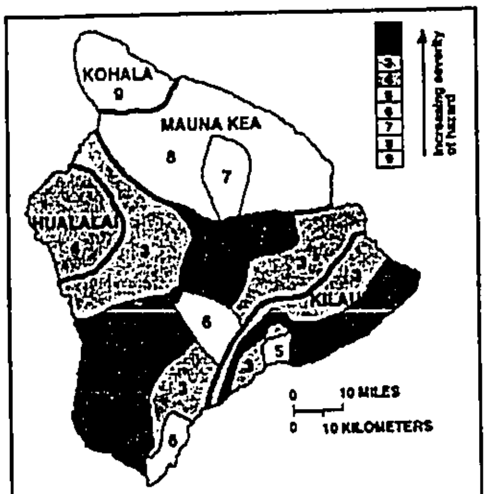
Under the No Action Alternative, the project site would continue to be subject to damage from an earthquake of sufficient magnitude. However, there would be no potential for damages to buildings or other structures since the property would remain undeveloped. Consequently, damages to the property would likely involve mainly damages to existing vegetation or possible alterations of the existing topography.

With the project, there is a possibility of future earthquakes occurring on the Island of Hawaii especially on the south flank of Kilauea. As a result, the PBARC project and accessory facilities may be subject to damage from an earthquake of sufficient magnitude occurring in the area. The susceptibility of being damaged from an earthquake would be no different from other homes and buildings present in the surrounding Hilo community. To minimize potential damages, the PBARC facilities and other accessory structures would be structurally designed and constructed in accordance to applicable Federal and County design standards for Zone 4 areas. Thus, the risk of damage to these facilities planned will not be more that other existing land uses in the Hilo district.

**Lava Flow Hazards**

Volcanic hazard zone maps developed for the Island of Hawaii were revised by the U.S. Geological Survey in 1987. The current map divides this island into zones ranked from 1 through 9 based on the probability of coverage by lava flows. Hazard zones from lava flows are based mainly on the location and frequency of both historic and prehistoric eruptions. Hazard zones also take into account larger topographic features of the volcanoes that will affect the distribution of lava flows.

Based upon this map, the PBARC project area in the Hilo District was given a hazard zone rating of 3 which includes the entire Hilo town area. This hazard rating is for areas having a greater distance from active vents and topography making it less likely that flows will cover that area. This is a hazard area that had 1 to 5 percent covered by lava since 1800, and 15 to75 percent of area covered by lava in the last 750 years. Only a few percentage of this area has been covered by lava over the past 10,000 years (USGS 1997).



Lava Flow Hazard Zone Maps (USGS 1997)

Potential Impacts From Lava Flow Hazards

Under the No Action Alternative, the project site would continue to be subject to a very low possibility of damage by lava flow from an eruption. However, there would be no potential for damages to buildings or other structures since the property would remain undeveloped. Consequently, damages to the property would likely involve mainly damages to existing vegetation and the topography.

With the project, there would similarly be a very low possibility of future eruptions occurring on the Island of Hawaii which may result in lava flows affecting the project site. As a result, the PBARC project and accessory facilities may be subject to damage from an eruption occurring in the area mainly associated with the Mauna Kea or Mauna Loa volcanoes. However, the susceptibility of this property being damaged from a lava flow would be no different from other homes and buildings present in the surrounding Hilo community.

### 4.2.2 Hurricane Hazards

The three major elements of a hurricane making it hazardous are: 1) strong winds and gusts, 2) large waves and storm surge, and 3) heavy rainfall (FEMA 1993). Of these three, only strong winds and heavy rainfall could affect the project. The project site is not located along the shoreline and is at an elevation over 330 feet msl. As a result, this location makes impacts from large waves and storm surge highly improbable. Impacts associated with heavy rainfall are addressed later under drainage facilities.

A hazard mitigation report prepared by the Federal Emergency Management Agency after Hurricane Iniki in 1992 determined that nine hurricanes approached within 300 nautical miles (about one day's travel time) of the Hawaiian Island's coastlines between 1970 and 1992. Most hurricanes affecting the islands have focused on Kauai. Based upon a tracking of hurricanes since 1950, there appears to be no geographical or meteorological reasons why hurricanes miss the other islands but tend to steer toward Kauai (FEMA 1993).

Although unpredictable, the Island of Hawaii has historically received less threat and damage from hurricanes as compared to Kauai. However, as with other existing and future developments in the South Hilo District as well as the rest of the island, structures built on the project site could potentially receive some damage from the high winds of a hurricane passing close to the island.

Under the No Action Alternative, the property would not be affected by hurricane hazards anymore than it is currently. With the PBARC Project, the potential damage to both the PBARC and IPIF complexes from high winds should be relatively minor due to the facility's design and concrete materials used for its construction. Utilities and infrastructure improvements should not be affected since they would be located underground. To minimize potential damages, the research facilities would be designed and constructed in accordance with appropriate County and Federal USDA design requirements and standards. Thus, the risk of potential damage from high winds should be less than or similar to other existing developments in the Hilo community.

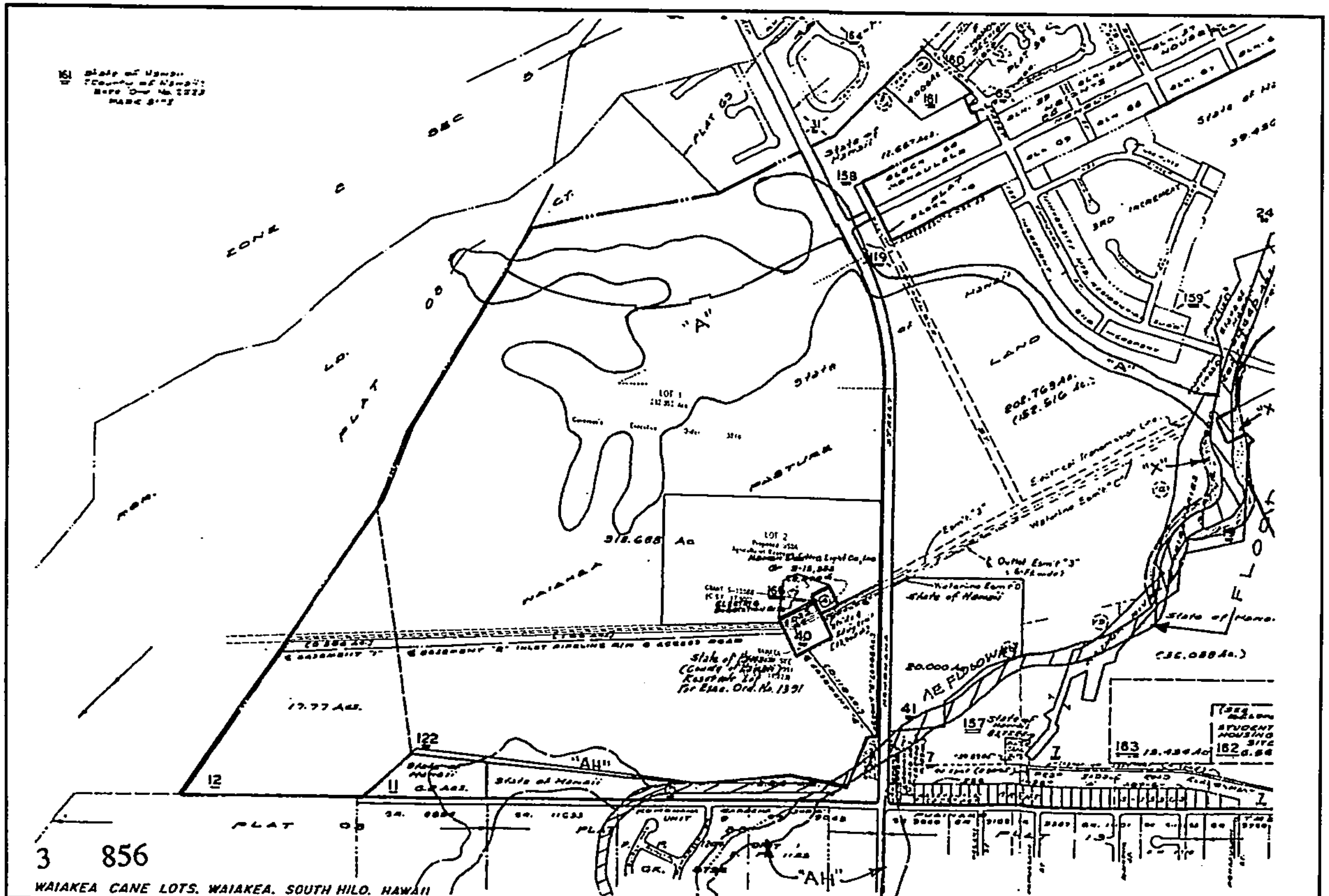
### 4.2.3 Tsunami Inundation And Flooding

The Flood Insurance Rate Map (FIRM), Community Panel Number 155166 0880 C (revised September 16, 1988), for the project area was reviewed to determine existing floodways. Based upon this FIRM, the project site is not located within any designated floodway. This property along with the immediate area surrounding it is designated Zone X which is area determined to be outside the 500-year flood plain. Figure 4.4 shows the project site in relation to this FIRM.

There are designated floodways located north and south of the property associated with an unnamed tributary and Waiakea Stream, respectively, which run in a west to east-northeast direction. The project site is also not located within a tsunami inundation area since it located several miles away from the shoreline at an elevation of over 330 feet msl.

<u>Effects From Flooding</u>

Under the No Action Alternative, the project site would not be subject to any more flooding hazards than it is currently since it would remain undeveloped. With the PBARC Project, facilities would not be subject to flooding hazards since they are located outside of designated floodways. Appropriate drainage improvements would be provided to serve the property and address surface runoff from increased impervious surfaces created in compliance with County building codes and design standards. Greater discussion of these improvements is provided under infrastructure in later chapters of this document.




# FLOOD INSURANCE RATE MAP

USDA Pacific Basin Agricultural Research Center
USDA ARS & Forest Service

## Figure 4.4

Source:
County Dept. of Public Works (Flood Base)
ControlPoint Surveying, Inc. (Boundary Map)

## 4.3 AQUATIC RESOURCES AND WATER QUALITY

A biological survey was conducted by AECOS, Inc. (AECOS) to assess water resources and identify potential sources of water quality and aquatic habitat degradation resulting from the proposed project. A survey of the Waiakea Stream was conducted on November 23, 2001 which was limited to the stream area between the western portion of the U.H.-Hilo campus and the Komohana Gardens subdivision. Water quality measurements were made in three locations, and selected parameters were measured to characterize the aquatic environments present. A copy of this report is included in Appendix C.

### 4.3.1 Existing Waiakea Stream Environment

<u>Description Of Waiakea Stream</u>

Waiakea Stream is one of several streams flowing into Waiakea Pond and Wailoa River, which discharges into the south part of Hilo Bay. This stream system is one of only a few which drain the Mauna Loa side of the area between ancient lava flows originating from Mauna Kea and those originating from Mauna Loa. Streams are sparse on the Mauna Loa lavas despite an annual rainfall averaging over 100 inches in the Hilo area and nearly 200 inches at Mountain View further upslope. The absence of perennial streams is characteristic of volcanic islands where the surface material is composed of recent lavas. In contrast, the much older Mauna Kea slopes are deeply dissected by streams and the Hamakua Coast supports many streams.

Waiakea Stream is essentially a drainage channel from upstream of the project area, through the U.H.-Hilo campus, and into Waiakea Pond. Along most of the stream course, portions of the channel have been modified with levees and revetments, and a few sections of the channel are concrete-lined due to roadway crossings. However, the stream bed remains in a fairly natural state comprised of bedrock material. This stream has many branches of which some are fed by springs at higher elevations above Hilo, and some segments may be perennial over short distances. This stream was intermittent flowing between the 300 meter (1,000-foot) elevation down toward the U.H.-Hilo campus at about the 30 meter (100-foot) elevation (AECOS 2002).

<u>Previous Stream Surveys</u>

The Wailoa River in Hilo is listed in the *Hawaii Stream Assessment* (HCPSU, 1990) as a "perennial" stream with some tributaries listed separately in the stream database (Alenaio as 8-2-61.01.1; Kaluiiki, Waiakea, and Waipahoehoe as 8-2-61.01). This Wailoa River is also listed under "special areas" because it includes a natural area reserve or sanctuary, special marine or estuarine reach, and waterfall. The waterfall reference is probably Na`alapa Falls. The "special" estuary may refer to Wailoa River at the head of Hilo Harbor which includes the Waiakea Public Fishing Area on the western border of Wailoa River State Park (AECOS 2002). The "aquatic resources" rank is "substantial," listing `o`opu nakea (*Awaous stamineus*) present.

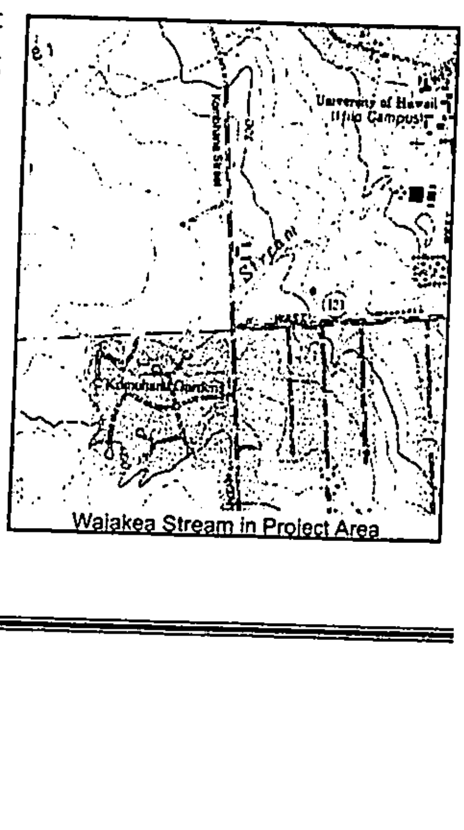
AECOS, Inc. has also conducted two previous surveys along Waiakea Stream in the vicinity of the project. In October 1993, a field reconnaissance of lower Waiakea Stream was conducted to assess the effect of a proposed sewer pipe crossing at the U.H.-Hilo campus. This survey began in the stream bed just above the West Lanikaula Street bridge at the campus and extended upstream to the area near the baseball field. A second survey was conducted in August 1996 in the area around the proposed bridge crossing for the University Park across the stream from the existing campus.

Despite the intermittent and interrupted nature of the lower reaches of Waiakea Stream, the number and variety of aquatic inhabitants observed within the isolated pool systems were higher than anticipated. The wet environment of the Hilo area confers a longevity on these pools that allows the inhabitants to survive all but the more severe drought periods, and disperse up and down the stream during relatively frequent freshets associated with local rain events. Numerous juvenile `o`opu nakea (*Awaous guamensis*) were observed in the 1993 survey. However, despite a concerted effort to locate native fauna, none was seen in the 1996 survey (AECOS 2002).

In 1993 and 1996, reconnaissance surveys of selected segments of Waiakea Stream above the U.H.-Hilo campus were undertaken to provide a general description of the upstream aquatic environments. Stream flow was observed off Hoaka Road within the Waiakea Homesteads, and considerable flow was present. This area was actually a separate, relatively short, branch of Waiakea Stream that must arise from springs around the 400 meter (1,300-foot) elevation. The flow was observed to disappear before the bridge under Hoaka Road where only standing water was seen. The stream was also explored along a short reach at the 230 meters (750-foot) elevation where a modified channel and culvert cross under a side road off Hoaka Road. Here small pools were present on dense basalt and were found to be inhabited by swordtail (*Xiphophorus helleri*), guppy (*Poecilia reticulata*), and crayfish (*Procambarus clarki*) (AECOS 2002).

**Stream Survey Findings**

Waiakea Stream in the vicinity of the PBARC project travels in a southwest to northeast direction crossing Komohana Street south of the project site near the Komohana Agricultural Complex. The stream bed in this vicinity consisted of exposed basalt bedrock with scattered pools in rock depressions. During the field survey, the stream reach near the PBARC project site could be defined as interrupted. This included a few short flowing sections, some completely dry segments, isolated pools, and some seeps. Pools of water were retained in areas where the stream bed was dense basalt, and were fed by both the considerable rainfall received in the Hilo area and, in some cases, seeps.




Waiakea Stream in Project Area

Above Komohana Street (southwest), much of the stream bank was reverted and there were few small pools. Larger pools were found further upstream, and one particularly large pool extended to a fence line traversing the stream near the Komohana Gardens subdivision. Some pools downstream of the bridge at Komohana Street originate as seeps from the stream banks and bed. The stream bed was fairly wide and receives little shade. Table 4.1 includes a list of aquatic species identified associated with this Waiakea Stream.

**Table 4.1 Aquatic Biota Observed Or Reported In Waiakea Stream**

| Species Description | Common Name | Status | Abundance |
|---|---|---|---|
| **ALGAE** | | | |
| MIXOPHYCEAE (CYANOPHYCEAE) | | | |
| ?Oscillatoria sp. | Algal Turf [1] | | Abundant |
| CHLOROPHYCEAE | | | |
| Spirogyra sp. | Green Filamentous Alga [1] | | Occasional |
| **INVERTEBRATES** | | | |
| *ARTHROPODA, INSECTA* | | | |
| Anax junius | Green Darner (Adult) | Indigenous | Common |
| Crocothemis servilia | Scarlet Skimmer (Adult) | Naturalized | Uncommon |
| Orthemis ferruginea | | Naturalized | Uncommon |
| Pantala flavescens | Globe Skimmer (Adult) | Indigenous | Common |
| Pantala flavescens | Globe Skimmer (Naiad) [1] | Indigenous | Common |
| Ischnura ramburi | Rambur's Forktail (Adult) | Naturalized | Uncommon |
| ARTHROPODA, CRUSTACEA | | | |
| Macrobrachium grandimanus | 'Opae o'Eha'a [1] | Endemic | Abundant |
| Procambarus clarki | American Swamp Crayfish | Naturalized | Occasional |
| MOLLUSCA | | | |
| Indet | Pond Snail (Sinistral) [1] | | |
| **VERTEBRATES** | | | |
| FISHES – ELEOTRIDAE | | | |
| Eleotris sandwicensis | 'O'opu 'Akupa [1] | Endemic | Uncommon |
| Awaos guamensis | 'O'opu Nakea | Indigenous | Occasional |
| Stenogobius genivittatus | 'O'opu Naniha [1] | Endemic | |
| FISHES – KUHLIIDAE | | | |
| Kuhlia sandvicensis | Aholehole [1] | Endemic | |
| FISHES – POECILIIDAE | | | |
| Gambusia affins | Mosquitofish [1] | Naturalized | |
| Poecilia reticulata | Guppy | Naturalized | Abundant |
| Xiphophorus helleri | Green Swordtail | Naturalized | Abundant |
| Xiphophorus maculatus | Moonfish [1] | Naturalized | |
| AMPHIBIANS – BUFONIDAE | | | |
| Bufo marinus L. | Giant Neotrop. Toad (juvenile) | Naturalized | Abundant |
| Bufo marinus L. | Giant Neotrop. Toad (tadpole) | Naturalized | Abundant |
| AMPHIBIANS – RANIDAE | | | |
| Rana catesbeiana | American Bullfrog (adult) | Naturalized | Common |
| Rana catesbeiana | American Bullfrog (tadpole) | Naturalized | Abundant |

Source: AECOS, Inc. 2002
Footnotes: 1 - Reported from prior surveys

Freshwater fauna were most abundant in deeper pools located well upstream and well downstream of the project site. Introduced guppies (*Poecillia reticulata*) were found in most pools along with introduced frog and toad tadpoles (*Rana catesbeiana* and *Bufo marinus*). Introduced swordtail (*Xiphophorus helleri*) was abundant in some pools and several indigenous `o`opu nakea (*Awaous guamensis*) and endemic `o`opu `akupa (*Eleotris sandwicensis*) were found in the large pool downstream of the project site. Several dragonflies (*Pantala flavescens*, *Anax junius*, *Crocothemis servilea* and *Orthemis feruginae*) and a damselfly (*Megalagrion hawaiiense*) were observed near isolated pools just below (southwest) Komohana Street. One live individual and several molted exoskeletons of the American crayfish (*Procambarus clarki*) were the only aquatic macroinvertebrates observed (AECOS 2002).

### 4.3.2 Water Quality Characteristics Of Waiakea Stream

Water quality samples were taken of Waiakea Stream at various stations in a prior study conducted by AECOS, Inc. in 1996 and again for this project in 2001. Stations 1 and 2 were sampled in 1996, and Stations A, B, and C were sampled in 2001 in the general project area. Station 1 was located well upstream of the project site off Hoaka Road while Station 2 was downstream of the PBARC site in a pool near the U.H.-Hilo dormitories.

Station A was taken just downstream (northeast) of Komohana Street in a pool connected to a series of others fed by a seep. Station B was a large isolated pool below Station A, and Station C was a pool located upstream of Komohana Street above the entrance of a large drainage culvert into Waiakea Stream. The results of water quality samples taken and analyzed for the stations near the project site and from the prior survey in 1996 are summarized on Table 4.2.

__Water Quality Sampling Results__

The samples taken indicate that Turbidity and Total Suspended Solids (TSS) levels were relatively low, suggesting still water that was isolated from runoff inputs, and the biological primary productivity was dominated by benthic algae. Values observed in 2001 compared with those in 1996 showed slightly lower Dissolved Oxygen (DO) and slightly higher conductivity. However, these values were not indicative of water quality problems.

Stations 2, A, and B were primarily unshaded and had lower inorganic nutrients (nitrate + nitrite at least) and abundant benthic algae, suggesting that algae used available dissolved nutrients to support growth. High ammonia values can indicate stagnant water. The total Nitrogen (N) and Phosphorus (P) values observed were fairly typical of Hawaiian streams in rural or undeveloped watersheds. Total N values were all above the perennial streams criteria of 180 and 250 μg N/L (dry and wet season geometric means, respectively) set forth in Hawaii's Water Quality standard. Total P values observed in the November 2001 samples were also slightly elevated but did not exceed the stream criteria (AECOS 2002).

**Table 4.2 Water Quality Characteristics Of Waiakea Stream From Samples Island Of Hawaii, August 1996 And November 2001**

| Station Description | Time Sampled | Temp. (°C) | Cond. (µmhos/cm) | Dissolved Oxygen (mg/l) | Dissolved Oxygen (% sat) | Turbidity (ntu) |
|---|---|---|---|---|---|---|
| **August 7, 1996** | | | | | | |
| Station 1 | — | 23.6 | 14.6 | 9.30 | 110 | 1.06 |
| Station 2 | — | 37.7 | 26.9 | 8.95 | 135 | 1.22 |
| **November 23, 2001** | | | | | | |
| Station A | 1150 | 27.4 | 47.1 | 6.14 | 78 | — |
| Station B | 1200 | 24.9 | 49.4 | 7.20 | 87 | — |
| Station C | 1220 | 23.9 | 46.3 | 5.88 | 70 | — |

| Station Description | Time Sampled | TSS (mg/l | Ammonia (µg N/l) | Nitrate + nitrite (µg N/l) | Total Nitrogen (µg N/l | Total Phosphorus (µg P/l) |
|---|---|---|---|---|---|---|
| **August 7, 1996** | | | | | | |
| Station 1 | — | 1.4 | 28 | 26 | 321 | 16 |
| Station 2 | — | 2.0 | 5 | 1 | 292 | 18 |
| **November 23, 2001** | | | | | | |
| Station A | 1150 | 0.9 | <1 | 2 | 230 | 42 |
| Station B | 1200 | 1.5 | 28 | 2 | 363 | 41 |
| Station C | 1220 | 1.8 | 106 | 19 | 680 | 44 |

Source: AECOS, Inc. 2002

### 4.3.3 Effects On Aquatic Resources And Water Quality

Under the No Action alternative, the project site would remain undeveloped. Consequently, there should be no effects on existing aquatic resources in Waiakea Stream or the present water quality associated with this stream.

With the project, increased impervious surfaces would be created due to facilities and paved areas (roads, walkways, etc.) constructed which would increase on-site generated surface water runoff. About 10 acres of the total 30-acre property would be developed with these facilities. The County requires that on-site storm drainage facilities be designed and sized to control runoff in excess of estimated pre-development runoff quantities. As a result, several on-site drywells would be provided to retain increased pre-development runoff quantities.

Consequently, the project should have minimal impact on the aquatic environment and water quality associated with Waiakea Stream because additional runoff quantities generated would be retained on-site. None of the observed aquatic species were listed as threatened or endangered. Surrounding areas of the property also consist of extensive vegetation along with the very porous geologic Pahoehoe lava flows which considerably reduce surface runoff in the area and from reaching Waiakea Stream.

## 4.4 BOTANICAL RESOURCES

A survey of botanical resources associated with the USDA PBARC project was performed by Char & Associates. The objectives of the survey were to: 1) provide a general description of the vegetation on the 30-acre project site; 2) inventory all plant species encountered; and 3) search for threatened and endangered species, as well as species of concern, and 4) identify areas of potential environmental problems or concerns and propose appropriate mitigation measures. A copy of this report is included in Appendix D of this document.

Prior to undertaking field work, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. Walk-through surveys of botanical resources present in the project area were conducted on May 20, 2000 for the 20-acre parcel and March 15, 2001 for the additional 10 acre portion. Plant identifications were made in the field, and plants which could not be positively identified, were collected for later determination in the herbarium, and for comparison with the recent taxonomic literature.

### 4.4.1 *Description Of Existing Botanical Resources*

The species recorded were indicative of the season ("rainy" vs. "dry") and the environmental conditions at the time of the field survey. An inventory of all the plants observed on the site during the field studies are presented in the botanical study included in the Appendix.

**Ohi'a/Uluhe Forest**

Large tracts of a combination of ohi'a (*Metrosideros polymorpha*) and uluhe (*Dicranopteris linearis*) forest are generally found on the lower, windward slopes of the Puna and Hilo Districts of the Island of Hawaii. These ohi'a/uluhe forests occur on young lava flows and shallow soils. 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 feet tall. Because of the thick cover of uluhe fern, there are only a few species associated with this vegetation type.

Within the project site, mats of uluhe present were 5 to 6 feet tall, and scattered over the site were ohi'a trees about 15 to 35 feet tall. Strawberry guava (*Psidium cattleianum*) and melastoma (*Melastoma candidum*) shrubs formed dense thickets (7 to 15 feet tall) throughout this ohi'a/uluhe forest, and shrub cover could be 50 to 60 feet in some places. Other woody components which occur on the project site in smaller numbers included guava (*Psidium guajava*), hala (*Pandanus tectorius*), gunpowder tree (*Trema orientalis*), melochia (*Melochia umbellata*), and king palm (*Archontophoenix alexandrae*). Along the northern area of the project site, a row of large albizia trees (*Falcataria moluccana*) was found adjacent to an overgrown road. Piles of old bottles and rusted cans were occasionally observed in this area. A few large common mango trees (*Mangifera indica*) also occurred along this northern boundary.

Ground cover is absent in most places due to the thick mats of uluhe. More open areas under and around the strawberry guava and melastoma thickets support scattered clumps of young strawberry guava seedlings, molasses grass (*Melinis minutiflora*), blechnum fern (*Blechnum occidentale*), star of Bethlehem (*Hippobroma longiflora*), Glenwood grass (*Sacciolepis indica*), Hilo grass (*Paspalum conjugatum*), bamboo orchid (*Arundina graminifolia*), etc. Lygodium (*Lygodium japonicum*) is a lacy, slender, climbing fern that was occasional to locally common in some places. Pig wallows were often associated with these more open, sunny areas within the site (Char 2001).

**Ruderal Vegetation**

Along the southern boundary of the project site adjacent to the utility easement and around the Hawaiian Electric Light Company, Inc.'s substation and access road, the vegetation consists of a weedy mixture of introduced grasses and herbs. These areas were infrequently maintained.

Commonly observed species included hairy swordfern (*Nephrolepis multiflora*), molasses grass, sensitive plant (*Mimosa pudica*), Desmodium sp., owi (*Stachytarpheta australis*), California grass (*Brachiaria mutica*), and broomsedge (*Andropogon virginicus*). Two ornamental species observed being common to abundant were wedelia (*Sphagneticola trilobata*) and dissotis (*Dissotis rotundifolia*). These species were probably planted along the easement as ground cover.

A woody scrub composed of melochia, gunpowder tree, lantana (*Lantana camara*), guava, melastoma, strawberry guava, and pluchea (*Pluchea carolinensis*) bordered these disturbed areas. Uluhe is also common to abundant. Other native species which prefer these more open, disturbed areas included neneleau trees (*Rhus sandwicensis*), uhaloa (*Waltheria indica*), and two sedges (*Scleria testacea* and *Cyperus polystachyos*) (Char 2001).

**Assessment Of Existing Conditions**

The native-dominated ohi'a/uluhe forest occurred over the majority of the 30-acre project site. In places, thickets of the introduced strawberry guava and melastoma were common to abundant. 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 is fairly common on the geologically young lava flows in the Puna and Hilo region.

Along the southern boundary of the project site, where it has been disturbed from construction of the existing water reservoir and electrical sub-station, the vegetation consists of a weedy mixture of species. A few native species which prefer more open, sunny locations border this ruderal vegetation type. Figure 4.5 shows the general locations of these vegetation zones.


# BOTANICAL RESOURCES ASSOCIATED WITH PROPERTY

Figure 4.5

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source:*
*Char & Associates*

A total of 100 plant species were inventoried on the 30-acre project site. Of these, 76 (76%) were introduced or alien with the majority of the plants occurring within the ruderal vegetation area. Introduced species were plants brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact in 1778. One plant (1%), the ti (*Cordyline fruticosa*), was originally of Polynesian introduction.

Twenty-three species (23%) were native. Of the native species, 17 were indigenous meaning they were native to the Hawaiian Islands and elsewhere, and 6 were endemic meaning they were native only to the Hawaiian Islands. These endemic species were: ohi'a, amau (*Sadleria pallida*), hapu'u (*Cibotium glaucum*), wahine noho mauna (*Adenophorus tamariscinus*), neneleau, and ahaniu or uki (*Machaerina mariscoides* ssp. *meyenii*).

None of the plants found during the field studies were a threatened or endangered species, or a species of concern. All of the plants can be found in similar vegetation types throughout the Hilo and Puna districts of the island. Two earlier botanical studies conducted for nearby areas recorded similar findings. The first study (Char 1992) was for the University of Hawaii-Hilo research and technology lots (University Park) located makai (east) of the project site. The second study (Char 1996) was for a 0.5 MG reservoir and water line alignment located mauka (west) of the project site, near Puloku Street (Sunrise Estates Subdivision).

### 4.4.2 Probable Impacts On Botanical Resources

Under the No Action Alternative, there would be no impact because the existing vegetation would remain on the project site since no development within the 2010 study year would occur.

With the proposed USDA PBARC project, this development would not have a significant negative impact on the botanical resources present. None of the plants identified were a threatened or endangered species, or a species of concern. Furthermore, all of the plants can be found in similar vegetation types throughout the Hilo and Puna districts of the island.

However, it was recommended that the existing ohi'a trees be incorporated into the landscaping plans wherever possible. This may also include transplanting some of the trees affected by construction. Other native species should also be considered for landscaping. Tree ferns (*Cibotium*), ahanui (*Machaerina*), ohe (*Tetraplasandra*), and loulu (*Pritchardia*) were recommended for landscaping associated with the University Park property across Komohana Street, and could be considered for use with the PBARC Project. It was also recommended that botanists, horticulturists, or others familiar with growing native species be contacted for a list of native plants suitable for landscape use.

## 4.5 AVIFAUNAL AND FERAL MAMMALS

An ornithological and mammalian survey of the project site was performed by Rana Productions, Ltd. The primary purpose of this survey was to determine if there were any federally listed endangered, threatened, proposed, or candidate avian or mammalian species on, or in the immediate vicinity of the project site. In addition, the probability of any usage of the site by these listed species given the existing habitat the site currently supports was evaluated. A copy of this report is included in Appendix E of this document.

**Survey Methods**

A two-day ornithological and mammalian field survey of the property was conducted on December 19th and 20th, 2001. All observations of mammalian species were of an incidental nature. With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or ‘ope‘ape‘a as it is known in Hawaiian, all terrestrial mammals found on the Island of Hawaii were alien species. Terrestrial mammals present in the project area are ubiquitous, thus, no trapping program was required to quantify the area's usage by alien mammalian species. The survey of mammals was limited to visual and auditory detection, and by searching for animal tracks and sign. Visual scans were also made for bats on one evening, and one morning during crepuscular periods.

A total of 10 count stations were established within the 30-acre project site. Counts were concentrated during the morning hours which are the peak of daily bird activity. An additional two hours were spent on site on the evening of the December 19th and two hours in the early morning of the December 20, 2001 in an attempt to detect nocturnally flying seabirds and owls flying over the area. Time not spent counting was used to search the site and the surrounding area for species and habitats not detected during count sessions.

### 4.5.1 Description Of Existing Mammalian And Avian Species

**Mammalian Species Present**

Three mammalian species were detected on the project site all of which were alien to the Hawaiian Islands. Two small Indian mongooses (*Herpestes a. auropunctatus*) were seen in the lower section of the site, close to Komohana Street. Numerous domestic dogs (*Canis f. familiaris*) were heard barking from subdivisions located to the north and west of the site, and both dog and cat (*Felis catus*) signs and scat were encountered within the site.

One pig (*Sus scrofa*) was encountered near the western boundary of the site. There was extensive recent pig damage present within the areas that have been bulldozed as part of topographical surveying field work, as well as in areas immediately adjacent to these cleared paths. There were also numerous well-established pig trails transecting the currently undisturbed parts of the site. All mammalian species detected were deleterious to native avian and plant communities.

The findings of the mammalian survey were consistent with the results of other recent surveys (1996-2001) conducted within the lowland areas of South Hilo. Although no Hawaiian hoary bats were recorded during the course of the survey, it is likely that bats do use resources within the site. Bats are regularly seen in and around Hilo, as well as along the coastline from Puna to North Hilo. Unlike nocturnally flying seabirds which often collide with man-made structures, bats are uniquely adapted to avoid collision with man-made and natural obstacles. They navigate and locate their prey using ultrasonic echolocation, which is sensitive enough to allow them to locate and capture small volent insects at night (Rana Productions 2001).

Although no rodents were detected during this survey, it is likely that roof rats (*Rattus r. rattus*), Norway rats (*Rattus norvegicus*), European house mice (*Mus domesticus*), and possibly Polynesian rats (*Rattus exulans hawaiiensis*) use various resources found within the project site.

**Avian Species Present**

Eight avian species, representing seven separate families were recorded during station counts. Table 4.3 includes a listing avian species along with their status and relative abundance. All species recorded were alien to Hawaii. No species listed as endangered, threatened, proposed, or as a candidate for listing under either the U.S. Fish and Wildlife Service or the State of Hawaii's endangered species programs were recorded within the project site.

**Table 4.3**
**Avian Species Detected During Station Counts**

| Common Name | Scientific Name | Status | Relative Abundance* |
|---|---|---|---|
| PHEASANTS & ALLIES – Phasianidae | | | |
| Ring-necked Pheasant | *Phasianus colchicus* | Alien Species | 0.10 |
| PIGEONS & DOVES - Columbidae | | | |
| Spotted Dove | *Streptopelia chinensis* | Alien Species | 0.50 |
| Zebra Dove | *Geopelia striata.* | Alien Species | 0.50 |
| BABBLERS - Timaliidae | | | |
| Hwamei | *Garulax canorous.* | Alien Species | 1.50 |
| SILVEREYES - Zosteropidae | | | |
| Japanese White-Eye | *Zosterops japonica.* | Alien Species | 15.00 |
| STARLINGS - Sturnidae | | | |
| Common Myna | *Acridotheres tristis.* | Alien Species | 0.10 |
| CARDULINE FINCHES & ALLIES - Fringillidae | | | |
| House Finch | *Carpodacus mexicanus frontalis.* | Alien Species | 9.30 |
| SALTATORS, CARDINALS & ALLIES - | | | |
| Northern Cardinal | *Cardinalis cardinalis.* | Alien Species | 2.20 |

* Relative abundance = No. of birds/No. of stations

Avian diversity and densities were relatively low at this site. Only two species accounted for 83 percent of the total number of birds recorded during station counts. These were the Japanese White-eye (*Zosterops japonicus*) and House Finch (*Carpodacus mexicanus frontalis*). An average of 29 birds was recorded per station count.

The findings of the avian survey were consistent with the findings of other recent surveys conducted within the lowland areas of South Hilo between 1996 and 2001 by Rana Productions, Ltd.. The eight alien avian species detected during station counts were species that one would expect to record within disturbed lowland areas in the South Hilo District (Rana Productions 2001).

**Presence Of Seabirds Not Detected During Survey**

It is also possible that small numbers of the endangered endemic Hawaiian subspecies of the Dark-rumped Petrel (*Pterodroma phaeopygia sandwichensis*), or ua'u, and the threatened Newell's Shearwater (*Puffinus auricularis newelli*), or 'a'o, fly over the project site between the months of May and October.

Dark-rumped Petrels were formerly common on the Island of Hawaii, and 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, as well as at the mid to high elevations of Mount Hualalai. It has since been reduced to relict breeding colonies located at high elevations on Mauna Loa and possibly Mount Hualalai.

Newell's Shearwaters were formerly common on the Island of Hawaii, and this species breeds on the islands of Kauai, Hawaii and Molokai in extremely small numbers. This pelagic species nests high in the mountains in burrows excavated under thick vegetation, especially 'uluhe fern. There are numerous records of this species having been seen, heard, or collected in and close to Hilo (Rana Productions 2001).

### 4.5.2 Effects On Mammalian And Avian Species

**Effects Under No Action Alternative**

Under the No Action Alternative, there should be no significant change to the types of present mammalian and avian species occurring within the project site and surrounding area. Since no development within the 2010 study year would occur, current mammals utilizing the property would continue such as rodents, mongooses, feral dogs and cats, and pigs. It is also possible that the Hawaiian hoary bat may occur in this project area foraging for resources. Thus, this bat could continue to utilize this project site.

Similarly, avian species sighted on the property would likely continue since the environment would remain unchanged. These birds consisted of alien species dominated by the Japanese White-eye and House Finch. Although not sighted, small numbers of the endangered endemic Hawaiian ua'u and the threatened Newell's Shearwater may continue to fly over the site if the currently do.

**Effects With Project**

With the project, existing mammals on the property would be displaced due to development of the PBARC and IPIF complexes. However, this change would not result in a significant negative impact on identified mammalian species present on the property or in the surrounding area because they consist of alien species such as rodents or feral animals which are harmful to native avian and plant communities. Areas of the project site used for field plots, landscaping, or left undeveloped may also provide similar habitat that can be used by these alien mammalian species.

It is possible that Hawaiian hoary bats do fly over this project site and surrounding area, and possibly utilizes resources within these areas. However, these bats are uniquely adapted to avoid collision with man-made and natural obstacles by navigating and locating their prey using ultrasonic echolocation. Therefore, development of the project should not have a significant negative impact on this bat which may continue to locate their prey, such as rodents and insects, present on the property and within the surrounding area.

Development of the PBARC and IPIC complexes are not expected to have a significant impact on the avian species identified to occur on the property. These consisted of alien species dominated by the Japanese White-eye and House Finch. These species would continue to have access to and likely occur on the property.

Although not detected during the avian survey, the Dark-rumped Petrels and Newell's Shearwaters may fly over this property. The principal potential impact that this project poses is the increased threat that these birds could be downed after becoming disoriented by exterior lighting that may be required in conjunction with the complexes. The primary cause of mortality in both these species is thought to be predation by alien mammalian species at the nesting colonies. Collision with utility structures is considered to be the second most significant cause of mortality of these seabird species in Hawaii. These nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds often collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Rana Productions 2001).

To reduce the potential for interactions between nocturnally flying Dark-rumped Petrels and Newell's Shearwaters with the project's external lights and structures, it is proposed that any external lighting planned within the proposed complexes be shielded. This mitigation measure would serve the dual purpose of: 1) minimizing the threat of disorientation and downing of Dark-rumped Petrels, and Newell's Shearwaters, and 2) comply with the County of Hawaii's current planning policy that recommends the shielding of exterior lights to lower the ambient glare on the astronomical observatories located on Mauna Kea. With these measures, the project should not have a significant negative impact on these birds.

## 4.6 AIR QUALITY

An air quality study of the project was performed by B.D. Neal & Associates, and a copy of this report is included in Appendix F. The study examined potential short- and long-term air quality impacts that may result from the construction and use of proposed facilities, and identified mitigative measures needed to reduce potential air quality impacts.

### 4.6.1 Ambient Air Quality Standards

Federal and state governments have established ambient air quality standards (AAQS) that limit ambient pollutant concentrations as identified below. At present, seven parameters are regulated which include: particulate matter, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, ozone and lead. Hawaii air quality standards are more stringent than national standards, except for those pertaining to sulfur dioxide and particulate matter.

**Summary of National and State Ambient Air Quality Standards**

| Pollutant | Sampling Period | NAAQS Primary | NAAQS Secondary | State Standards |
|---|---|---|---|---|
| Particulate Matter Less Than 10 Microns ($PM_{10}$) | Annual | 50 | 50 | 50 |
| | 24-Hour | 150 | 150 | 150 |
| Sulfur Dioxide | Annual | 80 | n/a | 80 |
| | 24-Hour | 365 | n/a | 365 |
| Nitrogen Dioxide | Annual | 100 | n/a | 70 |
| Carbon Monoxide | 8-Hour | 10 | n/a | 5 |
| | 1-Hour | 40 | n/a | 10 |
| Ozone | 1-Hour | 235 | n/a | 100 |
| Hydrogen Sulfide | 1-Hour | n/a | n/a | 35 |
| Lead | Quarter | 1.5 | n/a | 1.5 |

Note: All concentrations in micrograms per cubic meter ($\mu g/m^3$) except for carbon monoxide which is in milligrams per cubic meter ($mg/m^3$)

### 4.6.2 Present Air Quality

Air quality in the project area is believed to be relatively good, except for occasional impacts from nearby volcanic emissions and localized traffic congestion. The limited air quality data available for the area from the State Department of Health (DOH) indicate that pollutant concentrations are well within state and federal air quality standards.

Manmade particulate emissions in Hawaii generally originate from area sources such as agriculture and the mineral product industry. Power plants, fuel-burning industries, and other point sources almost exclusively emit manmade sulfur dioxides while nitrogen oxides and carbon monoxides are primarily emitted from motor vehicle traffic and industrial point sources. Sulfur dioxide emissions from Kilauea Volcano are converted into particulate sulfate, which causes volcanic haze (vog) to blanket the Hilo area during Kona wind conditions (BD Neal 2002).

## 4.6 AIR QUALITY

An air quality study of the project was performed by B.D. Neal & Associates, and a copy of this report is included in Appendix F. The study examined potential short- and long-term air quality impacts that may result from the construction and use of proposed facilities, and identified mitigative measures needed to reduce potential air quality impacts.

### 4.6.1 Ambient Air Quality Standards

Federal and state governments have established ambient air quality standards (AAQS) that limit ambient pollutant concentrations as identified below. At present, seven parameters are regulated which include: particulate matter, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, ozone and lead. Hawaii air quality standards are more stringent than national standards, except for those pertaining to sulfur dioxide and particulate matter.

**Summary of National and State Ambient Air Quality Standards**

| Pollutant | Sampling Period | NAAQS Primary | NAAQS Secondary | State Standards |
|---|---|---|---|---|
| Particulate Matter Less Than 10 Microns ($PM_{10}$) | Annual | 50 | 50 | 50 |
| | 24-Hour | 150 | 150 | 150 |
| Sulfur Dioxide | Annual | 80 | n/a | 80 |
| | 24-Hour | 365 | n/a | 365 |
| Nitrogen Dioxide | Annual | 100 | n/a | 70 |
| Carbon Monoxide | 8-Hour | 10 | n/a | 5 |
| | 1-Hour | 40 | n/a | 10 |
| Ozone | 1-Hour | 235 | n/a | 100 |
| Hydrogen Sulfide | 1-Hour | n/a | n/a | 35 |
| Lead | Quarter | 1.5 | n/a | 1.5 |

Note: All concentrations in micrograms per cubic meter ($\mu g/m^3$) except for carbon monoxide which is in milligrams per cubic meter ($mg/m^3$)

### 4.6.2 Present Air Quality

Air quality in the project area is believed to be relatively good, except for occasional impacts from nearby volcanic emissions and localized traffic congestion. The limited air quality data available for the area from the State Department of Health (DOH) indicate that pollutant concentrations are well within state and federal air quality standards.

Manmade particulate emissions in Hawaii generally originate from area sources such as agriculture and the mineral product industry. Power plants, fuel-burning industries, and other point sources almost exclusively emit manmade sulfur dioxides while nitrogen oxides and carbon monoxides are primarily emitted from motor vehicle traffic and industrial point sources. Sulfur dioxide emissions from Kilauea Volcano are converted into particulate sulfate, which causes volcanic haze (vog) to blanket the Hilo area during Kona wind conditions (BD Neal 2002).

**Present Air Quality Concentrations**

The State DOH has operated an air quality monitoring station on the grounds of the Adult Rehabilitation Center of Hilo since March 1995. However, data for the station have only been reported in annual summaries to date for the years 1999 and 2000. Sulfur dioxide concentrations recorded during this time were generally low. The annual average concentration of only 2 to 4 $\mu g/m^3$ represents about 4 percent of the State and National standards. Occasional elevated short-term concentrations were also measured but were probably volcanically related. The Hilo monitoring station did not record any sulfur dioxide concentrations exceeding state/national 3-hour and 24-hour AAQS during 1999 and 2000.

Annual average particulate matter ($PM_{10}$) concentrations at the station for 1999 and 2000 were each 11 $\mu g/m^3$ or about 20 percent of the state/national standard. None of the State/National AAQS were violated throughout the two-year monitoring period.

There are currently no reported measurements of lead, ozone, nitrogen dioxide or carbon monoxide in the project vicinity. These are primarily motor vehicle related air pollutants. Lead, ozone and nitrogen dioxide typically are regional scale problems. Concentrations of these contaminants generally have not been found to exceed AAQS elsewhere in the State.

Carbon monoxide air pollution, on the other hand, typically is a microscale problem caused by motor vehicular traffic congestion. In traffic congested areas such as urban Honolulu, carbon monoxide concentrations have been found to occasionally exceed the State AAQS. Carbon monoxide concentrations in the project area are addressed separately under a separate heading of this section based on computer modeling of motor vehicle emissions (BD Neal 2002).

### 4.6.3 Effects Of Carbon Monoxide Emissions On Air Quality

Some short- and long-term impacts on air quality will occur either directly or indirectly through construction of the project and activities resulting from the project. Short-term impacts from fugitive dust will likely occur during the project construction phase, while exhaust emissions from stationary and mobile construction equipment, traffic disruption, and workers' vehicles may occur to a lesser extent. These impacts and mitigative measures were previously discussed in Section 4.1.

Use of the proposed facilities will result in increased motor vehicle traffic on nearby roadways, potentially causing long-term impacts on ambient air quality in the project vicinity. Motor vehicles with gasoline-powered engines are significant sources of carbon monoxide and also emit nitrogen oxides and other contaminates.

Federal air pollution control regulations require new motor vehicles to be equipped with emission control devices that reduce emissions significantly compared to a few years ago. Amendments to the Clean Air Act required further emission reductions which have been phased in since 1994. The added restrictions on emissions from new motor vehicles will lower average emissions each year as more and more older vehicles leave the State's roadways. Carbon monoxide emissions, for example, will go down by an average of about 10 percent per vehicle during the next 10 years due to the replacement of older vehicles with newer models (B.D. Neal 2002).

**Emission And Atmospheric Dispersion Modeling**

To evaluate potential long-term indirect ambient air quality impacts associated with this project, computerized emission and atmospheric dispersion models were used to estimate ambient carbon monoxide concentrations along roadways leading to and from the project site. These included the two intersections of Komohana Street with Puainako Street and Komohana Street with Nowelo Street (PBARC permanent entrance). Roadway intersections are the primary concern because of traffic congestion and because of the increase in vehicular emissions associated with traffic queuing. Carbon monoxide air pollution is generally considered to be a microscale problem that can be addressed locally to some extent, whereas nitrogen oxides air pollution most often is a regional issue that cannot be addressed by a single new development.

Both 1-hour and 8-hour carbon monoxide concentrations were estimated for present conditions (year 2001) and future conditions with and without the project (year 2010). To evaluate the significance of the estimated concentrations, a comparison of the predicted values for each scenario was made. Comparison of the estimated values to the National and State AAQS was also used to provide another measure of significance.

Meteorological conditions for this modeling were defined to provide "worst-case" results. One of the key meteorological inputs is atmospheric stability category. For these analyses, Atmospheric Stability Category 5 was assumed for the morning cases, while Category 4 was assumed for the afternoon cases. These are the most conservative stability categories that are generally used for estimating worst-case pollutant dispersion within suburban areas for these periods.

Worst-case wind conditions were defined as a wind speed of 1 meter per second (2.24 mph) with a direction resulting in the highest predicted concentration. It should be noted that a steady wind of 1 meter per second blowing from a single direction for an hour is extremely unlikely and may occur only once a year or less. With wind speeds of 2 meters per second (4.47 mph), computed carbon monoxide concentrations would be only about half the values given above (B.D. Neal 2002).

**Predicted 1-Hour And 8-Hour Concentrations**

Table 4.4 summarizes the results of the modeling in the form of the estimated worst-case 1-hour morning and afternoon ambient carbon monoxide concentrations. Worst-case 8-hour carbon monoxide concentrations (Table 4.5) were estimated by multiplying the worst-case 1-hour values by a persistence factor of 0.5. This accounts for two factors: 1) traffic volumes averaged over 8 hours are lower than peak 1-hour values, and 2) meteorological conditions are more variable (and hence more favorable for dispersion) over an 8-hour period than they are for a single hour.

**Table 4.4 Estimated Worst-Case 1-Hour Carbon Monoxide Concentrations At Selected Intersections (mg/m$^3$)**

| Roadway Intersection | (Year/Scenario) 2001/Present | 2010/Without Project | 2010/With Project |
|---|---|---|---|
| Puainako Street at Komohana Street (AM) | 5.3 | 7.8 | 7.9 |
| Puainako Street at Komohana Street (PM) | 5.5 | 7.8 | 7.9 |
| Nowelo Street at Komohana Street (AM) | 2.6 | 8.7 | 8.7 |
| Nowelo Street at Komohana Street (PM) | 1.8 | 6.3 | 6.3 |

Hawaii State AAQS: 10 mg/m$^3$ : National AAQS: 40 mg/m$^3$
Note: All concentrations in milligrams per cubic meter (mg/m$^3$)

**Table 4.5 Estimated Worst-Case 8-Hour Carbon Monoxide Concentrations At Selected Intersections (mg/m$^3$)**

| Roadway Intersection | (Year/Scenario) 2001/Present | 2010/Without Project | 2010/With Project |
|---|---|---|---|
| Puainako Street at Komohana Street | 2.8 | 3.9 | 3.9 |
| Nowelo Street at Komohana Street | 1.3 | 4.4 | 4.4 |

Hawaii State AAQS: 5 mg/m$^3$ : National AAQS: 10 mg/m$^3$
Note: All concentrations in milligrams per cubic meter (mg/m$^3$)

**Present Carbon Monoxide Concentrations**

As indicated in the table, the highest estimated 1-hour concentration within the project vicinity for current (year 2001) conditions was 5.5 mg/m$^3$ during the afternoon peak traffic hour near the intersection of Puainako Street with Komohana Street. Concentrations at other locations and times studied were 5.3 mg/m$^3$ or lower. Consequently, all predicted "worst-case" 1-hour concentrations for present conditions were well within both the National AAQS of 40 mg/m$^3$ and the more restrictive State standard of 10 mg/m$^3$.

The estimated worst-case 8-hour carbon monoxide concentrations for the two locations studied ranged from 1.3 mg/m$^3$at the Nowelo Street intersection to 2.8 mg/m$^3$at the Puainako Street intersection. These concentrations were well within both the State standard of 5 mg/m$^3$and the National limit of 10 mg/m$^3$.

**Effects Under No Action Alternative**

Under the No Action Alternative, additional developments were anticipated to occur in the immediate area of the project by the year 2010. These other developments are primarily associated with the U.H.-Hilo's expansion and included more infilling within the University Park, the China-U.S. Center, and a multi-purpose sport and recreational complex. Consequently, increased traffic volumes would occur along Komohana Street in the vicinity of the project.

In the year 2010, a worst-case 1-hour concentration of 8.7 mg/m$^3$ was predicted to occur during the morning peak-traffic hour near the intersection of Nowelo Street and Komohana Street. Predicted concentrations at the other locations ranged between about 6 and 8 mg/m$^3$. Although the predicted concentrations increased substantially compared to the existing case, especially at the Nowelo Street intersection, the concentrations remained within the standards. The projected increase was due both to higher traffic volumes and the assumed installation of traffic signals along Komohana Street at Nowelo and Puainako Streets.

Under the predicted 8-hour worst-case scenario, concentrations ranged between 3.9 and 4.4 mg/m$^3$, increasing substantially compared to the present (2001) concentrations but remaining within the AAQC standards. The projected increase was due both to higher traffic volumes and the assumed installation of traffic signals.

**Effects With Proposed Project**

With the PBARC Project, additional traffic generated by this complex was added to the roadways affecting the study intersections along Komohana Street. The predicted 1-hour worst-case concentrations in 2010 with the project were essentially unchanged compared to the No Action Alternative with the project showing virtually no impact on air quality emission levels. All concentrations with the project were within both the National and the State AAQS.

Under the 8-hour predicted concentrations, the levels remained unchanged compared to the No Action alternative, indicating no project impact. All predicted 8-hour concentrations for this scenario were within both the National and the State AAQS.

Therefore, the PBARC Project is projected to have minimal if any impact on carbon monoxide concentrations at the study intersections. The additional traffic generated by the project would essentially not change the predicted emission levels in 2010 under the No Action Alternative. Predicted "worst-case" levels were within both National and the State AAQS, thus, implementing any air quality mitigation measures for long-term traffic-related impacts is probably unnecessary and unwarranted (B.D. Neal 2002). Furthermore, these conditions represented worst-case conditions assuming wind speeds about 2.24 mph. As discussed previously, wind speeds double this (<5 mph) would produce emission levels of half that predicted.

Electrical Power and Solid Waste Disposal Demands

Indirect air pollution emissions would result from power generating facilities providing electrical power to the proposed project. Electrical power would be provided by oil-fired generating facilities, geothermal power plants, or other sources. Power generating facilities may need to burn more fuel and emit more pollutants to accommodate the electrical power needs of the project. Estimates of project electrical demand were not available, but it is anticipated that for a project of this nature and size that any related impacts on air quality will be negligible.

The only associated air quality impacts that may occur from solid waste disposal would result from the transportation and burial of waste at the landfill. Estimates of project solid waste disposal demand were not available, but it is anticipated that for a project of this nature and size that any related impacts on air quality will be negligible (B.D. Neal 2002).

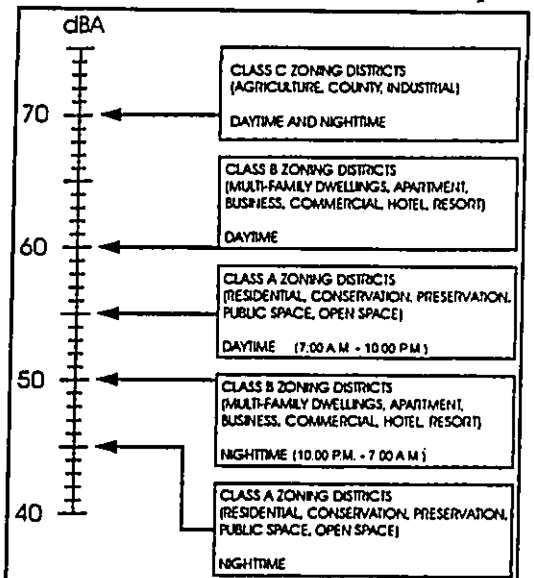
## 4.7 NOISE

An environmental noise assessment study for the PBARC Project was conducted by D.L. Adams Associates, Ltd. The study, included in Appendix G, examined the existing acoustical environment and probable noise impacts that may result from the proposed project.

**Noise Standards And Guidelines**

Various State and Federal agencies have established guidelines and standards for assessing environmental noise impacts and have set noise limits as a function of land use. A brief description of these noise standards is provided.

1. State Department of Health (DOH). The DOH defines three classes of zoning districts and specifies corresponding maximum permissible sound levels due to stationary noise sources such as air-conditioning units, exhaust systems, generators, compressors, pumps, etc., and equipment related agricultural, construction, and industrial activities. These levels are enforced for any location at or beyond the property line and shall not be exceeded for more than 10 percent of the time during any 20-minute period. The noise limits which apply are a function of the zoning and time of day.



State DOH Maximum Permissible Sound Levels for Various Zoning Districts

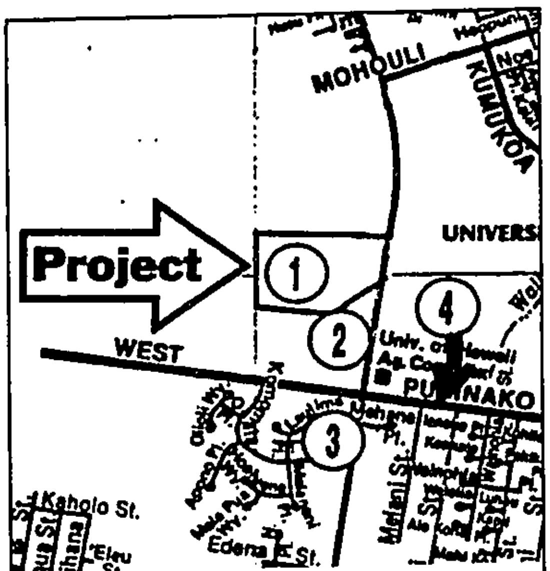
2. U.S. Environmental Protection Agency (EPA). The U.S. EPA has identified a range of yearly day-night equivalent sound levels, Ldn, sufficient to protect public health and welfare from the effects of environmental noise. The EPA has established a goal to reduce exterior environmental noise to an Ldn not exceeding 65 dBA and a future goal to further reduce exterior environmental noise to an Ldn not exceeding 55 dBA. These goals are not intended as regulations as EPA has no authority to regulate noise levels, but rather they are intended to be viewed as levels below which the general population will not be at risk from the effects of noise.
3. U.S. Federal Highway Administration (FHWA). The FHWA defines four land use categories and assigns corresponding maximum hourly equivalent sound levels, Leq, for traffic noise exposure. For example, Category B, defined as picnic and recreation areas,

parks, residences, motels, hotels, schools, churches, libraries, and hospitals, has a corresponding maximum exterior Leq of 67 dBA and a maximum interior Leq of 52 dBA. These limits are viewed as design goals, and all projects meeting these limits are deemed in conformance with FHWA noise standards.

4. State Department of Transportation (DOT). The State DOT has adopted FHWA's design goals for traffic noise exposure in its noise analysis and abatement policy. According to the policy, a traffic noise impact occurs when the predicted traffic noise levels "approach" or exceed FHWA's design goals or when the predicted traffic noise levels "substantially exceed the existing noise levels." The policy also states that "approach" means at least 1 dB less than FHWA's design goals and "substantially exceed the existing noise levels" means an increase of at least 15 dB.

### 4.7.1 Existing Acoustical Environment

Noise level measurements were conducted on September 21, 2001 to assess the existing acoustical environment (sound pressure levels in terms of decibels) of the project area. The locations of these measurement sites along with sound pressure levels recorded (dBA) were: 1) the project site (43.4 dBA); 2) 18 feet from Komohana Street (75.1 dBA); 3) 10 feet from Komohana Street (69.4 dBA); and 4) 10 feet from Puainako Street (73.1 dBA). These measurements indicated that the dominant noise sources at the specified locations were generated by vehicular traffic, wind, and occasional distant aircraft flybys (DLAA 2002).



Locations Of Noise Measurements (DLAA 2002)

### 4.7.2 Probable Noise Impacts On Acoustical Environment

Short- and long-term impacts on the acoustical environment will occur from construction work and activities associated with the project. Short-term noise impacts likely to occur during the project's construction phase were previously discussed in Section 4.1. Potential long-term impacts on the acoustical environment are primarily associated with additional traffic noise and noise generated by on-site equipment.

Measured traffic noise levels along with the traffic volume and vehicle mix counts obtained during the field measurements were used to calibrate the FHWA's Traffic Noise Prediction Model. The noise model together with projected traffic volumes for the year 2010 was then used to calculate the peak hour traffic noise levels with and without the project (No Action Alternative). These predicted results are presented in Table 4.6.

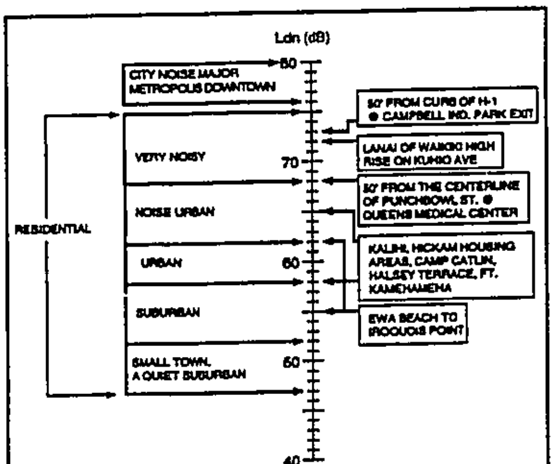
| Table 4.6 Existing and Projected Future Peak Hour Traffic Noise Levels ($L_{eq}$ in dBA) | | | | | | |
|---|---|---|---|---|---|---|
| **Scenario Description** | **Location 2 Komohana Street (18')** | | **Location 3 Komohana Street (10')** | | **Location 4 Puainako Street (10')** | |
| | **AM** | **PM** | **AM** | **PM** | **AM** | **PM** |
| **Existing Conditions (2001)** | 77.5 | 77.2 | 72.7 | 73.1 | 72.2 | 73.2 |
| **Without Project (2010) [No Action Alternative]** | 79.6 | 79.8 | 75.6 | 73.9 | 76.5 | 78.5 |
| **With Project (2010)** | 79.8 | 79.8 | 75.7 | 74.0 | 76.6 | 78.5 |
| **Project Related Increase In Noise Levels** | 0.2 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 |

As shown on the table, the model calibrated existing noise levels occurring along Komohana Street and Puainako Street are fairly noisy with noise levels varying between 72 and 78 dBA. This noise level is the result of present traffic volumes occurring along these major roadways serving the South Hilo district.

<u>Traffic Noise Effects Under No Action Alternative</u>

Under the No Action Alternative, additional developments were anticipated to occur in the immediate area of the project by the year 2010. These other developments are primarily associated with the U.H.-Hilo's expansion and included more infilling within the University Park, the China-U.S. Center, and a multi-purpose sport and recreational complex. Consequently, increased traffic volumes would occur along the study roadways in the vicinity of the project resulting in increased traffic noise levels.

Future projected noise volumes along Komohana Street and Puainako Street were shown to have an increase varying between approximately 1.0 dBA up to 5.3 dBA. Projected noise levels ranged from a low of 73.9 dBA at Location 3 in the afternoon to a high of 79.8 at Location 2 in the afternoon. The larger increases over existing noise levels would occur along Puainako Street where the China-U.S. Center and multi-purpose sport and recreational complex would be located. In addition, Puainako Street would be widened from two to four lanes and extended west of its current intersection with Komohana Street under the planned improvement of this road.



Qualitative Description Of Equivalent Sound Levels (DLAA 2002)

**Traffic Noise Effects From Project**

The PBARC Project would add more traffic volumes on Komohana Street associated with research activities conducted there. However, this additional traffic is projected to result in minimal increase in noise levels along Komohana Street and Puainako Street. As shown on the table, the largest increase of 0.2 decibels would occur at Location 2 during the morning peak hour. Other increases would be 0.1 decibels or have no change. The largest increase of 0.2 dB would be below the threshold of change in noise level that is perceptible to most people with normal hearing (DLAA 2002). Generally, a noise level increase of 1.0 decibel or less should not be perceptible to persons situated along a roadway. Therefore, the project should have minimal impact on traffic noise levels along Komohana Street.

Noise from pumps, AHU's, compressors, condensing units, and other on-site equipment would be addressed during the design phase of the project. Noise at the property line from on-site equipment must be at a level of 70 dBA or less in order to be within the State DOH maximum permissible sound limit because the property falls under the Class C Zoning District (Agriculture, County, Industrial).

Proposed facilities are sited at the far western end of the property over 650 feet away from Komohana Street. The area located nearest this road would be used for field plots, demonstration gardens, landscaping, or left undeveloped. The properties located to the north, south, and west of this project site would continue to be undeveloped by the 2010 study year. As a result, on-site equipment noise or noise from research activities conducted from this complex should not have a significant noise impact to these surrounding parcels and be within the 70 dBA noise limit. The design of the PBARC and IPIF complexes would incorporate appropriate measures to minimize noise from on-site equipment. If on-site equipment would exceed this limit, mitigation in the form of barriers, enclosures, silencers, etc. would be incorporated in the design.

## 4.8 HISTORIC, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Archaeological inventory surveys were conducted for the PBARC property by Cultural Surveys Hawaii, Inc. (CSH). CSH initially conducted a preliminary reconnaissance and, subsequently, an archaeological inventory survey of an approximately 20-acre parcel in the ahupua`a of Waiakea that was being considered for the project in May 2000. Subsequently, a second inventory survey investigation was conducted in March 2001 for an additional approximately 10+-acre parcel located adjacently west of the first 20-acre parcel. This additional parcel was studied due to the change in the original property being considered for the PBARC Project. Copies of both inventory survey reports are included in Appendix H.

The inventory survey report on the 20-acre parcel was reviewed and approved by the State Historic Preservation Division (SHPD) on October 4, 2000 (LOG NO: 26293 DOC NO: 0010RC03). The inventory survey report on the 10+-acre parcel was reviewed and approved by the SHPD on May 16, 2001 (LOG NO: 27484 DOC NO: 0105PM08). These letters are included in Appendix H.

## Archaeological Fieldwork And Procedures

The work associated with the archaeological inventory surveys included the following typical procedures:

1. A complete ground survey of the entire project area for the purpose of site inventory. All sites were located, described, and mapped with evaluation of function, interrelationships, and significance. All sites identified were assigned State site numbers.
2. If warranted, conduct limited subsurface testing to determine depth and quantity of cultural materials within archaeological sites and to obtain datable samples for chronological information.
3. Research historic and archaeological information including search of historic maps, written records, and Land Commission Award documents. Research focused on the specific area with general background on the *ahupua`a,* district, and settlement patterns.
4. Prepare inventory survey report which includes recommendations based on all information generated and specify steps needed to mitigate the impact of development on archaeological resources.

Fieldwork for the initial 20-acre parcel was completed in two steps, first a preliminary reconnaissance followed by the more intensive inventory survey. The preliminary reconnaissance was conducted on May 8 and 9, 2000 while the inventory survey was completed between May 15 and 17, 2000. Fieldwork for the approximately 10-acre parcel was an inventory survey conducted on March 14 and 15, 2001. The methods of pedestrian inspection for the reconnaissance and inventory surveys were the same consisting of a series of north-south oriented pedestrian sweeps with the interval between archaeologists maintained at 5 to 10 meters.

### 4.8.1 Historical Background

The PBARC project site lies within the ahupua`a of Waiakea which is large encompassing some 95,000 acres. This ahupua`a extends from the coast to approximately the 6,000-foot elevation on the windward slope of Mauna Loa. Five zones of land use and associated resources were described for this ahupua`a. These zones consisted of Coastal Settlement (Zone I), Upland Agricultural (Zone II), Lower Forest (Zone III), Rain Forest (Zone IV), and Sub-Alpine (Zone V). The PBARC property is situated within the Upland Agricultural Zone.

This Zone II was defined as ranging from the 50 to 1,500-foot elevation and an area of open parkland gently sloping to the base of the woods. The project area is situated within the lower elevations of this Upland Agricultural Zone, and it appeared that only the more agriculturally productive areas were intensively farmed. In the 1820s, it was estimated that only 1/20 of the expanse (i.e., zone of cultivation) in North and South Hilo was planted in crops. Habitation within this Zone apparently included some permanent occupation sites, but was still dominantly temporary. The description of habitations referred to "scattered huts" with adjacent "garden plots" or "cottages" with "neatly tended gardens" but no descriptions of village complexes like those along the coast.

## Late Prehistoric Through 1800s

Chiefly associations with this ahupua`a began early, with chiefly residences being documented as early as ca. 1550. This was mainly due to the rich resources of the area such as fishponds, crops, sandalwood, bird feathers, and later the whaling industry. Kamehameha I retained Waiakea after conquering the island, and later gave the `ili of Pi`opi`o to his favorite wife Ka`ahumanu.

In the early 1800s, a shift from a subsistence-based to a more market-based economy developed. This occurred with the coming of the sandalwood trade, the establishment of the American Board of Commissioners for Foreign Missions station in Hilo, and the whaling industry descending on the Hilo area. Land use still remained essentially the same, but was starting to evolve as elements such as cattle, timber and whaling became more intensive.

In the *mid-1800s*, the Mahele brought with it the end of traditional land tenure, issuing in the age of privatization of land. Twenty-six Land Commission Awards (LCAs) were granted within Waiakea with all but two located in the Coastal Settlement Zone. The remaining two were within the first 100-foot elevation of the Upland Agricultural Zone but not close to the project area. Cattle ranching were at the forefront in interior land areas while Hilo Town was being transformed into an entirely wooden-framed "New Bedford-type Whaling Town." Though the Coastal Settlement Zone still contained a vast majority of the population, the construction of houses and stores started to shift away Waiakea to the north as the main pier for Hilo was located at the mouth of the Wailuku River. This was a significant shift from traditional coastal settlement.

The late 1800s brought with it the advent of sugarcane and the Waiakea Mill Company. Plantations developed in the 1860s, and by the 1888 the Waiakea Mill had procured all of the ahupua'a of Waiakea. Immigrant labor lived in "camps", near existing sugarcane railroad lines.

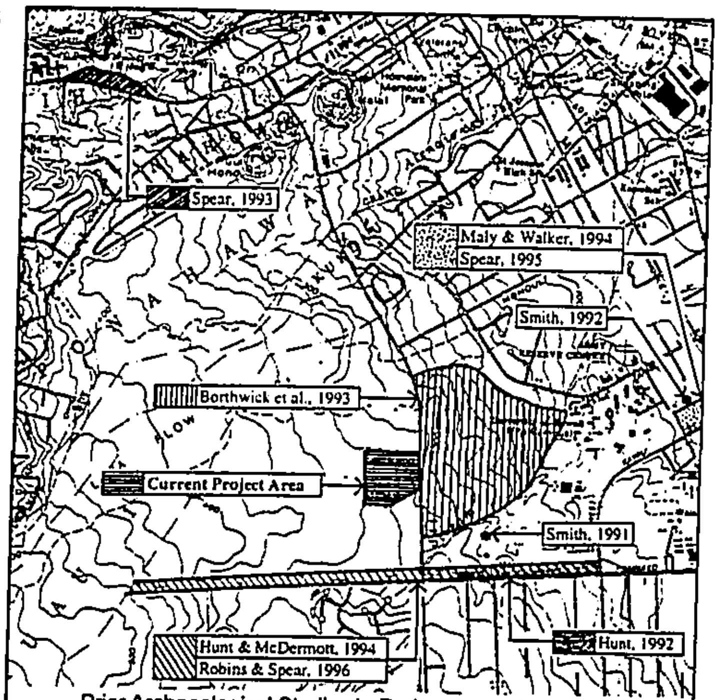
## 1900s To Present

With the 1900s came the expansion of sugarcane production in the area, but it also brought in the Parker and Shipman ranches for pasture in areas too rocky for sugarcane. A substantial amount of grazing land adjacent to Hilo or to sugarcane fields supported dairy cows for Hilo's several dairies. Homesteading was tried but declared a failure two years later. In the 1920s several large tracts of the remaining forest lands in Waiakea were designated as a forest reserve.

In the late 1900s, major construction projects were completed in the Hilo area such as Hilo Bay, wharfs, breakwater, and bridges, the Hilo Airport, and construction of the Saddle Road. After statehood, and with the closing of the sugar mill and canec plant, tourism was looked at as the next economic mainstay. Some hotels were built along the Hilo Bay frontage of Waiakea near Coconut Island or Mokuola, and large tracts of former Waiakea Homestead and sugarcane lots were converted to housing adjacent to the study area. The U.H.-Hilo campus was constructed, and the campus continues to be expanded. The project area most likely ceased to be utilized for pasturage in the 1960s. Since that time a portion of the lot has been used to construct the County's water reservoir, waterlines, and HELCO's electrical substation (CSH 2002).

### 4.8.2 Previous Archaeological Research

Prior archaeological investigations have been conducted of the Waiakea ahupua'a which are helpful in providing information on the types of sites and their distribution that can be expected within the current project area. These included Smith (1991; 1992), Borthwick *et al.* (1993), and the series of reports related to the Puainako Street Extension/Realignment project.



Prior Archaeological Studies In Project Area (CSH 2000)

Field checks conducted by Marc *Smith in 1991* identified several historic sites in the area of the project including large faced platforms, modified outcrops, enclosures which may be house sites, and a large walled enclosure. Smith also noted similar features in another project area, bounded by Ululani, Kawili, and Kapiolani Streets, and located within the former Waiakea Cane Lots during field inspection further makai of the current project area in 1992. In both cases, these features were demonstrated to be the result of historic sugarcane agriculture based on the findings of subsequent investigations of these sites.

Smith noted three different lava flows occurred in this project area which included: 1) a portion of the 1881 Mauna Loa pahoehoe flow; 2) a pahoehoe flow dating to 1,500 to 750 before present day (BP), and 3) the oldest flow which has a more level soil surface and dates greater than 4,000 BP. According to Smith, 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 appeared to be constructed along the margin of the 1,500 to 750 year old flow. Thus, sites are much more common on the older, more weathered lava flows that had significantly greater soil development.

Survey work for the proposed Puainako Street extension covered various road corridor alignments from the 200 to 1,500-foot elevation through multiple *ahupua'a*. A total of 13 sites were recorded which included stacked stone walls, mounds, platforms, modified outcrops, and faced terraces along with railroad related features such as berms, sections of track, and cross-ties. The historical research and oral interviews with knowledgeable local residents determined that all of these features were historic and related to the development of commercial sugarcane agriculture in this portion of Hilo after 1870s.

Work conducted for a U.H.-Hilo parcel (University Park) located directly across Komohana Street from the PBARC project area found similar types of stacked stone structures like those found in the Puainako Street Extension area. These features were shown to date to historic sugarcane agriculture, circa post-1870. The distribution of the features was found to follow the distribution of the three lava flows that crossed through the project area substantiating the observations made by Smith (CSH 2002).

**Findings From Prior Archaeological Studies**

The PBARC property is located on the 1,500 to 750 BP lava flow. In the vicinity of the project site, archaeological research has shown that historic properties were concentrated on the older lava flows. The more recent 1,500 to 750 BP lava flow and 1881 flow contained drastically fewer sites *which are related to soil distribution and historic agriculture.*

Within the project area vicinity, the most common site types were related to historic sugarcane agriculture. Accordingly it is not surprising that site distributions clearly mirror the distributions of older lava flows where soil development, and hence agricultural productivity, is greater. Based on this archaeological information, it is unlikely that the historic sugarcane related clearing mounds, walls, and railroad features, noted in nearby project areas on older lava flows, would be found in the project area. Historic maps showed the project area listed as pasture and outside the bounds of the sugarcane agricultural lands.

Consequently, evidence for traditional-Hawaiian land-use within the PBARC project area is lacking. In light of the poor soils and exposed lava flows within this project area, it is unlikely that intensive agriculture took place there in the prehistoric period. There is the possibility that opportunistic dryland agriculture took place, however this is unlikely. The remnants of traditional trails, with associated trail markers, are a possible site type that may be found in the project area. Sinks and lava tubes modified for temporary habitation or agriculture are another possibility.

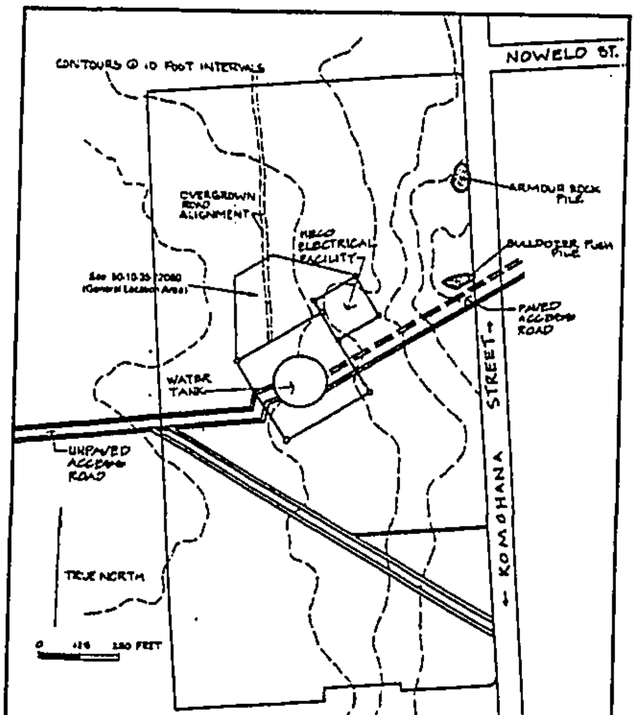
### 4.8.3 Results Of Inventory Survey

**Results For 20-Acre Study Area**

During the fieldwork, several features related to past land use were noted within this 20-acre study area. These features are identified below:

1. A north-south oriented former unimproved road alignment was noted near the center of the project area. This alignment was overgrown with vegetation but parallel tire markings were still discernable, as were the parallel berms which make up the road margins. The rusted out remains of a car were also found along this road alignment. Judging by the modern garbage scattered along the margins of the road, this road alignment was not older than 50 years and may have been in use as recently as 20 to 30 years ago based on the age of the overgrowth. Therefore, this road alignment was not considered a historic property.

2. There were bulldozer push-piles along the margin of the water tank and electrical facility access road that mark the southern end of the project area.
3. Along Komohana Street there was a stockpile of "armor rock" (boulders greater than 1 meter in diameter) most likely related to the construction and excavation associated with Komohana Street. Modern garbage (bottles, canned-food refuse, plastic, etc.) was lightly scattered through most of the project area. Several well-tended marijuana plants were also noted.



Field Survey Results In 20-Acre Project Area (CSH 2001)

During the preliminary reconnaissance of the project area in May 2000, human skeletal remains consisting of a single, left femur was found in a lava sink feature. No other remains or cultural material were located in the sink. Based on the eroded appearance of the bone and the general context, the remains were thought to be traditional Native Hawaiian most likely prehistoric or early historic. Staff persons from the SHPD were immediately notified and apprised of the find, and a SHPD representative visited the project area.

<u>State Site 50-10-35-22080</u>

Following this initial preliminary reconnaissance, a more intensive archaeological inventory survey was conducted with 100 percent of the area inspected. In the vicinity of the burial sink, several additional sinks were located. Careful examination of these features found no evidence of burial interment or other cultural modification. Confidence was high that all historic properties in the project area were located during the survey. This was the only historic site recorded within the 20-acre study area and was assigned State Site 50-10-35-22080.

| | |
|---|---|
| **State Site #** | 50-10-35-22080 |
| **Site Type:** | Sinkhole and associated caves/ overhangs |
| **Function:** | Burial Cave |
| **Features (#):** | 1 |
| **Dimensions:** | 3.5 m X 10 m |

The age, ethnicity, and function (or reason for deposition) of the single human femur within Site 50-10-35-22080 is a matter of speculation. Possible scenarios for the deposition of the isolated bone include: 1) deposition by Native Hawaiians as a discarded keep-sake; 2) deposition by Native Hawaiians as the secreted remains of a grave robbed for bone to be used as raw material for fish hook manufacture; and 3) deposition by some other ethnic group as part of a mortuary practice.

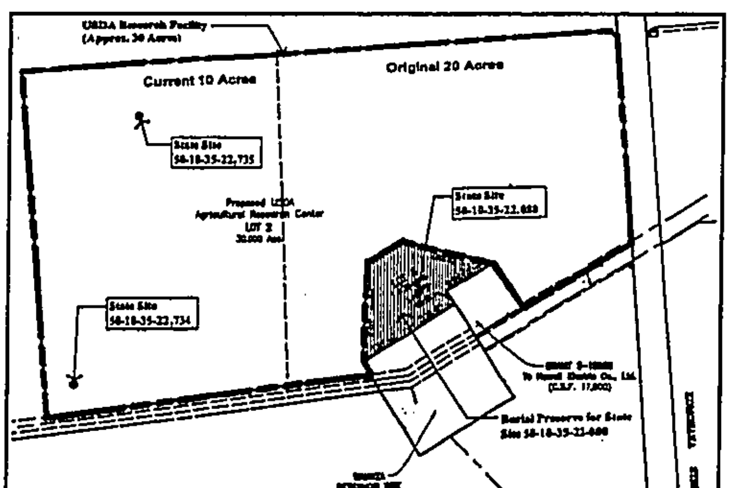
It is a possibility that the human femur is the result of grave vandalism and/or the search for human bone raw material for the fish hook manufacture. However, the long bones of these vandalized burials were typically cut and/or shattered to obtain the tabular fragments of human bone that were used for fish hook manufacture. The femur in Site 50-10-35-22080 is decomposing from exposure, but it is not cut or shattered. Thus, it seems less likely that this isolated femur was associated with the search for fish hook raw material.

The various non-Hawaiian ethnic groups that lived in the vicinity of the project during the historic period included various European nationalities, Chinese, Japanese, and Filipino. Consequently, it was less likely that these ethnic groups would have an established mortuary practice involving the deposition of an isolated human bone in a cave feature.

The thought is that the bone was intentionally hidden away in a rather difficult to reach location. There is a fair amount of ethnographic information and archaeological data documenting the common Native Hawaiian mortuary practice of curation of skeletal material or other body parts as keep-sakes from deceased loved-ones. Based on this information, the most likely scenario is that *the femur was Native Hawaiian, of prehistoric or early historic age, and was deposited as a discarded* keepsake. However, this cannot be demonstrated conclusively.

**<u>Results For 10-Acre Parcel Addition</u>**

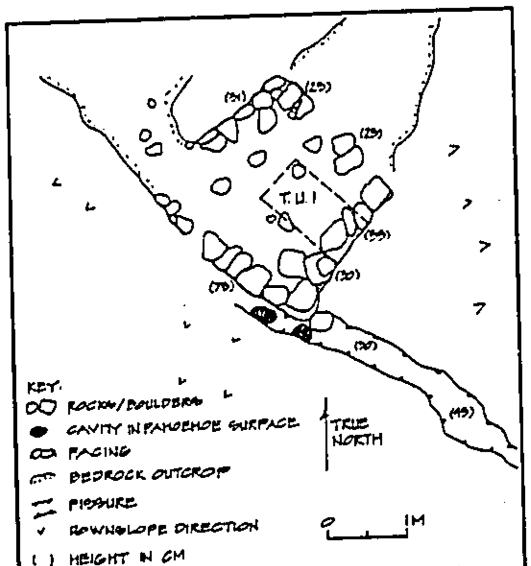
Two historic properties were located within the approximately 10+-acre parcel. Based on all available evidence, both were thought to be historic and related to agricultural or ranching activities in the area during the first part of the 20th century. These sites were designated State Site #50-10-35-22734 and Site #50-10-35-22735.



Field Survey Results For 10+-Acre Project Area (CSH 2001)

<u>State Site 50-10-35-22734</u>

State Site #50-10-35-22734 consisted of a modified crest of a low pahoehoe knoll located in the southeastern corner of this additional 10-acre project area within dense stand of strawberry guava. Pahoehoe boulders were used to form a roughly square platform that measured approximately 2.5 meters on a side. Facing is most evident along the southern portion of the feature. A shallow, narrow, natural fissure in the pahoehoe extends southeast from the feature. Two small, deeper natural cavities are located within this fissure. Approximately 15 meters to the southeast of the platform, lies an old, rubber truck tire and badly rusted wheel rim. There was no other cultural material in the vicinity of the platform.



State Site #50-10-35-22734 (CSH 2001)

Based on surface observations and general context, there were two site interpretations likely for this Site. First, the feature has the general appearance of a traditional Hawaiian burial platform. Because a burial was found in the adjacent 20-acre parcel to the east, it was not unreasonable that a traditional Hawaiian burial platform be found with the current 10-acre parcel.

Second, the platform is similar to features found within the extensive historic agricultural complexes documented along this portion of Waiakea. These historic features consist of modified outcrops, platforms, and terraces that were constructed during intensive sugarcane cultivation in the area in the early portion of the 20th century. These features functioned as clearing mounds, stone ramps, loading platforms, and temporary track foundations.

To better determine the structure's function and age of construction, a test unit was excavated within the platform's central portion. No cultural material was found, and the stratigraphy in the unit was as follows:

| | |
|---|---|
| Stratum I (0-25 cmbs): | Pahoehoe boulders used in the platform perimeter construction. |
| Stratum II (0-35 cmbs): | (Dry) 7.5 YR 3/2 dark brown; slightly hard; cobbly, gravelly sandy loam; structureless; contains very abundant roots and rootlets from the surrounding guava vegetation; lower boundary is abrupt/wavy; a combination natural sediment and platform construction (cobbles). |
| Stratum III (below 35 cmbs): | Decomposing pahoehoe bedrock. |

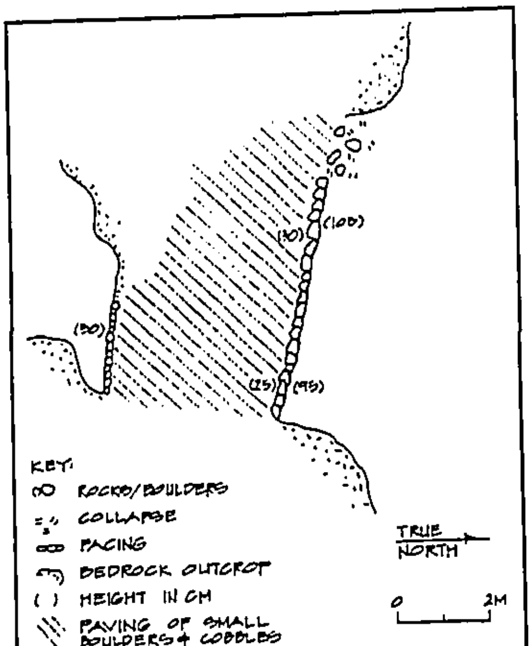
Based upon these results, it was unlikely that the platform was a burial. There was no indication of human skeletal remains, nor any indication of an internal crypt-like construction that is sometimes observed in burial platforms. Stratum II was a mix of the surrounding sediment and the locally available pahoehoe cobbles and boulders. It appeared to be a fill material used to create the level surface of the platform itself, within the perimeter of stacked boulders.

Based on the information, this feature is thought to be historic (older than 50 years), and to have functioned as a planting feature, or, possibly a foundation platform for some sort of small structure or tank. It is unclear why the feature is in apparent isolation. With the exception of its isolation, the site is very similar to structures described as historic plantation era features in inventory survey reports from adjacent parcels (CSH 2001).

State Site 50-10-35-22735

State Site #50-10-35-22735 was located within the central northern portion of the project area. There was an 8 to 12-meter tall mango tree, with historic garbage scattered underneath it approximately 30 meters to the north-northwest of the site. This historic refuse material, including machine parts and glass jars and bottles, appeared to date to the first half of the 20th century.

The Site consisted of a stacked stone causeway that was formerly part of an unimproved roadway that traversed through the area. Except at the location of the causeway, the roadway alignment is no longer discernable across the landscape. The causeway measured about 6 meters long and 4 meters wide, and was constructed to fill in a natural low spot in the pahoehoe land surface. The two sides of the causeway are neatly stacked and faced with the locally available pahoehoe boulders and cobbles. Two shallow parallel depressions, appropriately spaced to be wheel tracks, are still discernable on the causeway's surface.



State Site #50-10-35-22735 (CSH 2001)

This feature is clearly a historic feature related to transportation within the project area. Unlike the bulldozed roadway that traversed north/south through the adjacent 20-acre parcel, this apparent historic roadway showed no signs of bulldozing (e.g., bulldozer push-piles). It also did not have modern (e.g. less than 50 years old) garbage scattered along its margins and is no longer discernable as a cleared spot in the surrounding vegetation. Based on these indications, this causeway is thought to be older than the roadway within the adjacent 20-acre parcel. It most likely dates to the first half of the 20th century and is related to agricultural, dairy, or ranching activity within the project area (CSH 2001).

**Significance Of Historic Sites**

Significance evaluation of these sites identified for both the 20-acre and 10+-acre parcels was based on the criteria of the Hawaii State and National Registers of Historic places which define five broad criteria for defining a cultural site as significant:

A. Site reflects major trends or events in the prehistory or history of the state or nation.
B. Site is associated with the lives of persons significant in our past.
C. Site is an excellent example of a site type.

D. Site has yielded or is likely to yield information important to prehistory or history.

E. Site has traditional cultural significance to an ethnic group.

The two historic sites identified in the 10-acre project area addition were both considered significant under Criterion D (for their information content). Their documentation during the inventory survey field work collected the available information from these sites. This information consisted of photographs, written descriptions, tape and compass maps, sub-surface testing, and accurate locations with GPS technology. Consequently, no further work was recommended for these sites which were concurred with by the SHPD in their May 16, 2001 letter (Appendix H).

<u>Preserve Area For Site 50-10-35-22080</u>

Based upon the criteria, Site 50-10-35-22080 (burial sink) was significant under Criterion D, for its information content regarding Traditional Hawaiian mortuary practices, and Criterion E, for its cultural significance to Native Hawaiians.

A meeting on the treatment of this burial site was held on June 8, 2000 with U.H.-Hilo representatives (the landowner), SHPD representatives, a representative of the Hawaii Island Burial Council, representatives of PBARC, and representatives of the consultant team. Under the direction of the SHPD Burials Program representative, this Site was considered a burial site, and was to be treated as an "inadvertent find." It was preliminarily discussed that a preserve area should be created with a 50-foot buffer area around the rim of the burial sink. It was also discussed that the parcel being considered for the PBARC Project be re-evaluated based upon this preserve along with other existing site constraints (water reservoir, electrical substation, etc.) present on the property.

A follow-up meeting was held on July 27, 2000 to discuss treatment of the Site which was attended by similar representatives to the first meeting. The SHPD determined that the Site would require a 50-foot buffer area measured from the sink edge around the sink feature. This area created would be preserved in-place in perpetuity, and delineated with appropriate Native Hawaiian vegetation. There would be no public access to the site, and the area recorded with the State Bureau of Conveyance as a preserve area dedicated permanently for protection of the site. U.H.-Hilo representatives indicated that a buffer of about 100 feet would be provided for this burial sink which is more than the 50-foot buffer recommended by SHPD.

It was also discussed that a new site would be provided for the PBARC project due to existing constraints associated with the property (water reservoir, substation, easements) along with this preserve. This preserve created would not be part of the PBARC property and would remain under the U.H.-Hilo. SHPD representatives stated that a burial treatment plan also needs to be developed by the U.H.-Hilo, and coordinated with the Hawaii Island Burial Council and SHPD to address the long-term preservation of this Site. By removing this preserve from the PBARC property, the project would have "no adverse effect" on the Site as documented in the May 16, 2001 letter from SHPD included in the Appendix H.

### 4.8.4 Effects On Historic Properties

Under the No Action Alternative, the 30-acre project site would remain undeveloped. Consequently, there should be no effect on the three historic sites identified since the property would remain undeveloped. A burial treatment plan would still be developed by the U.H.-Hilo and processed with the SHPD and Hawaii Island Burial Council for review and approval to address preservation of State Site #50-10-35-22080.

With the PBARC Project developed on the 30-acre property, there should be no adverse effect on the three historic sites. The two sites identified on the 10-acre portion of the property, State Sites #50-10-35-22734 and #50-10-35-22734, were only significant for their information content. Consequently, the inventory survey work conducted for these sites was adequate in collecting all the available information from these sites, and no further work is required. Concurrence of this was also obtained from the SHPD as indicated in their May 16, 2001 response letter after reviewing the inventory survey report for this additional parcel.

State Site #50-10-35-22080 (burial sink) would not be affected by development of the PBARC Project since this preserve area is not part of the 30-acre project site. The location of the PBARC and IPIF complexes are located on the western end of the property a considerable distance away from this sink feature. The area near this preserve is currently planned to be used for demonstration gardens, landscaping, field plots, or left undeveloped.

The preserve area created for this historic site has about 100-foot buffers around the entire sink feature which is twice as large as the 50-foot buffer recommended by the SHPD. This preserve created would remain under the jurisdiction of U.H.-Hilo, and set aside as a permanent preserve with no public access. Furthermore, a burial treatment plan would be developed by the U.H.-Hilo, and coordinated with the Hawaii Island Burial Council and SHPD to address the long-term preservation of this Site. Consequently, the project would have no adverse effect on this historic site as concurred with the SHPD.

### 4.8.5 Traditional And Cultural Practices

A traditional and cultural practices assessment was performed for the proposed PBARC Project by Cultural Surveys Hawaii, Inc. and is included in Appendix I of this document. This study assessed the potential impacts of the project on traditional cultural practices, including native Hawaiian gathering rights and involved the following:

1. Examination of historical documents, Land Commission Awards, and historic maps to identify traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. Review existing archaeological information pertaining to sites present on the property to reconstruct traditional land use activities, and identify and describe the cultural resources, practices and beliefs associated with the parcel.

3. Conduct oral interviews with persons knowledgeable about the historic and traditional practices in the project area and region.

**Traditional Hawaiian Folklore Of Waiakea**

Waiakea, with its rich natural resources of the forests and the sea, has long been a center of habitation for Hawaiians. As a result, it is often mentioned in Hawaiian folklore and legends. According to many legends, Waiakea has also been associated with Hawaiian royalty (ali`i) since the 16th century and a gathering place for many ceremonies. Greater discussion of the traditional Hawaiian folklore of Waiakea is included in the appendices of this document.

The rich mountain resources of taro and sweet potato and the abundant marine resources particularly shrimp and fish made Waiakea very valuable to the Hawaiian people. At least five heiau of various sizes and class, stood within Waiakea. One in particular, the Kanoa Heiau, was of significant size and class where human sacrifices were offered to the gods. Many Hawaiian gods and goddesses frequented Waiakea including Pele, Hi`iaka and Pana`ewa (CSH 2002).

**Historical Background And Previous Archaeological Investigations**

A discussion of the historical background of the Waiakea ahupua`a was previously provided in this section under archaeology. This background covered the early settlement and land use patterns of Waiakea from the late prehistoric to present day.

Archaeological investigations in the area of the project site were also previously documented. The majority of archaeological work in Waiakea has occurred near the downtown core of Hilo, at the U.H.-Hilo campus, and in and around General Lyman Field. The PBARC project area is south of the airport's General Lyman Field with a few archaeological reports documenting sites within the general area.

An archaeological reconnaissance and historical investigation conducted in 1974 of a 135-acre drag strip at Pana`ewa recorded no archaeological sites. In 1985, the State Parks Administrator responded to a discovery of a cave in Pana`ewa located about 1.4 km (about 0.9 miles) east of the project area of which two adult human burials were reported. An archaeological inventory survey of the 176-acre Pana`ewa Campus site in the Hilo District conducted in 1999 determined that no significant archaeological sites or features were present in that area (CSH 2002).

**Community Consultation**

Consultation was conducted with several agencies, organizations, and community members to comment on the project based on their general knowledge of the project area along with potential cultural properties and historic sites in the area. A total of 17 persons were consulted which included representatives from the State Historic Preservation Division's (SHPD) Culture and History Branch, Office of Hawaiian Affairs, Department of Hawaiian Studies-U.H.-Hilo, Department of Anthropology-U.H.-Hilo, Pana`ewa Homestead Association, Hawaiian Civic Clubs, and various community members.

Consulted parties were also asked to identify potential negative cultural impacts and other possible interview informants or *kupuna* willing to share their knowledge of the area. Two potential *kupuna* were identified which were Kenneth Bell (70 yrs.) and Genesis Lee-Loy (83 yrs.). However, it was determined that both had insufficient knowledge of the project area to warrant an interview. Both *kupuna* were familiar with the general project area and were unaware of any nearby cultural sites or properties and any oral history information or stories concerning it. Further consultation and "talk-story" with the community did not identify any cultural concerns regarding cultural properties, sites or practices, nor did it disclose any potential negative cultural impacts (CSH 2002).

**Effects On Traditional And Cultural Practices**

Under the No Action Alternative, the 30-acre project site would remain undeveloped. The results of the assessment and consultation with informants determined that this property was absent of cultural properties, sites, or practices. Consequently, there would be no impact on traditional or cultural practices.

With the proposed USDA PBARC project, no negative cultural impacts or concerns were similarly identified after consultation with Hawaiian organizations, agencies, and community members. Therefore, the proposed project is not expected to have any short- or long-term impacts on traditional or cultural practices associated with the property.

## 4.9 VISUAL RESOURCES

This section addresses the PBARC project's impact on visual resources in the South Hilo District of the Island of Hawaii. In order to examine the possible impacts, existing important visual resources in the Hilo area were identified. These visual resources consists of scenic resources such as major land forms, open spaces, viewing points, scenic drives, and other physical features that create the visual quality of the area. The framework also consists of State and County policies, guidelines, and regulations established to protect scenic resources that are of value and importance.

### 4.9.1 Existing Visual Resources

**Visual Resources Of The Hilo Area**

The *General Plan* of the County of Hawaii (County 1989) along with the current draft *General Plan Update* (County 2001) identify a number of sites as important scenic resources contributing to the natural beauty of the South Hilo District. The South Hilo District landscape gently slopes from Hilo Bay inland and upwards towards Mauna Kea and Mauna Loa. Hilo Bay also provides a picturesque foreground for the town of Hilo. Thus, visual resources in this district are generally dominated by views associated with the coastline and of Mauna Kea and Mauna Loa.

The County's *Hilo Community Development Plan* (BCA 1975) identified many natural and man-made visual resources in the Hilo town area along with significant viewing points. Similar to the *General Plan*, these resources and viewing points are concentrated along the shoreline area.

Other resources included the many waterfalls associated with Wailuku River Valley. Some of the notable areas relevant to the project area identified as important scenic resources to the Hilo area's natural beauty include the following:

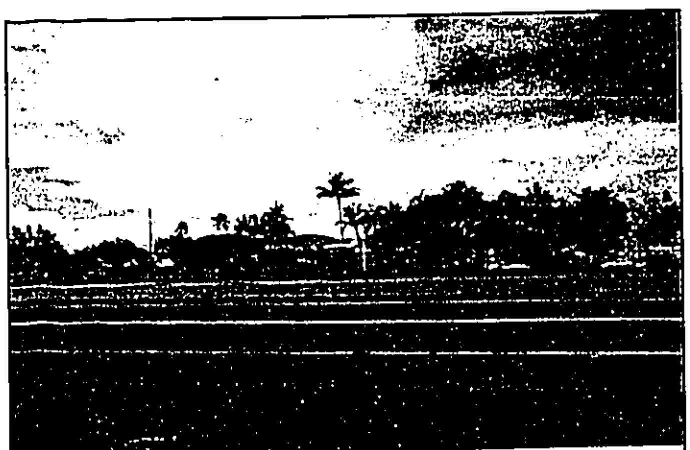
- Banyan Drive and associated scenic resources such as Liliuokalani Gardens, Coconut Isle, and Reeds Bay;
- Views of Hilo Bay with Mauna Kea and Mauna Loa in the background from coastal roads such as Hawaii Belt Road, Bayfront Highway, Banyan Drive, and Kalanianaole Avenue;
- Views of the Waiakea Fish Pond and associated Wailoa River area from surrounding roadways.

**Visual Resources Associated With Project Site**

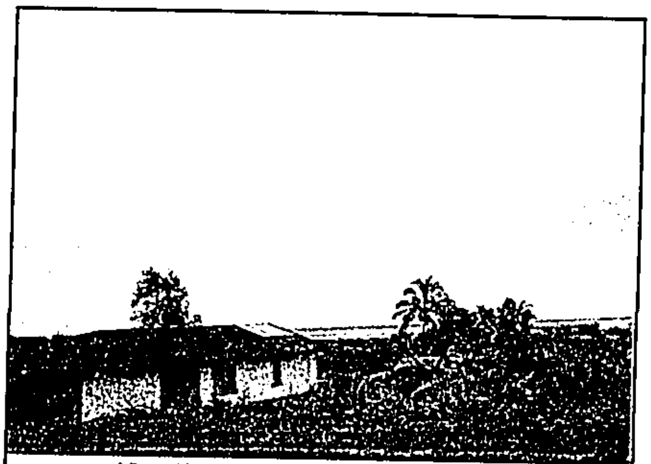
The project site is located over 2 miles inland from the Hilo Bay shoreline area. Elevation of the project site and surrounding areas is about 350 to 370 feet above mean sea level, and the property slopes gently upwards in an easterly to westerly direction. The project site is currently undeveloped, and covered with native-dominated ohi'a and uluhe forest. Views of the site from Komohana Street along with Nowelo Street are limited only to the tall and dense ohi'a and uluhe forest vegetation bordering the property. Thus, no views are available of the inner portions of the property. There are also no significant or important visual resources or landforms present within the 30-acre property.


View Of Project Site (Right Side) Along Komohana Street

Inland (mauka) views of the property from coastal roadways ("eye" level) would be obstructed by existing developments, trees, and other structures between these areas. From the shoreline inland (southwest) about 1 mile, the slope is rather flat at about 2 percent rising from the shoreline to about 100 feet msl. Views of inland (mauka) areas are thus obstructed to a large extent by existing structures. Over the next 0.6 miles inland (about 3,300 feet), the slope increases to 6 percent changing from 100 feet to 300 feet msl at about Komohana Street. However, from Komohana Street inland, the land flattens out again to a slope of about 2 percent.


Mauka View Toward Project Site From Bayfront Highway

Thus, the project site should generally be difficult to view from the shoreline area, if at all, due to the area's rather flat slope and obstructions from existing structures. The University Park below (northeast) of Komohana Street may be somewhat visible from areas further inland (mauka) within Hilo town due to the steeper slope associated with this area. Figure 4.6 shows aerial photographs of the property to give some perspective views of its relation to the shoreline and inland (mauka) areas.


View Along Lihoe Street Toward Coastline

With view planes toward the shoreline, the project site may be partially visible from a few house lots of the Sunrise Ridge Estates subdivision located to the northwest at higher elevations. Some homes from residential subdivisions located at higher elevations further west and northwest of the site may also have partial views of the site along with the lower Hilo town area if they are set along the ridgeline. However, the existing tall vegetation of the ohi'a and uluhe forest in the area generally limits and obstructs any views of the project site. The only public views from these subdivision areas would be from roadways. Public views of the project site from these subdivision roadways are generally obstructed and limited due to existing homes and vegetation.

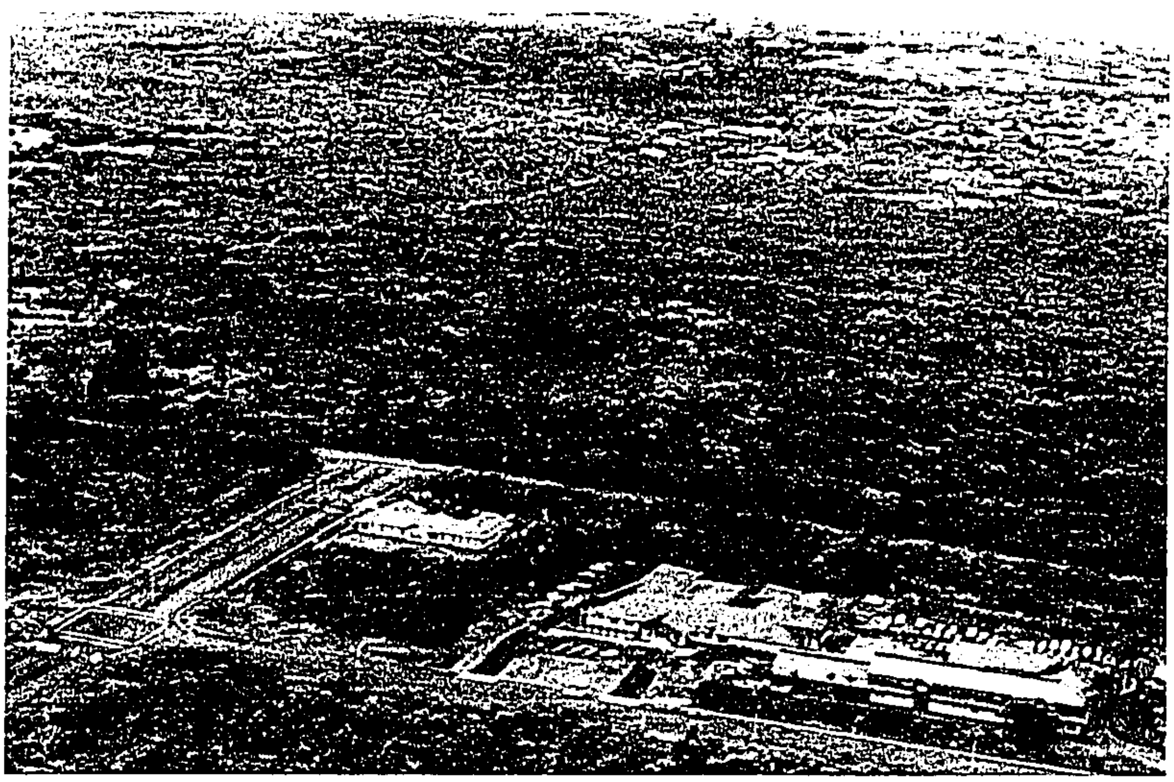
### 4.9.2 Effects On Visual Resources

**View Plane Assessment – No-Action Alternative**

Non-development of the project would result in no change to the existing visual character of the property which would continue to consist of vegetation associated with the ohi'a and uluhe forest. View planes of the project site and inland (mauka) areas from surrounding streets would be unchanged and limited to the thick vegetation along Komohana Street.

Existing views from the shoreline area toward the project site would not be visible due to existing urban development and structures. From inland areas of Hilo town, mauka views of the project site would continue to remain unchanged if visible. However, further development of the University Park site would occur by the year 2010 resulting in additional structures visible within that area. Urbanization of this site would reflect the planned expansion of the U.H.-Hilo toward the PBARC project site. This view would thus reflect a continued expansion of urbanization from Hilo Town, to the U.H.-Hilo, and to residential subdivisions being developed at higher elevations with Mauna Kea, and Mauna Loa in the background.

Aerial View Towards Hilo Bay And Coastline Area



Aerial View Towards Project Site And Mauka Area

**PERSPECTIVE PHOTOS OF SITE VIEW PLANES**

**Figure 4.6**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source: Richard Matsunaga & Associates Architects, Inc.*

The view plane from higher inland areas toward the coastline would also remain essentially unchanged. Development of the University Park would occur resulting in additional buildings and urbanization being visible. This would similarly reflect the continued urbanization toward the more developed shoreline area. These changes to the view plane from both a shoreline and mountain (mauka) perspective should not have an adverse impact on existing public viewing locations (roadways, scenic points) or visual resources (landforms, important open space).

**View Plane Assessment – With Project**

Development of the PBARC project is not anticipated to have significant impacts on the view planes towards the project site nor adversely effect important public viewing points or visual resources. With the project, new views of Mauna Kea, Mauna Loa and the coastline would be created from the facilities since this property is presently inaccessible by the public.

Zoning regulations for the project site limits the height of structures to 45 feet. Preliminary design information of the PBARC and IPIF facilities indicates that structures will not extend higher than this height limitation. Most of the buildings and accessory facilities associated with this project are planned to be single-story structures with the tallest facility consisting of the PBARC administration building.

Views from the shoreline area and scenic coastal roads should be minimally impacted by the project. The majority of important visual resources and viewing points identified under the County's *General Plan* and *Hilo Community Development Plan* are located along the coastline and involve views of the Hilo Bay. As a result, the project would not affect these views or resources.

Residences located at higher elevations which have coastline views are not expected to have their view planes significantly impacted by the project. Even with the maximum height limits of 45 feet, existing views should not be obstructed by buildings and structures constructed. In addition, the extensive and tall ohi'a and uluhe forest vegetation in the surrounding area limits available coastline views from these residential areas.

Mauka views from the shoreline and lower elevations are not expected to be affected since the project site should not be visible due to other existing buildings and structures in the Hilo Town area given the generally flat slope and topography. Views of Mauna Kea and Mauna Loa should similarly not be affected by the project. As under the No Action Alternative, these mauka views would reflect the continued expansion of urbanization from Hilo Town. This change would reflect an extension of the built environment in the area basically creating a continuous flow of urbanization from the U.H.-Hilo campus up to that of the Sunrise Estates subdivision.

In the immediate vicinity of the project site, views of the research facilities should not create a significant visual impact. Research facilities are sited well inland (mauka) of Komohana Street. As shown on the Site Plan, large open space areas from this roadway to the facilities would be landscaped, left undeveloped, or used for field plots or demonstration gardens. This large open area would provide a substantial buffer area between facilities and Komohana Street. Further, design plans for PBARC facilities would consider incorporation of existing trees and native plants in the facility's landscaping which would further screen the project and supplement this buffer area.

**Light Pollution Effects**

The project would include some outdoor lighting for the access driveway, parking areas, walkways, entries to buildings, exterior of buildings, and for signs. These light fixtures along with lighting associated with the research facilities would generate increased light sources which may affect the astronomical observatories on Mauna Kea.

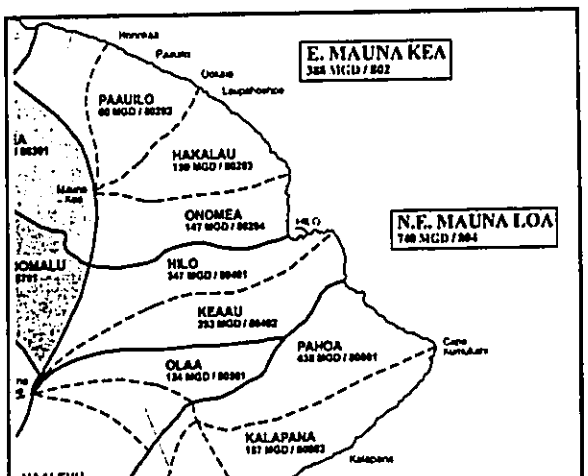
To mitigate potential undesirable light effects from the project, the design of facilities will be developed in compliance with County of Hawaii's Ordinance No. 88-122 relating to Outdoor Lighting. The purpose of the ordinance is to aid in the conservation of energy and to restrict the permitted use of outdoor light fixtures emitting undesirable light rays into the night sky which have a detrimental effect on astronomical research.

This ordinance covers the class of lighting applications by: 1) color, 2) general illumination of ground areas, and 3) decorative uses. The Ordinance is intended to protect the observatories from undesirable effects from light sources by the use of low pressure sodium lamps, limiting the wattage of lamps, requiring shielding to prevent "uplights", and having time restrictions for light sources other than low pressure sodium lamps.

Lighting fixtures that completely shield the lighting source (lamp) to limit the direction of light rays downward only would be considered. Further steps would include considerations to minimize the reflected light from ground or wall surfaces by avoiding smooth reflective surfaces where lighting fixtures are used. Possible use of pole heights for lighting standards that match the heights of the building roof eave would also minimize visual effects.

## 4.10 HYDROGEOLOGICAL RESOURCES

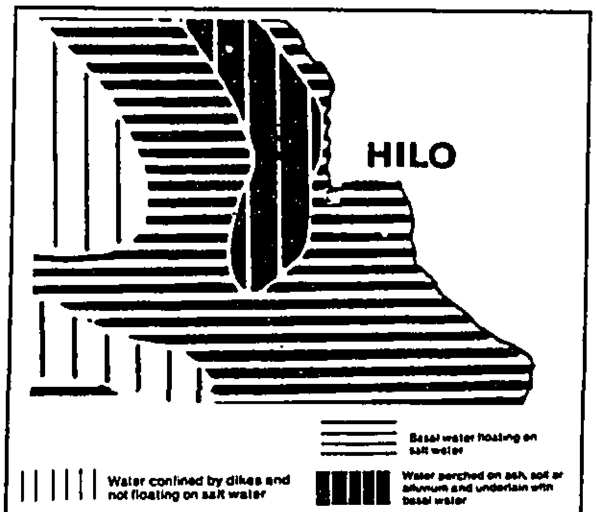
Aquifers in the Island of Hawaii have been classified by the State under an aquifer coding system to identify and describe them under the Water Resource Protection Plan. Under this system, the island is divided into Aquifer Sectors which then have Aquifer Systems located within each sectors. An Aquifer Sector reflects an area with broad hydrogeological (subsurface) similarities while maintaining traditional hydrographic (surface), topographic and historical boundaries. The Aquifer system is an area within a sector that is more specifically defined by hydrogeologic continuity, particularly hydraulic connections among aquifer types and units (CWRM 1989).



Northeast Mauna Loa Aquifer Systems (CWRM 1995)

### 4.10.1 Existing Hydrogeological Resources

The PBARC project site is located within the Northeast Mauna Loa Aquifer Sector (Sector 804) which includes a large majority of the South Hilo district. This aquifer sector generally includes the area from the shoreline inland up the slopes of Mauna Loa volcano between the Wailua River to the north and the Pahoa district to the south. Within this aquifer sector, there are two Aquifer Systems which are the Hilo (80401) and Keaau Systems (80402). The project site is located within the Hilo Aquifer System (CWRM 1989).



Ground Water Resource Areas (CWRM 1989)

In Hilo, ground water resources associated with this Hilo Aquifer System include: 1) basal water floating on salt water, and 2) water perched on ash, soil, or alluvium and underlain with basal water. The 30-acre PBARC project site appears to be located within the resource area having water perched on ash, soil, or alluvium. This Hilo aquifer system was identified as having a sustainable yield of 347 million gallons per day (mgd).

Streams are not well developed within this Hilo Aquifer system. The Wailuku River is the largest stream in the vicinity of this aquifer system, however, this river is included as part of the Onomea Aquifer System (East Mauna Kea Aquifer Sector). Heavy rainfall in this Hilo system produces many small streams which are intermittent. The area's thin soils and relatively new permeable lava flows are not conducive to surface runoff by promote infiltration (CWRM 1990).

The largest aquifer is the non-artesian basal aquifer that underlies much of the northeast flank of Mauna Loa. It is hypothesized that a groundwater gradient of 5 feet per mile occurs due to groundwater standing 17 feet mean sea level at Olaa located about 3.5 miles from the coast. The vast quantity of recharge to this basal groundwater creates higher than normal non-artesian heads in the Hilo area. A very large basal spring, having flows up to 146 mgd, discharges into the Waiakea estuary. High level dike water may also exist at some point inland from the coast. Dikes associated with the Mauna Loa northeast rift could store groundwater at a high level. Perched groundwater aquifers are also important to this system and occur near the Mauna Loa and Mauna Kea contact area. This water is associated with the Kau Basalt overlying Pahala Ash (CWRM 1990).

### 4.10.2 Effects On Hydrogeological Resources

There would be no effects on hydrological resources under the No Action Alternative since the project site would remain undeveloped. Consequently, no surface or subsurface activities would occur on the site which could affect groundwater or surface water resources.

**Project Effects On Hydrogeological Resources**

The PBARC Project should not have a significant impact on hydrogeological resources in the surrounding area of the property. Construction activities associated with the property would not alter existing streams or drainage patterns associated with any perennial streams. Thus, the project would not impact surface water resources in the surrounding area.

Domestic water service for the project would be provided by the County Department of Water Supply which has a system complying with drinking water standards as approved by the State DOH. Additional water sources should be available from existing and planned water system improvements discussed in Chapter 5, and necessary water allocations would be obtained.

Wastewater facilities would connect to the County's existing wastewater system. Thus, no septic systems or cesspools would be utilized which may affect groundwater resources. Reclaimed water processed from the wastewater facility being provided as part of the project would be suitable for vegetated areas on the property such as landscaping, field plots, etc. Solid wastes generated from activities would not affect groundwater resources because it would be collected by a private hauler and disposed of at County landfill sites in accordance with County regulations.

To maintain existing pre-development surface runoff conditions, drywells are planned to be utilized within the project site to collect and dispose of surface water runoff. These drywells would essentially allow surface runoff to infiltrate within the site which already occurs to a large extent due to the high porous conditions associated with the Pahoehoe Lava. These drywells would be developed as part of the facility's design, and design plans coordinated with the County and State DOH. Furthermore, an Underground Injection Control permit would be obtained for these drywells, and drywells would be maintained and monitored in accordance with permit conditions.

## 4.11 COMPLIANCE WITH FEDERAL CONSULTATION REQUIREMENTS

Development of both the PBARC and IPIF complexes would be federally funded through the U.S. Department of Agriculture. Consequently, this project is subject to various Federal regulations which need to be complied with. This section discusses the applicability and efforts which have been taken in complying with those pertinent requirements.

### 4.11.1 Section 106 Consultation, National Historic Preservation Act

This project is considered a Federal "undertaking" and is thus subject to Section 106 consultation under the National Historic Preservation Act, as amended (NHPA) (16 U.S.C. 470(f)). Section 106 consultation procedures are defined by the Advisory Council on Historic Preservation (ACHP) under their regulations 36 CFR Part 800, Protection of Historic Properties.

This Section 106 consultation requires Federal agencies to take into account the effects of their undertakings on historic properties. The USDA, ARS is serving as the Agency Official initiating this Section 106 consultation process for this entire PBARC Project. This document was subsequently used to facilitate consultation efforts with consulting parties in assessing the project's impact on historic properties.

Consultation under this Section 106 process was combined with the environmental review process allowing for public review and input on the project and its probable effects on historic properties. The information provided in the Draft EA was used to facilitate consultation efforts with consulting parties in assessing the project's impact on historic properties. Comments received on that Draft EA was considered in evaluating the project's effect on historic properties resulting in the completion of this Final EA document.

**Identification And Consultation With Consulting Parties**

Efforts were conducted to initiate consultation with several native Hawaiian organizations and pertinent government agencies which included the SHPD, Office of Hawaiian Affairs, Department of Hawaiian Home Lands, and Hawaii Island Burial Council. A listing of native Hawaiian organizations was compiled based upon information obtained from the SHPD and previous projects. Using this list, solicitation letters with project information were sent on October 16, 2001 to these parties giving them 30 days to provide any comments.

Public notices of the project and initiation of Section 106 consultation efforts were also published in the Hawaii Tribune Herald and West Hawaii Today newspapers on October 23 and 24, 2001. These notices were published in these local newspapers of general circulation on the Island of Hawaii to notify the general public and other potential Hawaiian organizations of these consultation efforts being initiated.

On March 19, 2002, follow-up letters were again sent to those who didn't respond to the initial solicitation letter. These follow-up letters informed parties of the project, the forthcoming publication of the Draft EA document for public review, and whether they would like to receive a copy of the Draft EA. No further responses to these follow-up letters were subsequently received.

Copies of the Draft EA document were provided to several of these Hawaiian organizations even though no responses were received from previous letters. All comment letters and responses received along with memos of consultation with individuals are included in Appendix B of this document. Based upon the comments received from the initial consultation efforts along with the publication of the Draft EA, no major issues or concerns associated with the PBARC Project or property in terms of archaeological or cultural matters have been raised.

**Identification Of Historic Properties And Assessment**

Section 4.8 discussed the results of archaeological inventory surveys conducted for the 30-acre project site. The "area of potential effects" was determined to consist of this 30-acre project site.

The inventory survey results determined that there were two historic sites present within this property which were given State Site #50-10-35-22734 and #50-10-35-22734. Both of these sites were only significant for their information content. Consequently, the inventory survey work conducted for these sites was adequate in collecting all the available information from these sites, and no further work was required.

State Site #50-10-35-22080 (burial sink) was identified within an area initially being considered for the PBARC Project. This Site was significant under Criterion D, for its information content regarding Traditional Hawaiian mortuary practices, and Criterion E, for its cultural significance to Native Hawaiians. Discussion with SHPD indicated a 50-foot buffer around this sink was required in establishing it as a preserve. The actual preserve created for this site will have about a 100-foot buffer around it. This preserve created would not be part of the PBARC property and would be set aside as a preserve area under the U.H.-Hilo dedicated permanently for protection of the site. A burial treatment plan would be developed by the U.H.-Hilo, and coordinated with the Hawaii Island Burial Council and SHPD to address the long-term preservation of this Site.

**Determination On Historic Properties**

Based upon these results and action, the project was determined to have "no adverse effect" on the two Sites within the PBARC property and the Site (#50-10-35-22080) located adjacent to it. The preserve established for this Site would help avoid any adverse effects. Concurrence of this was obtained from the SHPD as indicated in their May 16, 2001 response letter included in Appendix H. Further, a comment letter received on the Draft EA from the State Historic Preservation Officer (SHPO), and included in Appendix B, indicated that this project has already gone through the historic preservation review process, and mitigation has been completed. The SHPO believes that no historic properties will be affected by this project. Therefore, based upon this SHPO finding and input received as part of the environmental review process, a "no effect" determination is being issued by the Federal Agency Official as part of this Section 106 consultation process. This completes the Section 106 consultation process for this project.

### 4.11.2 Section 7 Consultation, Endangered Species Act

This project is considered a Federal "action" and is thus subject to Section 7 consultation under the Endangered Species Act, as amended November 1988 (ESA). This PBARC Project is not considered a "major construction activity" and "informal consultation" was conducted with the U.S. Fish and Wildlife Service (FWS) under these requirements. This consultation was conducted to ensure that the project was not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

Consultation efforts conducted with the FWS have included: 1) transmitting a pre-assessment consultation letter as part of the Draft EA's preparation asking for any comments on the project, and 2) providing a letter dated March 21, 2002 requesting information clarifying the presence of listed species and designated critical habitat that may be affected by the project under the informal consultation process. This letter also included copies of the preliminary botanical and faunal studies prepared for this project for their review and information. The Draft EA document published was also provided to the FWS for their review and comments to help facilitate consultation efforts with FWS in assessing the project's impact.

**Preliminary Assessment Of Effects**

Sections 4.4 and 4.5 discussed the results of botanical and faunal studies conducted for the 30-acre project site. The botanical study determined that the project would not have a significant negative impact on botanical resources present. None of the plants identified were a threatened or endangered species, or a species of concern. Furthermore, all of the plants can be found in similar vegetation types throughout the Hilo and Puna districts of the island.

Mammalian species detected on the project site consisted of alien species to the Hawaiian Islands such as small Indian mongooses and a pig. Thus, all mammalian species detected were deleterious to native avian and plant communities.

It is possible that Hawaiian hoary bats do fly over this project site and surrounding area, and forage for food or roost within these areas. However, the project should not have a significant negative impact on this bat which may continue to locate their prey, such as rodents and insects, present on the property and surrounding area. A comment letter received from the FWS on May 20, 2002 (included in Appendix B) recommended that site clearing and tree felling for the project occur outside the months of both June and July to minimize the risk of possible harm to breeding bats and their young which could be at the project site.

The project is also not expected to have a significant impact on avian species identified to occur on the property. These consisted of alien species dominated by the Japanese White-eye and House Finch. Although not detected during the avian survey, the Dark-rumped Petrels and Newell's Shearwaters may fly over this property along with the larger Hilo town area. The potential impact that this project poses is the increased threat that these birds could be downed after becoming disoriented by exterior lighting that may be required in conjunction with the complexes.

To reduce the potential for interactions between these birds with external lights and man-made structures, it was proposed that any external lighting planned be shielded. This mitigation measure would serve the dual purpose of: 1) minimizing the threat of disorientation and downing of Dark-rumped Petrels, and Newell's Shearwaters, and 2) comply with the County of Hawaii's current policy that recommends the shielding of exterior lights to lower the ambient glare on the astronomical observatories located on Mauna Kea. The FWS determined that they concur with this recommendation. In addition, they recommended that light poles erected at the site should be limited to a maximum height of 25 feet.

**Determination On Endangered Species**

The FWS has assessed this project to evaluate the effects which may be beneficial, insignificant, or discountable as part of their responsibilities under Section 7 of the ESA. They determined that no federally endangered, threatened, or candidate species, significant wetlands, or other Federal trust resources under their jurisdiction occur at the project site nor in the immediate vicinity of the project. For those species which may occur in the area, the USDA has agreed to implement the recommendations identified above to avoid harm to federally listed species. Based upon these study results and implementation of mitigative measures, the FWS concurs with the finding that no federally listed species are likely to be affected by the proposed project. This determination completes the Section 7 consultation process.

### 4.11.3 Executive Order 11990 Protection Of Wetlands

Executive Order 11990 was issued to minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. This Order requires Federal agencies, in their planning actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided. The botanical survey conducted of the project site determined that there are no wetlands present on the 30-acre property. Consequently, the project would not affect or result in the loss or destruction of wetland.

### 4.11.4 Executive Order 11988 Floodplain Management

Executive Order 11988 requires Federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains. It also requires agencies to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. The project site is not located within a designated floodplain based upon the FIRM for the project area, nor would it alter floodplains located in the surrounding area. Therefore, the project would not trigger the procedures and requirements associated with this Order.

### 4.11.5 Coastal Zone Management Act

The Coastal Zone Management Act (CZM Act) encourages the management of coastal areas and provides grants to be used in maintaining coastal zone areas. It requires Federal agencies to be consistent with the enforceable policies of state coastal zone management programs when conducting or supporting activities which affect a coastal zone. It is intended to ensure that Federal activities are consistent with state programs for the protection and enhancement of the nation's coastal zones.

The State's Coastal Zone Management policies and regulations are prescribed under Chapter 205A, HRS. The coastal zone management area is defined to include all lands of the State and the area extending seaward from the shoreline to the limit of the State's management authority. Thus, the project site is within this CZM area and subject to being consistent with the CZM program objectives and policies. The project would be consistent with these objectives and policies as discussed later in this document under Chapter 8 covering consistency with plans and policies.

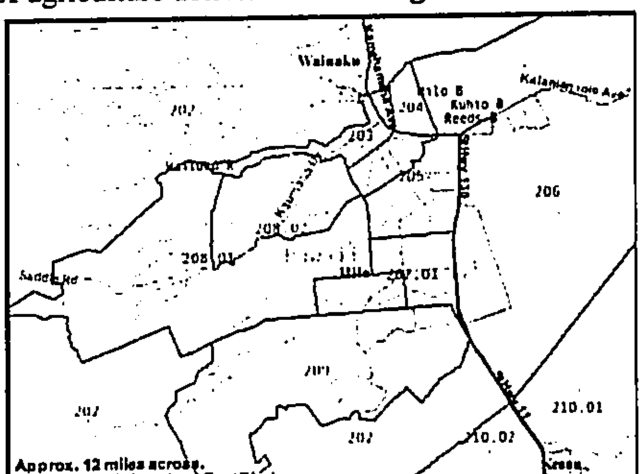
# CHAPTER 5
# ECONOMIC AND SOCIAL FACTORS

This chapter discusses the project's probable impact on economic and fiscal factors associated with the State and County, as well as social factors such as changes in resident population, housing, and character of the community. A socio-economic impact assessment study was conducted for the PBARC property by SMS which is included in Appendix J of this document.

## 5.1 EXISTING SOCIAL AND ECONOMIC CONTEXT

Hilo is the capital of the County of Hawaii and the center of much of its agricultural activity. It has been the government center for the island since County government was instituted in 1905. It is also home to the University of Hawaii, Hilo and a campus of the University of Hawaii Community College system. The University Park development is also being developed by the University as a research and technology park representing the expansion of the existing campus. Hawaii County has weathered an economic transformation and emerged with a mixed economy and relatively high levels of employment, but modest incomes on the whole.

The Hilo district is large having a variety of areas supporting tropical agriculture on the island. The island's diverse ecosystems ranging from high alpine zones to low elevation systems varying from rain forest to desert support the diversity of agriculture activities occurring. The total farm acreage in Hawaii County was approximately 870,000 acres in 1999 or 60.4 percent of the State's total. This County is the largest producer of fruit, flowers, macadamia nuts, coffee and cattle in the State, and also has larger areas in government forest reserve and private forestland than the other counties. There is extensive variation in climate on the island, with agricultural specialization well developed for different ecologies (e.g., papaya production in Puna, ginger cultivation along the Hamakua coast, and coffee plantings in South Kona) (SMS 2002).



Hilo Census Designated Place (SMS 2002)

### 5.1.1 Population And Demography

The County has a total population of 148,677 persons based upon the recent 2000 Census data. Hilo is the County's most populous town, and the Hilo Census Designated Place (CDP) had a total population of 40,759 persons. The Hilo CDP has 14,577 households and the median age of residents is the same as the County as a whole which is 38.6 years slightly older than the State. Table 5.1 provides more data on the demography of the Hilo CDP in relation to both the County and State.

Ethnically, Hawaii County's population is mixed, like the rest of the State. However, persons with Hawaiian and Caucasian ancestry are especially numerous representing 30.2 percent and 24.3 percent of the population, respectively.

**Table 5.1 Demography, 2000 Census**

| Description | Hilo CDP | | Hawaii County | | State of Hawaii | |
|---|---|---|---|---|---|---|
| Total Population | 40,759 | | 148, 677 | | 1,211,537 | |
| | No. | % | No. | % | No. | % |
| Age: | | | | | | |
| 0 - 5 years | 2,301 | 5.6% | 9,130 | 6.1% | 78,163 | 6.5% |
| 5 - 19 years | 9,143 | 22.4% | 22,601 | 15.2% | 249,088 | 20.6% |
| 20 - 64 years | 22,492 | 55.2% | 96,827 | 65.1% | 723,685 | 59.7% |
| 65 + years | 6,823 | 16.7% | 20,119 | 13.5% | 160,601 | 13.3% |
| Median Age | 38.6 years | | 38.6 years | | 36.2 years | |
| Persons in Households | 39,368 | | 145,873 | | 1,175,755 | |
| Persons in General Quarters | 1,391 | | 2,804 | | 35,782 | |
| No. of Households | 14,577 | | 52,985 | | 403,240 | |
| No. of Persons Living Alone | 3,510 | | 12,240 | | 88,153 | |
| Average Family Size | 3.19 | | 3.24 | | 3.42 | |
| Average Household Size | 2.70 | | 2.75 | | 2.92 | |

Source: SMS 2002

### 5.1.2 Housing

The housing stock for the Hilo CDP presently accounts for a little over 25 percent (16,026 units) of the County total and about 3 percent of the State total. Table 5.2 shows housing information for this CDP along with the entire County. This Hilo CDP has a higher percentage of occupied housing than the overall County or the State at about 91 percent. This situation is largely because visitor units form only a small part of the housing stock (as indicated by the Census category "Vacant for seasonal or recreational use"). Hilo CDP and Hawaii County household sizes are small compared to the State, due in part to the overall aging of the local population.

### 5.1.3 Economy

Hawaii County has transformed over the last four decades from a plantation economy to a mixed one. Tourism, diversified agriculture, construction, and local niche industries such as astronomy have replaced sugar as the basis of the economy. However, this transformation has been unevenly distributed over the entire island. For example, the South Kohala district has emerged as a large resort area with upscale hotels and residential areas. While the former plantation areas of North Kohala and Hamakua supply much of the resort area workforce, and have only small-scale diversified agriculture and tourism attractions to employ residents in those districts (SMS 2002).

**Table 5.2 Housing Data, 2000 Census**

| Description | Hilo CDP | Hawaii County | State of Hawaii |
|---|---|---|---|
| Housing Stock | 16,026 | 62,674 | 460,542 |
| Occupied Units | 14,577 | 52,985 | 403,240 |
| Percent occupied | 91.0% | 84.5% | 87.5% |
| Vacant | 1,499 | 9,689 | 57,302 |
| For seasonal use, etc. | 216 | 5,101 | 25,584 |
| Percent for seasonal use | 3,510 | 12,240 | 88,153 |
| Rental Vacancy Rate | 10.99% | 7.6% | 8.2% |
| Owner-occupied Units | 8,873 | 34,175 | 227,888 |
| (Percent of occupied units) | 60.9% | 65.5% | 56.5% |
| Average population | | | |
| Per household | 2.70 | 2.75 | 2.92 |
| Family | 3.19 | 3.24 | 3.42 |

Source: SMS 2002

Hilo has its own harbor and airport which serve the entire island, but Kona International Airport at Keahole in West Hawaii has emerged as more important facility for supporting tourism. In 2000, the average daily visitor census in East Hawaii was estimated as 4,096, while the count for West Hawaii was 17,742.

Unemployment is also unevenly distributed over the various districts of the island where the County average is about 5.9 percent. The distribution is not simply due to recent plantation closings. Unemployment is high in Kau (10%), where the closing of Kau Agribusiness affected many workers, but low in Hamakua (<4%), where the same process occurred only a few years before. Unemployment in the South Hilo District, where the project site is located, is slightly below the County average (5.7%). However, Hilo is the urban center for Puna District which has the highest level of unemployment (about 11.3%).

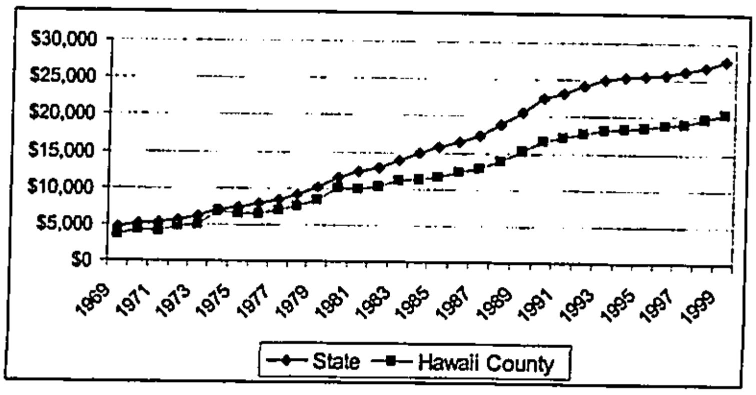
**Industries**

The largest industries in terms of jobs are in trade (retail and wholesale) and services. Hotels accounted for some 6,800 jobs in 2000, while agriculture supported 2,650 jobs. As plantations closed in Puna, North Kohala, Hamakua, and most recently Kau, residents and policy-makers have looked toward diversified agriculture and forestry to use most of the acreage released from sugar and to generate new jobs. Although the results have been less than desired, the island leads in the production of many crops such as coffee, macadamia nuts, papayas, ginger root and orchids.

As of 1999, the value of Hawaii County crops and livestock was $143.4 million. Of that figure, $121.1 million was in diversified agriculture or 48.1 percent of the State total. Consequently, the value of farm production has been climbing back toward the levels seen when sugar was the main dominant crop in the mid-1980s.

Over the past decade, the number of farms in Hawaii County grew modestly, from 2,700 to 3,300, but farm acreage declined by 13.9 percent to 870,000 acres in 2000. This decline in acreage was due to the closing of sugar plantations. Without a plantation crop to replace it, forestry has become an important potential land use that can be productive. However, proposals for large-scale plantings of eucalyptus trees for wood chip production have been opposed as likely to be environmentally destructive and as tying up land that could, at least in part, be farmed by residents.

Other industries affecting East Hawaii include tourism. With 2.7 million visitors per year, Volcanoes National Park is Hawaii's is most frequented visitor attraction in East Hawaii (SMS 2002).




Per Capita Income for State and Hawaii County (SMS 2002)

## Income

Personal income of County residents has been increasing over time, but not as fast as the State as a whole. The per capita disposable personal income level for residents of the County has fallen below income levels for the State as a whole since the mid-1970s. Since that time, this gap has also slowly widened where it is now about $8,000 lower to approximately $28,000 for the State and $20,000 for the County.

The 2000 Hawaii Health Survey indicated that 21.9 percent of the County population was below the poverty line, while only 14.1 percent of the statewide population was. The same source indicated the median household income in the County as 78.0 percent of the State's median. The State median household income was $41,137 while the County was $32,084. Both the extremely low- and low- income groups (up to $30,000) also form a much larger share of the County population than for the State as a whole.

| | Percentage of Households | |
|---|---|---|
| | Hawaii County | State |
| less than $15,000 | 19.7% | 12.0% |
| $15,000-$29,999 | 24.1% | 19.3% |
| $30,000-$44,999 | 20.3% | 20.9% |
| $45,000-$59,999 | 13.5% | 13.9% |
| $60,000-$74,999 | 8.3% | 10.7% |
| $75,000-$99,999 | 7.7% | 11.7% |
| $100,000 and up | 6.4% | 11.4% |
| Median | $32,084 | $41,137 |

Household Income (SMS 2002)

## Emerging Trends

The low unemployment figures in the last section point out the fact that Hawaii County was well positioned to rebound before the September 11 tragedies. Unlike Oahu, where many tourists are Japanese, the Neighbor Islands largely attract Mainland visitors, who returned to Hawaii in large numbers by the end of 2001. In the wake of September 11 tragedy, economic forecasts are even less certain than usual. The most recent published short-term forecast from the State suggests that growth will be minimal in the 2001 to 2002 time period, but return to slow growth trends as of 2003.

For Hawaii County, the long-term forecast is for steady growth. The population has been expected to grow by about 1 percent annually, with jobs and personal income growing at about 1.6 percent annually over the period.

Whether or not the island economy grows in the next year or two, there is likely to be demand for more new workers than are graduating from Hawaii County schools. While the annual graduating cohort is about 1,600 persons, the number of new jobs expected each year is about 2,330. More than half of that number is due to separations, i.e., people retiring or otherwise leaving jobs. New openings will be most numerous in service jobs while openings in agriculture will be few.

Growth in agriculture will depend on short-term factors, above all the weather. Over the next few years, changes in Hawaii's air services could affect export crop industries. Currently, the two local airlines are merging which should reduce scheduled lift to maximize passenger occupancy. This could mean less freight volume and higher rates. Again, long-haul service to and from the U.S. Mainland is increasingly handled by newer jets (e.g., Boeing 757s) with less cargo space available for freight than on older planes (SMS 2002).

## 5.2 ECONOMIC AND FISCAL FACTORS

This section discusses both the short and long-term effects of the project on both the County and State's economic and fiscal factors. Development of the PBARC and IPIF facilities will have different impacts in relation to Hawaii County and the State of Hawaii. Construction of new facilities will allow for: a) consolidation of ongoing activities, and b) expansion of research and increased staffing.

Consolidation of existing activities at the new site has a County level impact since some jobs are planned to be transferred from Oahu to Hawaii, but not a State level impact. The expansion of research programs and staffing would affect both the State and the County. In discussions of jobs and income, three broad types are distinguished:

- *Direct* jobs are immediately involved with construction of a project or with its operations.
- *Indirect* jobs are created as <u>businesses</u> directly involved with a project purchase goods and services in the local economy.
- *Induced* jobs are created as <u>workers</u> spend their income for goods and services.

### 5.2.1 Construction Related Employment And Income

<u>**No Action Alternative**</u>

Under this alternative, the PBARC project would not be constructed within the 2010 study year. As a result, there would be no additional construction jobs or income generated for County residents.

**Project Effects**

Construction of the PBARC project should have a positive economic impact associated with the creation of short-term construction related jobs over a few years. The preliminary estimated construction costs for the project are projected to be approximately $41.8 million for the PBARC complex, and $6.7 million for the IPIF complex. However, construction costs would vary depending upon final design plans and phasing given funding availability. Construction of these facilities would create several short-term construction jobs over a number of years (estimated 48 months) for the entire project. Construction is scheduled to begin in 2003, with the first phase of either the IPIF or PBARC complex to open in 2004. Subsequent phases of the project will be constructed over time until about 2007.

Construction Jobs

Direct construction jobs would typically consist of on-site laborers, tradesmen, mechanical operators, supervisors, etc. These new jobs created would also generate additional personal income for construction workers. Personal income is defined as the wages paid to the direct construction workers or operational employees associated with a development. It is anticipated that these construction jobs would likely be filled by residents from the Island of Hawaii employed within the construction industry. Direct construction jobs created would also stimulate indirect and induced employment within other industries on the island such as retail, restaurants, material distributors, and other related businesses supporting the construction industry.

Based upon the construction budgets and four year time frame, it was estimated that the project would create a total of about 315 jobs over the entire construction period resulting in about 80 new direct construction jobs annually. This would generate a total of another approximately 407 indirect and induced jobs over the entire construction period or about 105 jobs annually. Thus, a total employment impact of about 180 to 190 jobs annually (direct, indirect, induced) would be generated by this project, or approximately 725 total over the entire construction period.

Construction Personal Income

These new construction jobs would generate additional personal income for construction workers totaling approximately $3.4 million per year or $13.1 million over the entire project. Personal income is defined as the wages paid to the direct construction workers associated with a development. It is anticipated that these construction jobs would likely be filled by residents of the island of Hawaii employed within the construction industry. Indirect and induced income would also be generated on the order of $2.9 million a year, or $11.0 million over the entire project.

### 5.2.2 Operational Related Employment And Income

**No Action Alternative**

Under this alternative, the PBARC project would not be constructed. Therefore, the existing number of operational jobs associated with PBARC and IPIF research operations would remain the same, and continue at their current locations on various islands within the State. Because of existing facility constraints and conditions, existing programs would not be expanded, and initiating new research programs would be restricted since additional staff could not be hired.

**Project Effects**

With the project, both the PBARC and the IPIF will consolidate most of their operations in a new centralized complex, be able to take on additional research projects, and be able to hire more researchers and supporting staff as operational budgets permit.

Operational Jobs

Consolidation of operations for PBARC would result in: 1) relocating their research programs at the Stainback Facility along with administrative operations in downtown Hilo to the new site, and 2) possibly relocating their research operations in Manoa Valley on the Oahu to the new site. Consolidation of IPIF operations would result in: 1) relocating most of their administrative operations and programs from Oahu to the new site, and 2) moving their Hilo operations on East Kawili Street to the new site. A summary of these operational jobs is provided below.

**Summary Of Operational Jobs Consolidation And Expansion**

| Description | Existing | With Project | Change |
|---|---|---|---|
| USDA PBARC | | | |
| Oahu - HARC Building & Manoa | 26 | 6 | -20 |
| Kauai Facility | 6 | 6 | 0 |
| Hawaii - Hilo Lagoon Annex & Stainback Facility | 50 | 0 | -50 |
| *New PBARC Complex (Future)* | *0* | *135* | *135* |
| PBARC Totals | 82 | 147 | 65 |
| USDA, IPIF | | | |
| Oahu - DOFAW Office | 18 | 0[1] | -18 |
| Hawaii - DOFAW Office & Volcano National Park | 11 | 3 | -8 |
| *New IPIF Complex (Future)* | *0* | *44* | *44* |
| IPIF Totals | 29 | 47 | 18 |

As shown above, there are a total of about 111 persons currently working within both the PBARC and IPIF programs statewide. With the new PBARC and IPIF complexes, the total staff would expand to about 194 persons. This increase of 83 new persons is due to the new PBARC and IPIF facilities allowing for new or expanded research programs and subsequent staff.

1 This office may be staffed with possibly up to 2 persons either full or part-time.

On the Island of Hawaii, the total number of operational jobs would increase from 61 persons currently to 182 persons. The total number of people working on the 30-acre project site would be 179 persons since 3 people for IPIF would continue working at Volcano National Park. This would result in an increase of 121 new operational jobs within the Hilo District due to relocated programs and new staff positions created. This would include 85 additional staff for PBARC and 36 more staff for IPIF to support the expansion of existing programs and new research projects undertaken by these agencies. These additional full-time operational jobs would create a moderate positive economic impact to the overall economy and job market within the County of Hawaii. There will be no loss of existing operational jobs on the Island of Hawaii since existing jobs with both PBARC and IPIF would only be spatially relocated to the new complex.

This consolidation of operations and relocation of research programs at the new site would close some existing offices being leased and relocate several jobs from Oahu to Hilo. The estimated number of jobs involved in this relocation from Oahu is 38 persons in total for both PBARC and IPIF, and is extremely small in comparison to total island job counts. Furthermore, this relocation total could be smaller if the PBARC program in Manoa Valley remains on Oahu. As a result, the economic impact from this operational job loss on the island of Oahu is minimal.

Wages From Operational Jobs

Operations jobs titles include scientist, ecologist, biologist, forester, management analyst, technician, and support staff. Many are graded at GS 11 and above in the Federal pay scales which include wages above the current median household income for the State of Hawaii. The wages for direct operations employees were calculated from average wages for Federal employees in Hawaii County.

New technicians and support staff are also planned to be hired from existing Hawaii island residents if qualified. Scientists are likely to be recruited through national advertisements, recruitment from graduate programs, from the University, or transfers within a Federal agency. Because of these intentions, most of the new hires at the PBARC and IPIF will be Hawaii Island residents, but some will come from other areas.

Additional direct operational jobs created within the County are estimated to generate about \$5.0 million in new annual wages, and another \$1.5 million in indirect and induced income. This includes the existing jobs being relocated to the Island of Hawaii along with new positions being filled. Thus, the total income generated for the County by these direct operational jobs would be \$6.5 million annually (2001 dollars).

For the State, these direct operational jobs are estimate to generate about \$3.4 million annually since several jobs would only be relocated within the State. Indirect and induced income generated within the State was estimated to be another \$1.4 million. Thus, the total impact of new income to the State from the project would be about \$4.8 million (2001 dollars). These effects would have a small positive effect on statewide income and minor to moderate positive effect on County incomes.

### 5.2.3 Fiscal Factors

Under the No Action Alternative, there would be no major change to government revenues and expenditures associated with the project site since it would remain undeveloped. PBARC and IPIF operations would continue at their existing facilities and not change the County's present revenue or expenditure requirements. Consequently, fiscal impacts discussed in this section are focused primarily on the impacts associated with the PBARC project.

State Revenues And Expenditures

Fiscal impacts associated with this project would primarily involve some additional tax revenue generated to the State. Costs to the State were estimated using an average cost approach. This was a maximal approach to cost estimation, since marginal costs are nearly always lower than average costs. The State is not likely to add personnel to their departments or new facilities to serve a few hundred more residents created by the project.

Construction Related Revenue

Tax revenue sources for State government are composed primarily of general excise taxes (GET) on development costs and construction materials, along with corporate income tax, and personal income tax from construction workers. These tax revenues are one-time or short-term increases in revenue since they are only associated with construction activities. Based upon the construction budget for both the PBARC and IPIF complexes, it was estimate that this project would generate about $4.0 million in total to the State as shown below.

**State Revenue Generated From Construction Activity**

| | Revenue Description | Amount ($ million) |
|---|---|---|
| 1. | GET - Construction Spending | $1.9 |
| 2. | GET - Construction Workforce Spending | $0.6 |
| 3. | Corporate Income Tax | $0.1 |
| 4. | Personal Income Tax - Direct Income | $1.3 |
| | Total State Revenue | $3.9 |

Operations Revenues

Changes to State revenues from operational employment resulting from the project would be associated with the in-migration of persons to fill new full-time jobs created. This could result in the in-migration of persons primarily related to new scientists migrating into the State to fill positions not filled by existing residents. These jobs do not include positions being relocated to the Island of Hawaii since they are not new positions being created within the State. State revenue generated from new operational jobs would include additional income tax and excise tax from the spending of this income. Thus, the operations related income generated to the State by the project was estimated to be about $390,000 annually.

Visitor Spending From Operations

The PBARC and IPIF research facilities are not visitor attractions, much less visitor accommodations. However, they will attract some visitors associated with the agriculture industry and related professional field only as attendees to periodic conferences or workshops held. Both PBARC and IPIF will hold small conferences and workshops, on perhaps a quarterly basis.

Together, these facilities can be expected to attract a few out-of-state visitors, perhaps 100 annually, on average, for the duration of a conference (two to three days) and associated vacation time, for a total time in Hawaii of about seven days. The average annual visitor impact, then, would be 700 person-days. These visitors' spending in Hawaii would result in an estimated $113,500 annually (in constant 2001 dollars) based on reported average daily spending of $160.10 by US visitors from the Western United States in 2000. This visitor spending would generate a combined total of $8,500 annually in additional revenues to the State and County of Hawaii (SMS 2002).

State Expenditures

The average cost approach was used to estimate State government costs per resident. State government spending per person was estimated to be $5,236 and $750 in expenditures per visitor. The average revenue to the State government per person was estimated to be $773. This includes State revenue generated from various taxes (fuel, utility, vehicle) and other revenue sources such as licenses, parking, fines, etc. Therefore, the net expenditure cost to the State per person was $4,462.

The net impact on State revenue from the project was estimated by combining additional revenues being generated (excise tax and personal income tax) by new residents in-migrating to the State with the average State expenditure cost per resident. The resulting net impact on State revenues would result in additional revenues of about $119,350 annually and is shown on Table 5.3. Consequently, a minor positive effect would result from the project on State revenues when considering State expenditures in 1996 totaled about $6.0 billion (SMS 2002).

**County Revenues And Expenditures**

County revenues are primarily limited to property tax revenues, with a small amount from taxes associated with visitor spending. There is minimal revenue currently generated from the project site since it is owned by the State of Hawaii, and is vacant undeveloped land. With development of the PBARC Project, the property may be appraised at a higher rate due to its improvements. However, there would similarly be minimal County revenue generated from the project site because it would remain as State-owned lands (under the jurisdiction of the State DLNR).

The project is anticipated to create demand for additional households in the County of Hawaii, particularly in the Hilo District, as a result of existing PBARC and IPIF employees being relocated to Hilo from Oahu and the in-migration of new employees filling positions. With new workers generating additional demand for new households, property tax revenues for the County will grow.

In the South Hilo District, the average home costs $145,300 as of late 2000. Property taxes on such a house would come to $895 annually at current rates for owner-occupants. Thus, given the additional households supported by in-migrant workers, the annual effect on property taxes was estimated to increase at least $20,000. In addition, some residents hired into operations jobs either through relocation or new positions would form separate households in time due to their annual salaries. This was estimated to also contribute at least $21,000 in additional property taxes for the County. Therefore, a total increase on the order of almost $42,000 in increased property taxes was estimated due to the project. Table 5.3 provides more details associated with this.

**Table 5.3**
**Summary of Project Effects on State and County Government Costs**

| Description | State of Hawaii | County of Hawaii |
|---|---|---|
| **A. Estimate of Costs to Government** | | |
| *New Population with Project* | | |
| Residents | 63 | 63 |
| Visitors | 2 | 2 |
| Cost of Additional Person | | |
| Residents | $4,462 | $910 |
| Visitors | $750 | $541 |
| Cost Associated with Project Populations | | |
| Residents | $278,975 | $56,917 |
| Visitors | $1,438 | $1,037 |
| Totals | $280,413 | $57,954 |
| **B. Project Related Revenues to Government** | | |
| Operations Related Employee Taxes | | |
| Income Tax | $263,996 | |
| Excise Tax on Spending | $128,830 | |
| Totals | $329,826 | |
| Taxes Associated with Visitor Spending | $6,937 | $1,578 |
| Property Taxes | | |
| Homes of In-Migrant Staff | | $20,324 |
| Homes of New Households by Relocated Staff | | $21,575 |
| **C. Net Impact on Government Revenues** | | |
| State of Hawaii | $119,350 | |
| County of Hawaii | | [$14,477] |

Source: SMS 2002

County Expenditures

County expenditures were estimated using an average cost approach similar to that used for the State. The average cost of County government spending per person was estimated to be $1,050 and expenditures per visitor $541. The average revenue to the County government per person was estimated to be $140. This includes revenue generated from various taxes (fuel, utility, vehicle) and other revenue sources such as licenses, parking, fines, etc. Therefore, the net expenditure cost to the County per person was $910.

The net impact on County revenue from the project was estimated by combining the additional revenues being generated (excise tax and personal income tax) with the average County expenditure cost per resident. Based upon these results, the project's net impact on County revenues would result in additional costs of about $14,475 annually as previously shown on Table 5.3. Consequently, the project would have a minor effect on the County's revenues by potentially increasing costs by this amount annually. This total reflects a minimal increase to the County's annual expenditures which was about $151.9 million in 1996 (SMS 2002).

It should also be noted that the method used reflects a maximal approach to cost estimation since marginal costs are nearly always lower than average costs. The County is not likely to add personnel to their departments or new facilities to serve the additional residents generated by the project. Thus, averages costs are exaggerated, and wage estimates used for the assessment likely underestimates taxes on employee incomes and spending especially since the PBARC and IPIF programs would probably attract more experienced and higher paid staff.

## 5.3 SOCIAL IMPACT FACTORS

Impacts on various social factors are discussed in this section for both the No Action and with Project alternatives. Such factors addressed include changes in population and housing, character of the community, and agricultural in the County.

### 5.3.1 Population and Housing

No Action Alternative

Under this alternative, the population in the South Hilo District would increase over the years as part of the County's overall projected increase in resident population. Additional students and residents would be added due to development of the China-U.S. Center and development of lots within the U.H.-Hilo University Park development.

The population of the island has grown in tandem with visitor industry growth, increasing by 45.0 percent between 1970 and 1980 (from 63,468 to 92,053), by 30.7 percent (to 120,137) between 1980 and 1990, and by 23.6 percent (to 148,677) between 1990 and 2000. These growth rates exceeded the statewide growth rate of about 10 percent over the last two decades. According to a State population projection, Hawaii County will continue to grow at a high rate, and population may exceed 200,000 by the year 2010. The year 2000 population was 148,677 persons based upon Census data. Much of this growth has been and is likely to remain concentrated in West Hawaii, particularly the North Kona and South Kohala Districts, as retirees or wealthy in-migrants from the U.S. mainland move to those areas (Terry & SSFM 2001).

The population of East Hawaii has also experienced growth, particularly in the Puna District. Population in the South Hilo District has increased somewhat more slowly, from 33,915 persons in 1970, to 42,278 in 1980, to 44,639 in 1990, and to 47,386 persos in 2000. Forecasts call for East Hawaii's population (including Hilo, Hamakua and Puna) to grow at an estimated annual rate of 2.24 percent, reaching 95,385 by the year 2010 (Terry & SSFM 2001).

With the China-U.S. Center and University Park developments, the resident and student populations in East Hawaii will grow further. Development of the University Park would contribute approximately 3,067 students to the campus and add another 558 persons working as faculty and support staff (ECI 1997). These developments would thus increase the demand for both student housing and resident housing (for faculty and support staff) in the South Hilo district. It should be noted the University Park would likely continue to be developed incrementally subject to funding availability which would likely extend it full build-out beyond 2010.

The China-U.S. Center would provide needed housing for students to support the campus expansion. Units would be provided for up to 600 students within the U.H.-Hilo campus along with additional units for visiting scientists, scholars, student families, faculty or other University-related personnel. Although not quantified, this development also includes commercial activities which may generate additional residents (workers) and subsequent demand for housing (Terry & SSFM 2001).

The population impacts from this University Park development was determined to have only a minor impact on the South Hilo district and Hawaii County since it would increase the population by 4 percent and 1 percent, respectively. This University Park development included student housing as a component to address this demand. There was also a high vacancy rate in the Hilo housing area that was expected to continue into the future. This condition would lessen the demand for new housing to support the additional faculty and support staff (ECI 1997). The China-U.S. Center would help address a large portion of needed student housing for the University's immediate future.

**Project Effects On Population And Housing**

This project is not expected to generate any new in-migrant residents to the Island of Hawaii to fill short-term construction related jobs. The PBARC and IPIF complexes would have a small effect on the County and State resident population. Increases to the State resident population would result from the filling of new positions created for expanded or new research programs if they can't be filled with existing State residents. The County would have additional increases in their resident population due to the relocation of several research programs from Oahu to the new facility in Hilo.

When the PBARC and IPIF facilities are fully operational, it is possible that new scientist positions may need to be filled by persons outside of the State due to the experience and expertise requirements needed for those positions. Thus, the in-migration of up to 24 scientist plus their families may occur resulting in about 63 new residents to the State whom would reside in Hawaii County (SMS 2002).

The relocation of existing programs and operational jobs to Hilo from Oahu could result in the relocation of up to 38 persons and families. However, the actual number of persons relocating to Hilo may be significantly less since the majority of technicians and staff would likely find other positions with the Federal government to remain on Oahu. Furthermore, the PBARC program in Manoa Valley could either remain there or relocate to another site on Oahu. Thus, these operational jobs relocated to Hilo would likely be filled by existing Hawaii County residents which would minimally affect the existing County housing demand and resident population.

The number of dwelling units in the Hilo district grew from 14,134 in 1990 to 16,026 in 2000. The majority of housing units are located within established subdivisions. Within the vicinity of the project site, established subdivisions are located north above the U.H.-Hilo campus, south along Puainako Street, and the urbanized area of Hilo town within a 2-mile radius of the project site.

The development of the PBARC and IPIF facilities should not have a significant impact on the County's resident population or housing inventory. The project is being built on vacant land that is owned by the State of Hawaii, and would thus not displace any existing homes and residents. Furthermore, the increased resident population is very small and minimal in relation to the percentage of the entire County population. New staff and families relocating to Hilo would also occur over several years as various phases of the facilities are completed (2005 to 2010 timeframe).

### 5.3.2 Project Impact on PBARC/IPIF Staff And Their Families

As the PBARC and IPIF facilities are developed and become operational, current staff on Oahu may have to relocate to the Island of Hawaii to continue working under these research programs as a Federal government employee. The alternatives to relocating include retirement, securing other Federal employment jobs on Oahu, or securing employment outside of the Federal government system. Therefore, there are several options presently available to existing staff. It is likely that many would secure other positions within the Federal government to remain on Oahu.

Families of PBARC and IPIF employees will also be impacted by this relocation. Relocation to the Hilo area would mean moving to a smaller town, having possibly less varied job opportunities for spouses and other family members, and different schools for children. These disruptions may affect personal relationships and present career opportunities. On the other hand, those employees and their families that do elect to relocate to the Hilo area will find homes that are approximately two-thirds the cost of housing on Oahu, and house lots that are generally much larger in size reducing their cost of living expenses.

The lower cost of housing, together with the fact that current PBARC and IPIF staff have a number of years before jobs are physically relocated to the new PBARC and IPIF complexes, will allow employees and their families to examine alternatives, and minimize disruption in their lives. Existing staff affected by the relocation would be informed of this project being implemented, and can properly plan for this change. Thus, these factors would lessen the disruption upon the employees and their families minimizing the impact of this project.

### 5.3.3 Project Effect on Community Character

The PBARC project is not expected to significantly impact the existing character of this South Hilo district community. The project area is currently vacant, and is in an area associated with the planned expansion of the University of Hawaii at Hilo. The immediate community in the area of the PBARC project could be considered one of higher learning and research oriented as the new facilities will be in close proximity to the U.H.-Hilo campus and the developing University Park site.

The University Park is serving as the expansion area for the University campus, and already includes several astronomical research facilities. The Komohana Agricultural Complex, where the University of Hawaii's College of Tropical Agriculture and Human Resources (CTAHR) and the Farm Bureau have offices, is also located along Komohana Street within the University Park. The University is also planning the development of a new science museum on some of the undeveloped lots near the astronomical observatory research facilities in this University Park.

Therefore, the PBARC facility will be consistent with the existing and planned land uses in the immediate area, and is not anticipated to significantly impact the character of this immediate area nor the community as a whole. The County *General Plan* and *General Plan Update* revision program being conducted by the County has designated this project site along with the surrounding area for the University's expansion. These new facilities would reflect the gradual expansion of the U.H.-Hilo campus westward across Komohana Street. Therefore, the PBARC Project would be consistent with the intended land use for this area.

Many homes in the Hilo area have areas where the homeowner grows trees, plants, shrubs, flowers, fruits, vegetables, and other garden items. It might be likely that residents within a mile or two of the PBARC facility may be concerned the PBARC's activities and research will have some affect on their yards and plants. With a planned insectary for the PBARC facility, area residents may be concerned with the possibility of an increase in flies or insects, and could place blame upon the facility. Other issues that may arise include the spread of plant diseases and pests that the PBARC facility is performing research on, and that PBARC's work on genetically engineered strains of fruits and other plants will spread to their yards.

PBARC and IPIF managers are aware of such concerns, and would incorporate necessary facility design controls and procedures for research activities conducted at the facility. The incorporation of suitable buffers and landscaped areas from laboratory buildings with existing residential subdivisions would visually screen and separate research activities.

Design controls implemented for research activities, even if fully effective, may not be sufficient to alleviate all concerns about the possible spread of plants or pests associated with research activities. To address such concerns, a public information strategy would be developed and implemented to keep the community informed. This strategy would include the following elements:

- Leading stakeholders are kept informed of project activities and controls.
- The research facilities have established procedures to respond quickly and clearly to citizen concerns.
- Interested persons are encouraged to learn about PBARC and IPIF activities and to share their knowledge with others in the community. Staff in both facilities would already be working closely with CTAHR researchers, with extension agents, and with farmers and forestry developers on the island. Therefore, these people can be encouraged to share knowledge of the project as a responsible member of the community.
- Facilities should present themselves as being open to the community, e.g., by holding occasional open house events and by hosting meetings of local groups such as the Farm Bureau.

### 5.3.4 Effect on Agriculture in Hawaii County

The PBARC project is anticipated to have a positive effect on agricultural activities State-wide, and in the Pacific Basin. Specifically, consolidation and expansion of the PBARC facilities and operations will have a positive impact on the agriculture of the Island of Hawaii.

PBARC and IPIF researchers will be available to extension agents, farmers, and forest managers to address crop and pest problems, and may be directly involved with farmers if they are monitoring a specific crop. Further, the PBARC research program will be responsive to local agricultural problems.

The University of Hawaii's CTAHR, and the State Department of Agriculture already have an active extension and research program on the Island of Hawaii. The PBARC and IPIF facilities and research will provide a positive impact on these programs as the new facility will support and strengthen existing outreach activities.

# CHAPTER 6
# INFRASTRUCTURE FACILITIES

This chapter addresses the project's probable effect on existing infrastructure facilities serving the PBARC Project and surrounding area.

## 6.1 WATER FACILITIES

### 6.1.1 Existing Water Facilities

The water supply serving the South Hilo district includes one large and four small municipal systems provided by the County Department of Water Supply (DWS). The Hilo System is the largest on the island, consuming water from five surface sources and five deep well sources. The system provides potable water supply for nearly all water users in South Hilo. Major service areas are the City's commercial and industrial areas and residential areas including Keaukaha, Kaumana, Waiakea Houselots, Waiakea Homestead, Waiakea Uka, and Panaewa. (CWRM 1989, DPW 1980).

The existing U.H.-Hilo campus is served by two separate water sources and reservoir systems which are referred to as the Waiakea system and Kawalani/Haihai system. The Waiakea system serves the western portion of the campus via the 0.5 million gallon (MG) Waiakea Reservoir located along the southeastern border of the PBARC property. The Kawalani/Haihai system serves the eastern portion of the university campus along with residential areas along Kawailani, Haihai, and West Puainako Streets. This system is comprised of the 0.5 MG Kawalani Reservoir and two Haihai Reservoirs of 0.1 and 0.5 MG (Terry & SSFM 2001).

**Recent And Planned System Improvements**

An 8-inch water line previously routed through the University Park site along Nowelo Street has been replaced by two 12-inch waterlines. One line is for a high pressure system from the Piihonua Reservoir #2 while the second is a low pressure system from the Waiakea Reservoir (PBR Hawaii 1996).

A new 1.0 MG reservoir with transmission lines are under construction by the County DWS to provide additional water capacity to serve the U.H.-Hilo campus and its expansion area. Based upon a water study done for the University, existing demands on the Kawalani/Haihai system were exceeding the capacity of this three reservoir system resulting in the need for this improvement. This new reservoir is being constructed at the top of the Sunset Estates subdivision located west of the project site. A new 16-inch transmission line along Komohana Street is also under construction as part of this system improvement.

### 6.1.2 Effect On Water Facilities

<u>No Action Alternative</u>

Under the No Action Alternative, there would be no increased potable water demands generated from the PBARC project site since it would remain undeveloped. However, increased demands for potable water from other developments planned in the immediate vicinity within the study year would result. These would include the China-U.S. Center, infilling of lots within the University Park, and the sports and recreation complex.

Average daily water demands generated by these developments are estimated to total about 347,000 gallons per day (gpd). The University Park, which includes the sports complex, was projected to generate about 255,000 gpd in demand, however, 212,800 gpd remains since some lots have already been developed. Based upon County DWS design criteria, a reservoir size of 0.34 MG was needed (ECI 1993). The China-U.S. Center was estimated to create demand for another 134,100 gpd (Terry & SSFM 2001).

The new 1.0 MG reservoir being constructed is planned to serve the entire U.H.-Hilo campus along with the University Park expansion area. A reserve of 437,200 gallons maximum daily would be available and 29,000 gpd from the existing Kawailani/Haihai system would be freed up due to this new reservoir. The China-U.S. Center is currently discussing with U.H.-Hilo their ability to utilize this reserve capacity to provide potable water to this development if approved by the County DWS. The DWS has indicated that they would require the payment by the developer of the current rate of the facility charges at the time of development which would be based on the number of water units required (Terry & SSFM 2001).

<u>Project Effects On Water Facilities</u>

The PBARC and IPIF complexes would inevitably generate increased demands for potable water due to the research activities conducted there. The average daily water demand for this project is estimated to be 52,000 gpd based upon a consumption planning rate of 4,000 gallons per acre (light industrial land use) and about 13 acres of actual developed property for these complexes (State of Hawaii 1985). The maximum daily demand is hence estimated to be 78,000 gpd (1.5 times average daily) and the peak hour flow is 260,000 gpd (5.0 times average daily). It should be noted that actual water demands generated by the existing U.H.-Hilo campus showed a rate of only 1,130 gallons per day per acre which is considerably lower (ECI 1993).

Presently, there are no water system improvements on the project site. On-site water system improvements for this project would consist of 6- and 8-inch water lines within driveways to serve the various facilities. A 12-inch line would initially connect to the existing 16-inch line being constructed along Komohana Street near the existing private driveway to the electrical substation and water reservoir. This 12-inch line would follow the temporary driveway to the complexes before changing to an 8-inch line.

This increased potable water demand generated by the project would have an effect on the existing municipal water system serving the area. Average daily demand was estimated to be 52,000 gpd using the County's *Water Systems Standards* planning consumption guideline for light industrial use. However, the actual water demand generated by the project could be quite lower as indicated by actual demands generated for the U.H.-Hilo campus. Furthermore, the project would include an on-site wastewater treatment system resulting in treated recycled water used to irrigate demonstration gardens, ornamental plants, field plots, and landscaped areas. This would further reduce the amount of potable water actually generated by the project.

The new 1.0 MG reservoir being constructed would have a reserve capacity of 437,200 gallons maximum daily demand. However, the China-U.S. Center is seeking to utilize about 201,150 gpd maximum daily demand from this reserve capacity which would leave 236,050 gallons remaining. The maximum daily demand for the PBARC Project is estimated to be about 78,000 gpd. Therefore, the remaining reserve capacity, even with allocations provided to the China-U.S. Center, should be more than enough to accommodate this project. Consequently, the project should not have a significant impact on the water system provided U.H.-Hilo agrees to this allocation with approval from the County DWS. Appropriate coordination will be conducted during the project's design with both the University and County DWS to address water system connection and availability.

## 6.2 WASTEWATER FACILITIES

### 6.2.1 Existing Wastewater Facilities

The Hilo area is designated as an urban sewage planning area, and the County Department of Environmental Management (DEM) operates a major treatment facility serving this area which includes the project area. This facility is the municipal Hilo Wastewater Treatment Plant located near the airport area fronting Puhi Bay. This system presently consists of a 5.0 million gallon per day (mgd) secondary sewage treatment plant with an ocean outfall effluent disposal, and a collection system of sewage pump stations, force mains, and gravity lines (County 2001). Many areas outside of central Hilo rely on cesspools and septic tanks for wastewater treatment.

There are two existing sewer systems serving the U.H.-Hilo campus. One system on Kawili Street serves the southern portion of the campus and the other on Lanikaula Street serves the northern portion including the University Park. An existing 8-inch sewer trunk line along West Kawili Street begins near the Puainako Street intersection and is routed past Kapiolani Street where it changes to a 10-inch sewer trunk that eventually connects to the wastewater treatment plant. The Lanikaula Street system has both 8- and 10-inch sewer trunk lines routed through the university campus that extends up to North Aohoku Place serving the existing astronomy observatory facilities in the University Park (PBR 1996). These sewer trunk lines represent the extension end of the area's public sewer system serving the University campus.

### 6.2.2 Effects On Wastewater Facilities

No Action Alternative Effects

Under the No Action Alternative, there would be no increased wastewater generated from the PBARC project site since it would remain undeveloped. However, increased wastewater from other developments planned (China-U.S. Center, infilling of University Park lots, and the sports and recreation complex) in the immediate vicinity would result.

The design average flows generated by these developments are estimated to total about 281,800 gallons per day (gpd). A breakdown of the projected design average, design maximum, and design peak wastewater flows in gallons per day is provided below. It should be noted that the projected flows for the University Park would be less since several lots associated with the astronomical observatories along North Aohoku Place have been built after the estimates.

| Description | Design Average Flow | Design Max. Flow | Design Peak Flow |
|---|---|---|---|
| University Park | 190,000 | 650,000 | 760,000 |
| China-U.S. Center | 91,800 | 434,100 | 472,600 |
| Totals | 281,800 | 1,084,100 | 1,232,600 |

Source: University Park (ECI 1993)
China-U.S. Center (Terry & SSFM 2001)

Increased wastewater from the University Park would be serviced by the Lanikaula Street. The existing 8-inch sewer line serving this development was determined to be acceptable in accommodating this estimated flow (ECI 1993). Increased wastewater from the China-U.S. Center would be directed to the 8-inch sewer line along West Kawili Street. Analysis of this sewer line determined that the additional flows from this development could be accommodated (Terry & SSFM 2001). Consequently, the existing sewer system was determined to be adequate to serve these developments.

Project Effects On Wastewater Facilities

There is currently no wastewater collection systems located on the project site or along Komohana Street in the vicinity of the PBARC property. Consequently, an extension of sewer lines would be required to connect the project to the County's municipal wastewater system.

Existing fruitfly research conducted at the PBARC facility in Manoa would be relocated to the new insectary at the project site. As a result, an industrial wastewater treatment system will be provided on the project site to treat wastewater from this PBARC insectary. This does not preclude the option of shared infrastructure between the on-site domestic sewer and the industrial wastewater system. Thus, an on-site treatment and disposal system for both domestic and industrial wastewater from this project is a possibility due to limitations with existing off-site sewer infrastructure. The appropriateness for this would be determined during the project's design.

Wastewater Treatment Facility

A wastewater treatment facility having a total land area of about 10,000 square feet will be provided adjacent to the insectary on the southern portion of the project site. Appendix K includes a report prepared by The Limtiaco Consulting Group on the proposed wastewater facility serving this project. Fruitflies are raised using a process that generates an industrial waste stream from the washdown of used fruitfly diet trays and other related equipment. The fruitfly diet is basically comprised of sugar, mill feed and yeast. The volume and pollutant concentration of the wash water would be minimized by recycling of the used diet for animal feed prior to washing.

The fly-rearing process occurring with the insectary results in high biochemical oxygen demand (BOD) level wastewater containing solids which need to be screened, removed, and then treated. The assumed peak flow for the wastewater facility is 10,000 gpd. This is a conservative estimate which is based on the insectary devoting most of its resources to fruitfly research, and the washdown occurring a few hours each workday.

Biological treatment used for this facility will be based on the Sequencing Batch Reactor (SBR) technology which is a process well suited to the wastewater stream from the insectary and is used successfully at the CDFA facility in Waimanalo (LCG 2001). SBR treatment is performed in batches (i.e., not a continuous, flow-through process) and consists of five basic phases during a single treatment cycle: 1) tank fill, 2) aeration, 3) sludge settling, 4) supernatant decant, and 5) sludge withdrawal. Two SBR tanks, each about 30,000 gallons in total volume, will be provided. Sludge removed from the SBR tanks will be drained to a covered sludge drying bed approximately 500 square feet.

Industrial wastewater from the insectary will be treated to meet disposal requirements. Influent industrial wastewater will first be screened of large particles using a basket screen prior to pumping and entering the treatment units. Solids will be removed from the basket screens manually and disposed as solid waste.

The industrial wastewater characteristics anticipated for this insectary is expected to be similar to existing insectaries on Oahu. Tao and Yang (1996) describe the characteristics of insectary wastewater at the CDFA medfly rearing facility in Waimanalo based on periodic (typically once a week) grab samples over a 9 month period. Their results from their sampling are provided in Table 6.1. Based on limited sampling conducted at the USDA PBARC Manoa facility, the fruitfly wastewater was found to be similar to these findings (LCG 2002).

Based upon the results shown on the table, this wastewater should be readily biodegradable since sufficient nutrients exist in the waste stream for biological treatment. Generally, a 100:5:1 BOD5-to-nitrogen-to-phosphate ratio reflects sufficient nutrient levels for biological treatment.

**Table 6.1 Characteristic of Industrial Wastewater CDFA Medfly Rearing Facility**

| Characteristics | Range | 50 percentile | 90 percentile |
|---|---|---|---|
| pH | 3.2 – 5.87 | 4.1 | 4.75 |
| Total Solids, mg/L | 425 – 5100 | 1750 | 3350 |
| Total Suspended Solids, mg/L | 90 – 2570 | 450 | 2100 |
| Total COD, mg/L | 734 – 6100 | 2400 | 5200 |
| Soluble COD, mg/L | 661 – 4444 | 2000 | 2800 |
| Total $BOD_5$, mg/L | 535 – 2700 | 1400 | 2120 |
| TKN, mg/L | 6 – 190 | 86 | 142 |
| $NH_4^+$-N, mg/L | 1 – 35 | 9.1 | 19.7 |
| $NO_3^-$-N, mg/L | 0.5 – 15 | 3.2 | 9 |
| Total Phosphorus as mg $P\text{-}PO_4$/L | 4.9 – 113 | 32 | 50 |

Source: (LCG 2002)

The selection of the ultimate industrial wastewater treatment system will be determined by the effluent disposal requirements developed during the project's design. The primary method for effluent disposal being considered would be water recycling. Treated recycled water is planned to be used to irrigate demonstration gardens, field plots, ornamental plants, and landscaped areas of the PBARC property. Effluent will be stored in a covered tank or pond in the event that wet weather reduces the irrigation demand for recycled water.

The Wastewater Branch of the State Department of Health has guidelines established for the use of reclaimed water for various types of uses such as golf courses, ornamental crops for commercial use, orchards, landscapes, etc. The reclaimed water processed from the wastewater facility should be suitable for the anticipated vegetation areas on the property. Although filtration and disinfection are not planned for the PBARC wastewater facility, the effluent should be free of fecal coliform bacteria and viral pathogens. If required by the State DOH, lysimeter sampling and analysis of soil conditions from irrigated areas would be monitored.

Domestic Wastewater Treatment And Facilities

On-site sewer system improvements would include both 6- and 8-inch sewer lines collecting domestic wastewater from the various facilities associated with the IPIF and PBARC complexes. Due to concerns from the County over the capacity of existing sewer lines associated with the Lanikaula Street system, a storage tank would be provided to hold wastewater for release during off-peak periods. This storage tank would then release wastewater to an 8-inch sewer line generally routed along the future extension of Nowelo Street. This sewer line would finally be extended across Komohana Street to connect with the existing municipal sewer line located on Nowelo Street within the University Park.

The projected domestic wastewater was estimated for planning purposes based upon a per capita per acre basis. More specific wastewater flows would be determined during the project's design. The projected wastewater flows were determined using the City and County of Honolulu

*Design Standards of the Department of Wastewater Management.* The "general industry" land use classification was used to determine the capita per acre over a 13-acre developed area of the property. Based upon these inputs, a design average flow of 0.11 million gallons per day (MGD) was estimated. This translated into a design maximum flow of 0.53 MGD and design peak flow rate of 0.54 MGD.

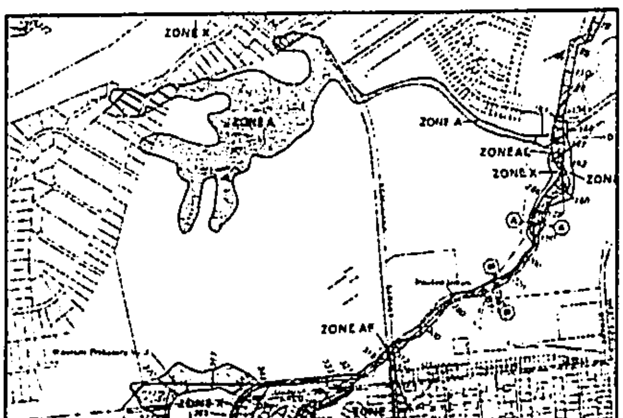
This increase in wastewater flows from the project may affect the capacity of existing downstream sewer trunk lines associated with the municipal Lanikaulu Street system. The sewer lines in this area are fairly old and may require improvements to serve this project along with the other developments planned to occur in the area. Consequently, the storage tank is being proposed to hold wastewater which would be released during non-peak periods.

Necessary off-site sewer improvements are being assessed and evaluated by the U.H.-Hilo to determine improvements needed to upgrade the existing sewer system to adequately serve the university campus and other related developments. Federal funding associated with the PBARC Project is not available to fund off-site infrastructure improvements. Consequently, the University will conduct appropriate coordination with the County DPW to address necessary off-site sewer improvements as the project proceeds with the design phase. Availability of a sewer line connection would be developed during this design phase and USDA will coordinate with both the County DPW and U.H.-Hilo. The option of using the project's wastewater treatment system to serve both the industrial wastewater and domestic wastewater from research facilities would also be considered during the project's design.

## 6.3 DRAINAGE FACILITIES

### 6.3.1 Existing Drainage Facilities

There are two major drainageways located within the PBARC project area. The first drainageway is associated with the Waiakea Stream located south of the project site as previously shown on the FIRM Figure in Chapter 4. This stream travels in a west to east direction along West Puainako Street before crossing Komohana Street near the Komohana Agricultural Complex in the University Park. It then continues in a northeast direction toward the U.H.-Hilo campus and to Waiakea Pond.



Flood Insurance Rate Map Showing Drainageways In Project Area

The second drainageway is located north of the project site just below the Sunrise Estates Subdivision. This drainageway travels in a west to east direction crossing Komohana Street near its intersection with Mohouli Street. It then travels just below (south) the University Heights Subdivision generally following Kumukoa and Lanikaula Streets before connecting with Waiakea Stream to the east.

Since the area surrounding the PBARC property is undeveloped, surface runoff in this area follows the natural slopes conditions which drain into the Waiakea Stream east of Komohana Street. The Flood Insurance Rate Map for this project area is designated Zone X indicating areas outside of the 500-year flood. Soil conditions consist of Pahoehoe Lava Flows which are very porous.

There are four drainage crossings at Komohana Street between Mohouli Street and West Puainako Street. An existing bridge is provided where the Waiakea Stream crosses Komohana Street. From this bridge are two drainage culverts (9'-6" x 6'-5" and 11'-5" x 7'-3") as one proceeds north along Komohana Street up to the private driveway into the electrical substation site. The fourth culvert (16'-5" x 10'-3") is located near the northern drainage crossing of this road (ECI 1993).

### 6.3.2 Effects On Drainage Facilities

Under the No Action Alternative, there would be no change to the existing drainage patterns and conditions associated with the project site and immediate surrounding area. Consequently, existing surface runoff quantities and patterns would remain. Necessary drainage improvements for other developments occurring (University Park, China-U.S. Center) would be addressed as part of those development's design.

With the project, there would be an increase in the amount of impervious surfaces created due to construction of PBARC and IPIC complexes, roadways, parking areas, and walkways. Consequently, this project would increase the pre-development runoff quantities and drainage patterns within the property. The specific runoff quantities and changes to drainage patterns would be developed during the design of the project.

Drainage facilities will be designed in accordance with the County Storm Drainage Standards. Estimated runoff values would be computed using the rational method as required for catchment areas less than 100 acres in size. Rainfall intensities will be based on the 50-year, 1-hour rainfall event to yield higher runoff values resulting in a more conservative drainage facilities design.

The County requires that on-site storm drainage facilities be sized to control runoff in excess of estimated pre-development runoff quantities. Thus, construction of about 16 drywells will be provided on the project site to detain increased runoff quantities generated. Hence, the project is not expected to have a significant impact on existing drainage conditions in the immediate project area. Coordination would be conducted with the County DPW during the project's design which would include their review and approval of Grading Plans and proposed drainage improvements.

## 6.4 SOLID WASTE

### 6.4.1 Existing Solid Waste Facilities

The Solid Waste Division of the County Department of Environmental Management is responsible for administering the island's solid waste management system. This division operates two active County landfills, one in Hilo and the other at Puuanahulu in West Hawaii. Waste is disposed at County landfills by commercial haulers, County transfer trailers, individual haulers, industrial haulers, and government haulers (BCGI 1993).

Collection of solid waste is provided by private contractors since no collection services are provided through the County. Thus, collection is voluntary as the public chooses whether to subscribe to private collection services or self-haul waste to disposal sites. Currently, residents and businesses can haul their solid waste to any one of 21 transfer stations located throughout the island which is then hauled to either the Hilo or Puuanahulu landfills (BCGI 1993). Transfer stations located in the general vicinity of the project site include the Hilo, Papaikou, and Keaau stations.

The County currently has a deadline from the State DOH to close the Hilo landfill in the year 2004. The County has no capacity limitation on the landfill at present, but is working to develop a long-range solid waste plan (Terry & SSFM 2001). Some options being considered by the County to extend the Hilo landfill include obtaining a permit for a vertical expansion of the landfill which would add more capacity and less of an impact. Another is the horizontal expansion of the landfill but it would require leachate issues and be more costly. Another method is to maximize diversion by expanding diversion credits to reduce the amount of waste disposed at the landfill (EMC 2001).

An update of the County's Solid Waste Management Plan is presently being conducted, and would address the closure and replacement of the Hilo landfill as a central focus. This Management Plan update would include public hearings and provide a definitive recommendation for new facilities and technologies to be installed in East Hawaii along with replacing the Hilo landfill (EMC 2001).

### 6.4.2 Effects On Solid Waste Facilities

<u>No Action Alternative Effects</u>

Under the No Action Alternative, there would be no solid waste material generated from the project site since it would remain undeveloped. Additional developments occurring within the immediate vicinity during the study year would generate increased solid waste needing to be disposed of at the landfill. This includes waste generated from the China-U.S. Center, University Park lots, and sports complex.

The U.H.-Hilo has one of the more extensive and active recycling plans compared with other government facilities on the island. Procedures have evolved to provide for the collection of glass, aluminum, white paper, mixed paper, and newspaper. Recycling bins are distributed throughout the campus, and a student worker position is dedicated to collecting recyclables from bins to waste pickup locations. The contractor collects recyclables at no cost to the University in exchange for salvage sales. These recycling efforts would occur for the University Park and sports complex which are part of the campus expansion. Developers of the China-U.S. Center have proposed to adopt similar procedures for this development (Terry & SSFM 2001).

**Project Effects On Solid Waste Facilities**

Construction of the PBARC project will generate solid waste typical of normal construction related activities over a short time period. Generated wastes will consist primarily of vegetation, rocks, and other debris resulting from the clearing and grubbing of project area. The contractor will be required to remove all debris from the site, and properly dispose them at the Hilo landfill in conformance with County regulations. Such activities are expected to have a minor impact on County solid waste facilities.

Research activities conducted at the project site would inevitably result in increased solid waste material being generated which would need to be disposed of at a landfill. All waste from the project would be transported to a landfill by a private contractor. At this time, it is not known whether the Hilo landfill will be extended and available until the year 2010, or a new landfill site would be available. Nevertheless, appropriate coordinate with the County would be conducted during the project's design and construction phasing plans to address solid waste facilities. Future facilities would be dependent upon the results of the Solid Waste Management Plan update. To minimize the amount of waste generated from the project, PBARC and IPIF will consider adopting similar recycling procedures already being implemented by the University.

## 6.5 TRANSPORTATION FACILITIES

A traffic impact study was conducted for the PBARC property by Phillip Rowell and Associates which is included in Appendix L of this document. This study analyzed the intersections of Komohana Street with Nowelo Street and Puainako Street to determine existing and future operational conditions in the year 2010. With the project, the intersection of Komohana Street with Nowelo Street (includes future extension west) would be the main roadway providing vehicular access to the project.

Analysis of traffic operations at study intersections were based upon the procedures and methods described in the 2000 *Highway Capacity Manual*. The methods described were used to analyze the capacity and operating efficiency of both signalized and unsignalized intersections. "Level-of-Service" (LOS) is term used as a qualitative measure of traffic conditions based upon a number of factors which include space, speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience.

There are six levels-of-service, A through F, which relate to the driving conditions from best to worst, respectively. For signalized intersections, LOS "A" and "B" reflect uncongested operations in which all vehicles clear in a single cycle while LOS "C" through "E" reflect increased levels of congestion with LOS "F" representing a total breakdown with stop-and-go operations. Level-Of-Service "D" is typically considered acceptable for peak hour conditions in urban areas.

Operating conditions of unsignalized intersections are controlled by "STOP" signs resulting in a LOS classification based on the use of gaps in traffic on the major street by vehicles crossing or turning through that stream. Thus, the criteria for level-of-service are based on delay of each turning movement. LOS "A" and "B" reflect little to short delays for vehicles which increase to long and very long traffic delays under LOS "D" and "E" conditions. LOS "F" occurs when demand volume exceeds the capacity of the lane causing extreme delays and queuing contributing to severe congestion.

### 6.5.1 Existing Transportation Facilities And Conditions

Existing transportation facilities in the project area include two major roadways which are Komohana Street and Puainako Street. Major intersections along Puainako Street are signalized, however, the intersection with Komohana Street is presently unsignalized. The posted speed limit along Puainako Street in this area is 35 miles per hour (mph). The Average Daily Traffic (ADT) recorded on this roadway last year (2001) was about 5,500 vehicles per day (vpd) between Komohana Street and Kawili Street (general vicinity of the project). Further east of Kawili Street, the ADT increases to about 7,200 vpd and then 10,000 vpd east of Kinoole Street.

There are two projects planned to improve Puainako Street in the immediate future. The first is the installation of signals at the intersection of Puainako Street with Komohana Street. The second is the widening of Puainako Street from two to four lanes and realigning it slightly north of it's existing route from Kawili Street past Komohana Street. This roadway would extend further west from its present terminus at Komohana Street.

Komohana Street is a two-lane County roadway traveling in a north to south direction in the vicinity of the project. The posted speed limit along this roadway is 45 mph between Nowelo Street and Puainako Street. Average daily traffic volumes are not available for this roadway. Nowelo Street is also a two-lane County road running in a west to east direction providing vehicular access into the University Park development and U.H.-Hilo campus.

<u>Existing Traffic Volumes And LOS</u>

Traffic counts were taken during the morning and afternoon peak hours in March 2001 for the study intersections of Komohana Street with both Nowelo Street and Puainako Street. Table 6.2 shows the existing LOS at these intersections and the Figure 6.1 shows the peak hour volumes by turning movements (Rowell 2002).

**Table 6.2 Existing Levels-Of-Service**

| Intersection / Movement | Morning Peak Hour | | Afternoon Peak Hour | |
|---|---|---|---|---|
| | Delay | LOS | Delay | LOS |
| **Komohana Street with Puainako Street (Unsignalized)** | | | | |
| *Southbound Left & Through* | 12.5 | B | 9.1 | A |
| *Westbound Left (Puainako)* | 61.4 | F | 110.5 | F |
| *Westbound Right (Puainako)* | 26.7 | D | 11.8 | B |
| **Komohana Street with Nowelo Street (Unsignalized)** | | | | |
| *Southbound Left* | 10.8 | B | 8.4 | A |
| *Westbound Left (Nowelo)* | 34.7 | D | 30.5 | D |
| *Westbound Right (Nowelo)* | 18.9 | C | 11.3 | B |

Note: Delay is average vehicle delay in seconds
Source: Rowell 2002

As shown on this table, westbound vehicles traveling along Puainako Street encounter long delays during both morning and afternoon peak hours with longest delays occurring in the afternoon. Other movements operate with shorter delays and better level-of-service conditions. The planned signalization of this intersection would improve the left-turn movements from Puainako Street. At the intersection of Komohana Street with Nowelo Street, vehicle movements operate with some delays but acceptable LOS. Vehicular traffic on Nowelo Street is fairly light with only 15 cars making left- and right-turns onto Komohana Street during the afternoon peak hour.

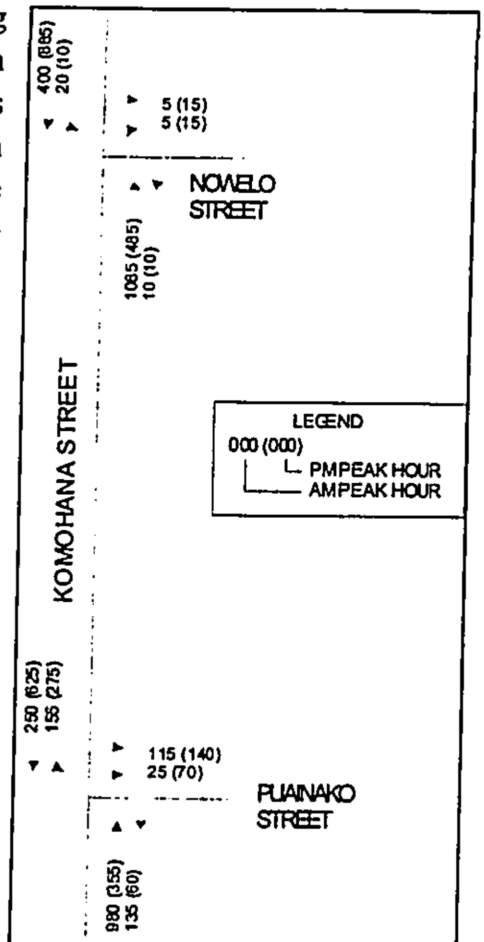


Figure 6.1
Existing 2001 Traffic Volumes
(Rowell 2002)

### 6.5.2 Projected Traffic Conditions

Future traffic conditions in the year 2010 were estimated for both the No Action Alternative and With Project scenarios. Future traffic conditions were projected based upon adding background growth and related projects to the existing roadway traffic. Background traffic volumes are the result of growth outside of the immediate project area which cannot be attributed to a specific project. Related projects include identifiable developments and roadway improvement projects in the immediate vicinity for which traffic volumes can be estimated. Various references were used to estimate future traffic conditions at the study intersections.

There were four roadway improvements planned to occur within the study area that are scheduled for completion before 2010. These improvements include the following:

1. Puainako Street will be widened from two to four lanes, relocated north of the existing location, and extended west of Komohana Street. The intersection of Puainako Street at Komohana Street will be signalized. These improvements are associated with the Puainako Street Widening Project.
2. A second southbound left-turn lane will be provided at the intersection of Komohana Street with Puainako Street. This improvement was recommended in the traffic study for the China-U.S. Center project to accommodate traffic associated with the University's multi-purpose sport and recreational complex in University Park.
3. Komohana Street will be widened from two to four lanes. This improvement was indicated in the Hawaii Long Range Land Transportation Plan and the Puainako Street Extension project.
4. The intersection of Komohana Street at Nowelo Street will be signalized. This improvement was recommended in the traffic study for the University Park development.

**Trips Generated By Project**

Future traffic volumes generated by the project were estimated using the procedures described in the Trip Generation Handbook. This methodology uses trip generation rates to estimate the number of trips that the project will generate during the morning and afternoon peak hours. The trip generation calculations were performed based upon the following assumption and is shown on Table 6.3. Figure 6.2 shows the resulting traffic volumes in 2010 with and without (No Action) the project.

1. Trip generation characteristics for the PBARC complex are comparable to those associated with a research and development center (ITE land use code 760).
   - The PBARC complex will have gross floor area of 76,000 square feet. This area includes office, administration offices and laboratories.
   - The insectery (24,000 sf) and the greenhouse (13,225 sf) do not generate trips. Personnel using these facilities will have offices in the research building.
   - The complex will have a visitors center, however, it does not generate any trips during the peak hours since it will not be used then.
2. Trip generation characteristics for the IPIF complex are also comparable to those associated with a research and development center (ITE land use code 760).
   - The IPIF complex will have approximately 24,000 square feet of floor area which research offices, administration offices, and laboratories.
   - About 6,200 square feet of floor area for the greenhouse and shade houses would not generate trips since personnel have offices in the other facilities.

| Table 6.3 Trip Generation Summary Of PBARC Project | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | PBARC Complex | | | IPIF Complex | | | |
| Time Period | Direction | Rate or Factor | TGSF | Peak Hour Trips | Rate or Factor | TGSF | Peak Hour Trips | Total New Trips |
| AM Peak Hour | Trips Per Unit | 1.24 | 76.0 | 94 | 1.24 | 24.0 | 30 | 124 |
| | % Inbound | 83% | | 78 | 83% | | 25 | 103 |
| | % Outbound | 27% | | 16 | 27% | | 5 | 21 |
| PM Peak Hour | Trips Per Unit | 1.08 | 76.0 | 82 | 1.08 | 24.0 | 26 | 108 |
| | % Inbound | 15% | | 12 | 15% | | 4 | 16 |
| | % Outbound | 85% | | 70 | 85% | | 22 | 92 |

Note: Trip rates are for Research and Development Center, Land Use Code 760
TGSF = Thousand Gross Square Feet

Source: Phillip Rowell & Associates, 2002

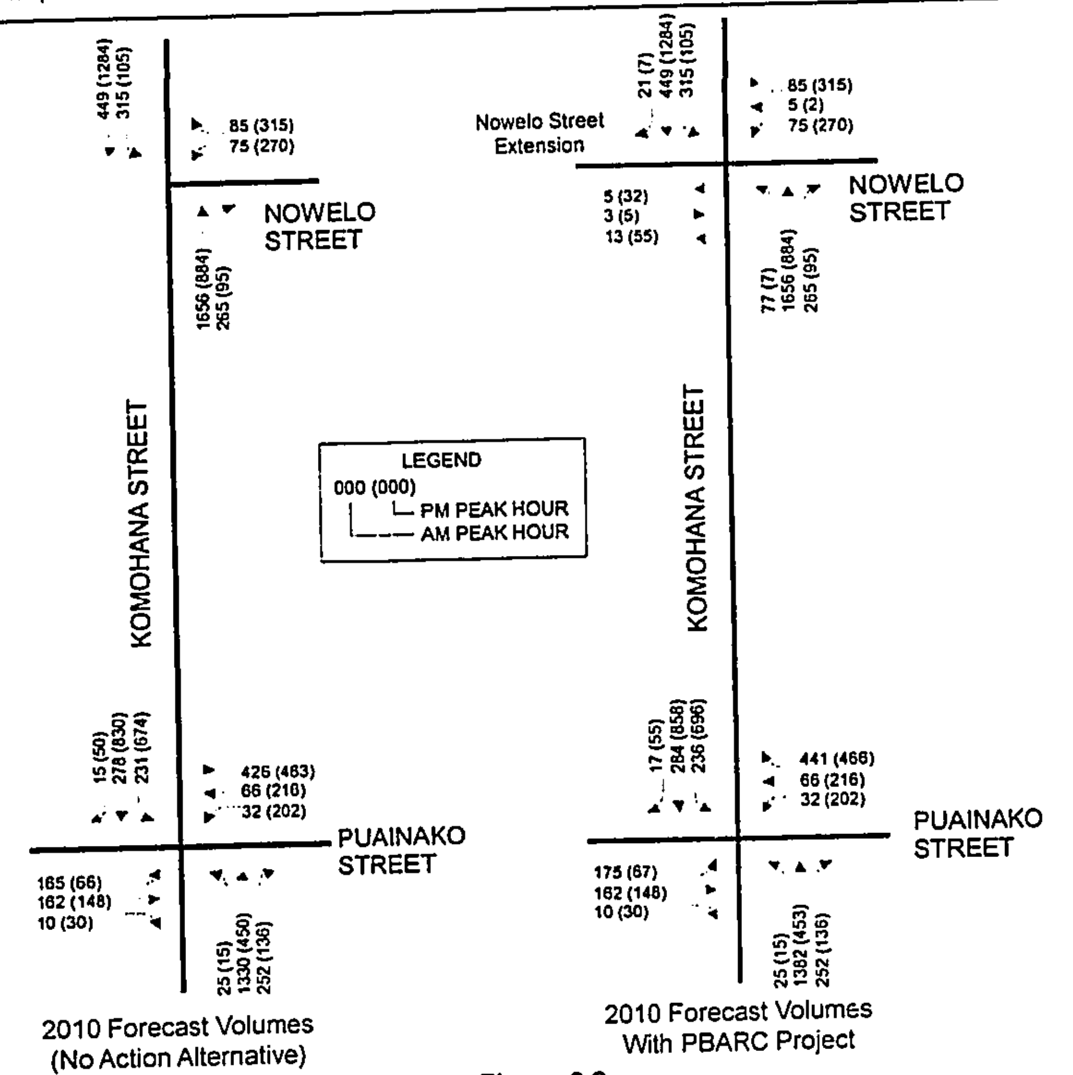



**Figure 6.2**
**2010 Forecast Traffic Volumes Without And With Project**

As shown in the table, the PBARC complex is projected to generate 94 additional trips during the morning peak hour and 82 trips during the afternoon peak hour. The IPIF complex will generate 30 trips during the morning peak hour and 26 during the afternoon peak hour. The total combined trips from this project would thus be 124 trips during the morning peak hour and 108 trips during the afternoon. As shown on the figure, these trips would be entering and exiting onto Komohana Street from the future planned extension of Nowelo Street. The University is currently conducting engineering work and evaluating implementation of this Nowelo Street extension. Improvements would be coordinated with the County DPW.

As shown on the figure, the project would have the majority of vehicles turning left (77 trips) from Komohana Street entering the Nowelo Street extension during the morning peak hour. Most of the remainder would enter making a right-turn approaching in a southbound direction from Komohana Street. In the afternoon, the majority of vehicles leaving the project would turn right (55 trips) from Nowelo Street onto Komohana Street. Most of the remaining vehicles would make a left turn heading northbound on Komohana Street.

### 6.5.3 Effects On Traffic Conditions

The following criteria used to determine whether the project has a significant traffic impact for which mitigation measures are required is shown below. These criteria define a significant impact for a signalized intersection since both the intersections of Komohana Street with Puainako and Nowelo Streets would be signalized by the project's study year.

**Definition Of A Significant Traffic Impact**

| Final V/C Ratio | Project Related Increase in V/C |
|---|---|
| 0.700-0.800 | equal to or greater than 0.040 |
| 0.800 - 0.900 | equal to or greater than 0.020 |
| > 0.900 | equal to or greater than 0.010 |

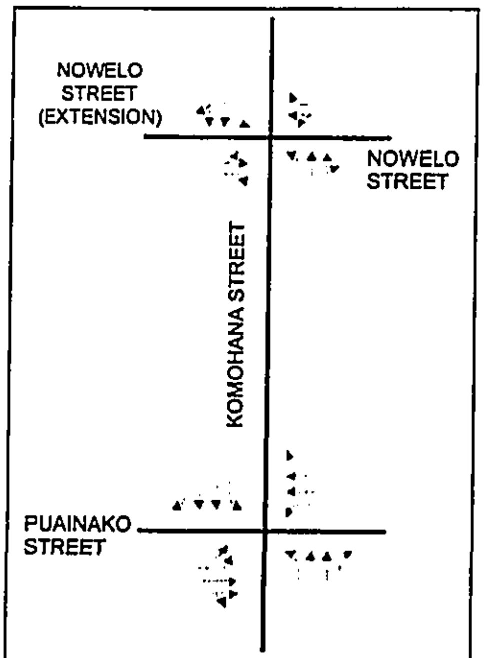
**No Action Alternative Conditions**

Tables 6.4 and 6.5 provided later show the analysis results for the study intersections for the No Action Alternative along with conditions with the project. Based upon these results, the newly signalized intersection of Komohana Street with Puainako Street would operate under good conditions during both peak hours with movements generally having a LOS of C or better. Only the northbound through movement on Komohana Street would operate at LOS D during the afternoon peak hour.

The signalized intersection of Komohana Street with Nowelo Street would also operate under acceptable conditions during both peak hours. As shown on the table, vehicular movements during the morning peak hour would have LOS D with one movement having LOS A. The afternoon peak hour would have better operating conditions with LOS C for Nowelo Street movements and LOS B for Komohana Street movements.

## Project Effects On Conditions

With development of the PBARC Project, the intersection of Nowelo Street with Komohana Street would change from a 3-way intersection to a 4-way signalized intersection. The addition "leg" of this intersection is due to the extension of Nowelo Street from this intersection in a west direction along the border of the PBARC property. Consequently, Nowelo Street will be the main roadway providing direct vehicular access to this project. The laneage configuration used for the analysis is shown here.



Lane Configuration For Analysis
(Rowell 2002)

### Komohana Street With Puainako Street Intersection

The results of the Level-of-Service analysis for the intersection of Komohana Street with Puainako Street are shown in Table 6.4. These results show that the project would have minimal impacts on this intersection with small changes to the volume-to-capacity (V/C) ratios. There would also be no changes to the level-of-service for all movements compared with the No Action Alternative.

During the morning peak hour, all movements at this intersection have LOS C or better, as defined by the average vehicle delay. During the afternoon peak hour, all movements are similarly LOS C or better. The only exception is the northbound through movement from Komohana Street which would continue to operate at LOS D compared with the No Action Alternative. As indicated on the table, changes (increases) to the V/C ratio are low with some even decreasing (improving). Based upon the significance criteria, this project should not have a significant impact on traffic conditions occurring at this intersection. Consequently, no mitigative measures are required.

### Komohana Street With Nowelo Street Intersection

These results on Table 6.5 show that the project would have minor impacts on this intersection with small changes to the volume-to-capacity (V/C) ratios. There would also be no changes to the level-of-service for all movements compared with the No Action Alternative. Westbound movements on Nowelo Street (exiting University Park) would actually see an improvement in conditions from LOS D to LOS C with the project. The new movements added to this intersection from the Nowelo Street extension would operate under acceptable levels-of-service also. New movements would have LOS C or better conditions. Consequently, no mitigative measures are required.

**Table 6.4**
**Level-Of-Service Analysis For Komohana Street With Puainako Street**

| | Intersection & Movement | 2010 No Action Alternative V/C | 2010 No Action Alternative Delay | 2010 No Action Alternative LOS | 2010 With PBARC Project V/C | 2010 With PBARC Project Delay | 2010 With PBARC Project LOS | Change V/C |
|---|---|---|---|---|---|---|---|---|
| AM Peak Hour | Puainako Street | | | | | | | |
| | Eastbound Left | 0.319 | 26.3 | C | 0.351 | 27.4 | C | 0.032 |
| | Eastbound Thru & Right | 0.192 | 25.2 | C | 0.200 | 26.0 | C | 0.008 |
| | Westbound Left | 0.169 | 33.1 | C | 0.180 | 34.2 | C | 0.011 |
| | Westbound Thru | 0.114 | 31.4 | C | 0.121 | 32.3 | C | 0.007 |
| | Westbound Right | 0.353 | 20.4 | C | 0.388 | 21.6 | C | 0.035 |
| | Komohana Street | | | | | | | |
| | Northbound Left | 0.056 | 13.4 | B | 0.055 | 12.8 | B | -0.001 |
| | Northbound Thru | 0.877 | 28.5 | C | 0.890 | 28.7 | C | 0.013 |
| | Northbound Right | 0.199 | 14.7 | B | 0.194 | 14.1 | B | -0.005 |
| | Southbound Left | 0.190 | 13.7 | B | 0.188 | 14.1 | B | -0.002 |
| | Southbound Thru | 0.131 | 6 | A | 0.131 | 5.6 | A | 0.000 |
| | Southbound Right | 0.016 | 5.4 | A | 0.018 | 5.1 | A | 0.002 |
| PM Peak Hour | Puainako Street | | | | | | | |
| | Eastbound Left | 0.108 | 25.8 | C | 0.109 | 25.8 | C | 0.001 |
| | Eastbound Thru & Right | 0.336 | 34.6 | C | 0.336 | 34.6 | C | 0.000 |
| | Westbound Left | 0.488 | 25.9 | C | 0.488 | 25.9 | C | 0.000 |
| | Westbound Thru | 0.260 | 27.4 | C | 0.260 | 27.4 | C | 0.000 |
| | Westbound Right | 0.213 | 5.5 | A | 0.216 | 5.6 | A | 0.003 |
| | Komohana Street | | | | | | | |
| | Northbound Left | 0.153 | 33.4 | C | 0.157 | 33.6 | C | 0.004 |
| | Northbound Thru | 0.733 | 41.2 | D | 0.738 | 41.4 | D | 0.005 |
| | Northbound Right | 0.220 | 32.5 | C | 0.220 | 32.5 | C | 0.000 |
| | Southbound Left | 0.401 | 10.9 | B | 0.413 | 11.1 | B | 0.012 |
| | Southbound Thru | 0.434 | 10.9 | B | 0.448 | 11.0 | B | 0.014 |
| | Southbound Right | 0.059 | 8.0 | A | 0.064 | 8.0 | A | 0.005 |

Note: Delay is average delay per vehicle in seconds
Source: Phillip Rowell & Associates, 2002

**Table 6.5**
**Level-Of-Service Analysis For Komohana Street With Nowelo Street**

| | Intersection & Movement | 2010 No Action Alternative V/C | 2010 No Action Alternative Delay | 2010 No Action Alternative LOS | 2010 With PBARC Project V/C | 2010 With PBARC Project Delay | 2010 With PBARC Project LOS | Change V/C |
|---|---|---|---|---|---|---|---|---|
| AM Peak Hour | Nowelo Street | | | | | | | |
| | Eastbound Left | | | | 0.028 | 29.4 | C | 0.028 |
| | Eastbound Thru & Right | | | | 0.029 | 29.5 | C | 0.029 |
| | Westbound Left | 0.276 | 35.0 | D | 0.325 | 34.2 | C | 0.049 |
| | Westbound Thru & Right | 0.309 | 35.9 | D | 0.269 | 32.8 | C | -0.040 |
| | Komohana Street | | | | | | | |
| | Northbound Left | | | | 0.165 | 8.8 | A | 0.165 |
| | Northbound Thru & Right | 1.012 | 41.3 | D | 0.990 | 35.1 | D | -0.022 |
| | Southbound Left | 0.753 | 36.4 | D | 0.856 | 47.4 | D | 0.103 |
| | Southbound Thru & Right | 0.181 | 3.0 | A | 0.194 | 3.6 | A | 0.013 |
| PM Peak Hour | Nowelo Street | | | | | | | |
| | Eastbound Left | | | | 0.096 | 21.1 | C | 0.096 |
| | Eastbound Thru & Right | | | | 0.041 | 20.4 | C | 0.041 |
| | Westbound Left | 0.498 | 26.9 | C | 0.693 | 34.8 | C | 0.195 |
| | Westbound Thru & Right | 0.589 | 29.6 | C | 0.630 | 30.8 | C | 0.041 |
| | Komohana Street | | | | | | | |
| | Northbound Left | | | | 0.618 | 18.5 | B | 0.068 |
| | Northbound Thru & Right | 0.618 | 18.5 | B | 0.618 | 18.5 | B | 0.000 |
| | Southbound Left | 0.314 | 13.1 | B | 0.314 | 13.1 | B | 0.000 |
| | Southbound Thru & Right | 0.659 | 13.5 | B | 0.661 | 13.5 | B | 0.002 |

Note: Delay is average delay per vehicle in seconds
Source: Phillip Rowell & Associates, 2002

# CHAPTER 7
# PUBLIC FACILITIES AND UTILITIES

This chapter addresses the probable impact on public facilities and utilities in the project area resulting from the PBARC Project.

## 7.1 ELECTRICAL AND COMMUNICATION FACILITIES

### 7.1.1 Existing Electrical And Communication Facilities

**Electrical Facilities**

The Hawaii Electric Light Company, Inc. (HELCO) provides electrical power to the Island of Hawaii. HELCO is a privately owned utility company regulated by the State Public Utilities Commission. Peak electrical demand in 1999 was 170.2 megawatts (MW). HELCO's power generation system presently has a total firm capacity of 260.4 MW. About 148.4 MW is produced by HELCO-owned steam units, diesel units, and gas turbines located in various areas of the island. Remaining capacity is purchased from three privately-owned companies (County 2001). Its network of power plants serving Hilo includes the Kanoelehua Power Plant, Puna Power Plant, Wailuku Hydro Power Plant, Hilo Coast Power Plant, and Shipman Power Plant (Terry & SSFM 2001).

There are two levels of transmission voltages to transfer power between areas on the Big Island. The main transmission voltage is 69 kilo-volt (kV) of which HELCO has four cross-island transmission lines. One line is the northern line connecting the Kanoelehua substation to West Hawaii via the Waimea substation along Highway 19 following the Hamakua coastline. The other transmission voltage is 13.8 kV that includes three tie-lines in Hilo connecting the Shipman and Kanoelehua power plants. The existing distribution system consists of several different voltage levels: 2.4 kV, 4.16 kV, 7.2 kV, 12.47 kV and 13.8 kV. This distribution system basically consists of overhead pole lines and underground systems (County 2001).

In the vicinity of the PBARC site, HELCO has their Komohana Substation located adjacent to this property situated along Komohana Street. There are both 69 kV and 12.47 kV overhead electrical lines associated with the substation following their existing easement along the southern boundary of the project site before crossing Komohana Street into the University Park development. Overhead electrical lines are also present along Komohana Street in the project area. This Komohana Substation was upgraded to a 17.5 megavolt-ampere (MVA) capacity several years ago to accommodate the load growth expected in the future due to development and expansion of the University campus (ECI 1993).

**Communication Facilities**

Verizon Hawaii provides telephone service for the Hilo area from a switching station in their Kawailani Street office. In the vicinity of the project, Verizon Hawaii has telephone lines located on HELCO's overhead distribution line routed along Komohana Street (Terry & SSFM 2001).

### 7.1.2 Effects On Electrical And Communication Facilities

There would be no impacts to existing electrical and communication facilities in the project area under the No Action Alternative since the property would remain undeveloped. Other developments planned to occur in the vicinity would coordinate their electrical requirements with HELCO and Verizon Hawaii as part of their design. As mentioned, HELCO has already expanded the Komohana Substation to service the anticipated expansion of U.H.-Hilo campus areas.

With the project, the new research facilities and greenhouses would result in increased demand for electrical power. For planning purposes, the electrical load was estimated to be about 21,000 kiloWatt-hour per day. The actual electrical loads would be determined during the project's design and appropriate coordination will be conducted with HELCO to determine necessary on-site utility improvements. Given the large capacity HELCO presently has island-wide along with their recent expansion of the Komohana Substation, the estimated increased loads should not have a significant impact on their facilities and ability to provide electrical power.

New connections to Verizon Hawaii's existing communication facilities and systems would be required for this project. The specific communication and telecommunication systems required for the project would be developed as part of the facility's design. Coordination would be conducted with Verizon Hawaii to determine needed site improvements and connection requirements. As a result, the project is not expected to have a significant impact on communication facilities.

## 7.2 RECREATIONAL FACILITIES

### 7.2.1 Existing Recreational Facilities

The town of Hilo is a major urban center in East Hawaii and has a diversity of recreational facilities. Within this town area, there are eight neighborhood parks having between 3.0 and 7.7 acres in size and have playfields. Additional playfields are provided by nine schools in the area. These parks have not been used to their optimum capacity because many have drainage problems or lack playground equipment, landscaping, and benches. Some residential areas do not have easy access to neighborhood parks, and newer communities lack recreational areas altogether.

Hoolulu Complex is the major regional recreational center in Hilo town and consists of 56 acres of land generally located a couple miles northeast of the project site between Waiakea Pond and the Hilo International Airport. There is an auditorium with a seating capacity of 2,800 that is used for various entertainment and sports events. Other facilities include Wong stadium for sporting events, a swimming pool, outdoor tennis courts, a covered tennis stadium, and baseball fields.

Five miles south of Hilo, the County maintains the Panaewa Recreation Complex located on a 173-acre parcel. This complex includes the Rainforest Zoo and the Equestrian Center, consisting of a race track, rodeo arena, and other equestrian facilities (County 2001).

Within the immediate vicinity of the project, there are a few County parks associated with existing residential subdivisions. Mohouli Park is located northeast of the site and University Heights Park is located to the east. Within the U.H.-Hilo campus is their athletic complex on West Kawili Street which includes a multi-purpose field, softball and baseball fields, and tennis complex.

### 7.2.2 Effects On Recreational Facilities

**No Action Alternative**

Without development of the PBARC Project, there would be no impact on existing recreational facilities since the property would remain undeveloped with no effect on the resident population. The other developments planned to occur within the 2010 study year would generate a fair amount of new residents and students to the Hilo town area.

The China-U.S. Center would add another 600 students along with faculty and administrative jobs, further development of the University Park lots would also add several hundred more jobs many of which would result in the migration of new residents to Hilo to fill them. Consequently, these other developments would increase the resident population in East Hawaii and subsequent use of existing recreational facilities in the area. Environmental Impact Statement documents prepared for these developments indicated area recreational facilities would not be significantly impacted (ECI 1997, Terry & SSFM 2001).

**Project Effects On Recreational Facilities**

Construction of the PBARC and IPIF complexes would occur over several years having a short-term impact in the immediate area. This construction related activities are not expected to have an impact on existing recreational facilities in the immediate area. Existing recreational facilities are located a considerable distance away from the property which is surrounded by undeveloped land. Thus, potential disturbances from construction noise, fugitive dust emissions, and construction traffic should not negatively affect activities conducted at recreational facilities in the area.

Development of the PBARC Project could result in the in-migration of up to 24 scientists to fill new positions along with the possible relocation of some research staff and their families from Oahu to Hilo as discussed in Chapter 5. If these Federal employees chose to move to other Federal government positions on Oahu, their positions at the new complexes would likely be filled by existing Hawaii County residents reducing the changes with new residents.

This increase in resident population was estimated to be in the range of about 63 persons for new in-migrants to Hilo to fill positions not qualified by existing residents. A small percentage of the 38 staff positions on Oahu potentially relocated to Hilo may also occur since most may likely find other Federal positions on Oahu. This increase in residents to the County would occur over several years (2004 to 2010) as construction of the various phases of the project is completed. Consequently, this would probably result in an average of only about 10 to possibly 20 additional residents per year which is a relatively insignificant amount in relation to the entire resident population in East Hawaii which is over 40,000 in the Hilo CDP alone (Hilo town area).

These additional residents would generate a slight increase in demand for recreational facilities serving East Hawaii. However, the relatively small number of residents being added by the project is not expected to have a significant impact on existing recreational facilities serving this district.

## 7.3 MEDICAL FACILITIES

### 7.3.1 Existing Medical Facilities

Current medical facilities in the Hilo area include the Hilo Medical Center, Life Care Center of Hawaii, and Hale Anuenue Care Center. The Hilo Medical Center is located about 2 miles northwest of the project site along Waianuenue Avenue. This medical center is the largest on the island with a total of 164 beds for acute care services which includes 113 beds for medical/surgical and critical care. Hilo Medical Center also has 108 beds providing skilled nursing and intermediate care facilities. For the year 2000, this center had 79 percent occupancy for medical/surgical beds with a 6.5 average length of stay. Critical care beds had only 39 percent occupancy, obstetric had 33 percent, and pediatric 16 percent (SHPDA 2001).

The Hale Anuenue Care Center is located across from Hilo Medical Center. This care center provides long-term care services for the elderly. It has 120 beds for both skilled nursing and intermediate care. The Life Care Center of Hawaii facility is located about 1 mile south of the PBARC property in the Waiakea Uka subdivision area. This is also a long-term care facility with 252 beds for skilled nursing and intermediate care (SHPDA 2001).

### 7.3.2 Effects On Medical Facilities

<u>No Action Alternative</u>

Without development of the PBARC Project, there would be no impact on existing medical facilities since the property would remain undeveloped. The other developments planned to occur within the 2010 study year would generate a fair amount of new residents and students to the Hilo town area.

As previously discussed, the China-U.S. Center would add several hundred students along with faculty and administrative jobs, and further development of the University Park lots would also add more jobs resulting in the migration of new residents to Hilo to fill them. Consequently, these other developments would increase the resident population in East Hawaii and subsequent demand for medical services and facilities in the area. Environmental Impact Statement documents prepared for these developments indicated area recreational facilities would not be significantly impacted (ECI 1997, Terry & SSFM 2001).

**Project Effects On Medical Facilities**

Construction of the PBARC and IPIF complexes are not expected to have an impact on these existing medical facilities in the Hilo town area. These facilities are located a considerable distance away from the property. Thus, potential disturbances from construction noise, fugitive dust emissions, and construction traffic should not negatively affect the services provided to patients at these medical facilities.

Although slight, there is the potential for additional medical services being required for PBARC and IPIF staff resulting from accidents or emergencies occurring at the PBARC property. These situations are expected to be rare or infrequent due to the type of activities conducted (research) at these facilities. Hilo Medical Center operated in the year 2000 with sufficient capacity and available bed space which should be adequate to accommodate the few emergency or medical services that may be required from the project.

The PBARC Project would also result in additional residents migrating to the island from either Oahu or outside the State as part of research activities relocated to the new facility or vacant positions being filled. As already discussed, additional residents generated by the project would be small and relatively minor in comparison to the entire population for East Hawaii. These additional residents would create slight increased demand for medical services such as obstetric and pediatric care in addition to medical/surgical care. However, this medical center should be able to accommodate this increased demand for services especially given the relatively low occupancy of beds for obstetric and pediatric care. Thus, the project should not have a significant impact on medical facilities.

## 7.4 EDUCATIONAL FACILITIES

### 7.4.1 Existing Educational Facilities

The PBARC Project site is situated within an area that includes educational facilities associated with both the North Hilo Complex and the Central Hilo Complex of the State Department of Education (DOE) school system. The North Hilo Complex consists of eight elementary schools, and two intermediate schools which feed into Hilo High School. The Central Hilo Complex is comprised of two elementary schools and one intermediate school which feed into Waiakea High School (DOE 2001). Other schools in the vicinity include the U.H.-Hilo campus and St. Joseph's Junior-Senior High School which is a private school in the general vicinity of the project.

Of the North Hilo Complex, Chiefess Kapiolani Elementary is the only school situated in the general vicinity the project site located on Kilauea Avenue northeast of the property about 1 mile away. Chiefess Kapiolani Elementary School serves students in Kindergarten to sixth grade from downtown and central Hilo. Student enrollments since the year 1999 have decreased slightly from 571 to 554 students in 2001. This school had about 37 teachers in 2001 and classroom space was rated as adequate in comparison with State standards (DOE 2001a).

Within the Central Hilo Complex, Waiakea High School, Waiakea Intermediate School and Waiakea Elementary School are located in the vicinity of the project site. All three of these schools are situated along West Puainako Street west of the U.H.-Hilo campus. These schools are located about 1 mile away from the project site.

Waiakea Elementary School serves students in Kindergarten to fifth grade. Student enrollments have decreased slightly from 819 students in 1999 to 758 in 2001. This school had 41 full-time teachers in 2001, and classroom space was rated as more than adequate in comparison with State standards (DOE 2001b).

Waiakea Intermediate School serves students in 6th to 8th grade. Student enrollments have similarly decreased from 1033 students in 1999 to 908 in 2001. This school had 45 full-time teachers in 2001, and classroom space was rated as more than adequate in comparison with State standards (DOE 2001c).

Waiakea High School is located on West Kawili Street below (south) the U.H.-Hilo campus. This high school serves students in grades 9th to 12th with student enrollments decreasing significantly from 2,475 in 1999 to 1810 in 2001. This school had 99 full-time teachers in 2001, and classroom space was rated as more than adequate in comparison with State standards (DOE 2001d).

The University of Hawaii at Hilo is located east of the PBARC project site along with the university's expansion area of University Park situated along Komohana Street. The University campus is divided into two distinct areas by the Wailoa Flood Control Channel. The eastern/makai portion is referred to as the "main campus" and includes the UH-Hilo/Hawaii Community College campus. The western portion is referred to as "University Park" and includes research and technology facilities along with currently undeveloped vacant lots. Student enrollment in 1994 was 3,111, or a full-time equivalent (FTE) of 2,328 students on campus. Student enrollment was projected to grow at an annual rate of between 3 and 4 percent, with a projected FTE enrolment of 2,854 in 2001 and 2,940 in 2002 (Terry & SSFM 2001).

U.H.-Hilo obtains its primary clientele from the State of Hawaii, particularly residents of the Big Island. People from the Pacific Rim and Pacific Islands compose a secondary clientele. The University focuses on a liberal arts undergraduate education with some high quality professional programs (PBR 1996). Hawaii Community College (Hawaii CC) separated from UH-Hilo in 1991. Although a separate entity, Hawaii CC continues to share facilities and services with UH-Hilo.

### 7.4.2 Effect On Educational Facilities

<u>No Action Alternative Effects</u>

Under the No Action Alternative, there would be no impact on existing State DOE school facilities since the property would remain undeveloped. However, this inaction would have a negative impact to the U.H.-Hilo and Hawaii CC educational programs. The present space constraints with facilities along with its fragmentation on different islands would prevent these existing USDA programs from being expanded, properly staffed, and taking on new research projects. These programs frequently work with students at the University to assist with these research programs as part of internships.

The IPIF already has strong relations with U.H-Hilo where IPIF staff participates with professors in teaching related courses, and IPIF has a strong internship program with the University. This was an important reason for the Forest Service wanting to develop their new complex closer to the University. Consequently, the potential to enhance this intern program would be eliminated under this alternative providing less opportunity for U.H.-Hilo students to participate in this field. Similarly, the potential for intern program development with PBARC and the University would be negatively affected under this alternative.

**Project Effects On Educational Facilities**

Construction of the PBARC and IPIF complexes are not expected to have an impact on these existing educational facilities in the Hilo town area. These facilities are located a significant distance away from the property. Thus, potential disturbances from construction noise, fugitive dust emissions, and construction traffic should not negatively affect the educational programs and activities conducted at these facilities.

The PBARC Project would result in more residents migrating to the island from either Oahu or outside the State as part of research activities being relocated or new and vacant positions being filled. These additional residents generated by the project would be small and relatively minor in comparison to the entire population for East Hawaii. However, these new residents would create a slight increase in the student population needing to be accommodated at school facilities.

The additional number of new students resulting from this population increase would likely be quite small. Based upon State DOE student enrollments for the year 2000 and year 2000 census population data, it was estimated for planning purposes that a range of 10 to 20 new students could be generated. Since the project's construction would be phased, this increase in students would occur over several years likely between 2004 and 2010 resulting in an average of two to three students a year. Therefore, the impact of these additional students on school facilities and staffing should be minimal if any. Furthermore, enrollments at schools in the immediate project area have decreased marginally over the last few years.

The project would have beneficial impacts to existing educational programs at U.H.-Hilo because existing intern programs, graduate work, and other programs could be enhanced with both PBARC and IPIF. As already discussed, the IPIF has strong relations with U.H.-Hilo where IPIF staff participates with professors in teaching related courses, and IPIF uses students for assisting with their research work. PBARC research programs on Oahu similarly use students from the U.H.-Manoa which would provide opportunities for U.H.-Hilo with the new PBARC complex. Therefore, the PBARC and IPIF complexes would help strengthen the U.H.-Hilo agricultural program due to the mutually beneficial relations they currently have.

## 7.5 POLICE PROTECTION

### 7.5.1 Existing Police Facilities

The County of Hawaii Police Department is divided into several districts and beats with their central headquarters located in the town of Hilo. The PBARC property is located within the Police Department's South Hilo District. This district includes the department's central headquarters in the Public Safety Building, and police mini-stations located at Clem Akina Park, Richardson Beach Park, and Mooheau Bus Terminal (HPD 2001).

This South Hilo district includes 3 footpatrol beats, 5 motorcycle beats, and 25 motorpatrol beats (Beats 130 to 154). There are no footpatrol beats covering the project site since these generally cover the Bayfront shoreline area. However, a motorcycle beat (M/C-3) covers the section from Komohana Street to the shoreline between Mohouli Street and Puainako Street. The project is located within motorpatrol Beat 134 which generally includes the University campus area from Kinoole Street westbound to the Kukuau Forest between Mohouli and Puainako Streets (HPD 1998).

### 7.5.2 Effects On Police Facilities

There would be no effects on the Department's facilities or their staff's ability to provide protective services under the No Action Alternative because the property would remain undeveloped.

The PBARC Project is not expected to have a significant impact on the Department's ability to continue providing protective services for area residents and the general public. The PBARC and IPIF complexes would include a camera security system as part of their facilities, and on-site security personnel would be employed to monitor activities occurring and assist visitors. As a result, daily patrols of the area should not be disrupted or negatively impacted by research activities conducted on the property.

Short-term construction activities associated with the project may require temporary lane closures to Komohana Street. However, if necessary, a traffic control plan would be developed and coordinated with County agencies for their review and approval. Police officers may also be hired to assist with implementing traffic control in the area during such construction activities. However, these added services are not expected to negatively impact the Department's operations.

## 7.6 FIRE PROTECTION

### 7.6.1 Existing Fire Facilities

The Hawaii County Fire Department presently has 14 regular fire stations, 18 volunteer fire stations and 2 federal fire stations located throughout the Island of Hawaii. In the South Hilo district area, there are four 24-hour, full-time fire stations which are the Central, Waiakea, Kaumana, and Kawailani substations. The County's Fire Administration is also located in Hilo, and is currently being housed in a temporary office located in the Kaiko'o business district while plans are being formulated for a new office complex (County 2001).

The County has contracted with the State Department of Health for emergency medical ambulance services. All fire department personnel who provide basic and advanced life support are licensed or certified as required by State law. In general, emergency medical services account for 75 percent of all incidences. Fire fighting comprises another 5 percent, and the balance is divided between rescue, hazardous substances, special services, and natural disasters (County 2001).

The Central Fire Station (Station #1) is a full-time fire and emergency medical service (EMS) operation that is equipped with a fire engine, a tanker, and an ambulance. Shifts A, B, and C have 9, 10, and 10 assigned persons, respectively. Waiakea Fire Station (Station #2) is a fire, EMS, and rescue operation equipped with a fire engine and a rescue vehicle. This Station has 4, 5, and 4 persons working in Shifts A, B, and C. Kaumana Fire Station (Station #4) is a fire, EMS, and hazardous materials operation designated for ocean and land rescues. It is equipped with a fire engine and a HAZMAT vehicle, and functions as the HAZMAT station for the island. Shifts A, B, and C are assigned to 4, 5, and 5 persons, respectively.

The Kawailani Fire Station, referred to as Station #3, is a fire and EMS operation that is the closest station to the PBARC project site. Hence, this Fire Station would provide primary service for the PBARC project if needed while the Central, Waiakea, and Kaumana Fire Stations would provide back-up service for this area. This Station is equipped with a fire engine and an ambulance, and Shifts A, B, and C are assigned to 5, 6, and 6 persons, respectively.

### 7.6.2 Effects On Fire Facilities

There would be no effects on the Fire Department's facilities or their staff's ability to provide fire protective services under the No Action Alternative because the property would remain undeveloped.

The PBARC Project is not expected to have a significant impact on the Department's ability to continue providing protective services for area residents and the general public. The PBARC and IPIF complexes would be designed to meet fire code requirements and design plans would be coordinated with this department.

# CHAPTER 8
# CONFORMANCE WITH PLANS AND POLICIES

This chapter discusses the project's conformance with the State Land Use District regulations, and the County's General Plan goals and policies, Hilo Community Development Plan recommendations, and Zoning District standards.

## 8.1 STATE LAND USE DISTRICT

The State Land Use Commission's Land Use District Boundary Maps for Hilo (H-66) indicates that the project site and immediate surrounding areas are designated as "Agricultural District." The *project site abuts the Urban District boundary in the immediate area.*

Permitted uses within the State Agricultural District are prescribed under Title 13, Chapter 205 (Land Use Commission), Hawaii Revised Statutes (HRS), and the State Land Use Commission's Administrative Rules prescribed under Title 15, Subtitle 3, Chapter 15, Hawaii Administrative Rules (HAR).

Soils associated with the project site have an overall master productivity rating of "E" under the Land Study Bureau's detailed land classification (LSB 1968). This productivity rating is the lowest in the hierarchy of ratings where "A" is the best agricultural lands for productivity, and "E" is the lowest.

Review of Chapter 205, HRS, indicates that Agricultural District lands having an overall master productivity rating of "C," "D," "E," or "U" shall be restricted to uses permitted in the Agricultural District as set forth in §205-5(b) (§205-4.5(c), HRS). Section 205-5(b), HRS, states that within the Agricultural District, uses compatible to the activities described in §205-2, HRS, as determined by the Land Use Commission, shall be permitted, provided that each county may further define accessory agricultural uses and services by zoning ordinance.

The PBARC and IPIF complexes are permitted uses within the Agricultural District as these facilities are compatible with and support agricultural uses and activities. The facility will support not only the agricultural activities of the State of Hawaii, who is the landowner of the subject parcel, but also agricultural activities of all counties and the Pacific Basin. The services offered by the PBARC Project will support and further the agricultural activities of crop cultivation, orchards, forage, forestry, and farming activities throughout the State and Pacific Basin.

Consequently, the improvements proposed as part of this project would be permitted uses within the Agricultural District as stated in Chapter 205, HRS. Furthermore, the County Planning Department, in their letter dated November 9, 2001 and included in Appendix B, has determined that the facilities proposed are permitted public uses in the County's Agricultural District zoning and no additional land use permits are required.

## 8.2 CHAPTER 344, STATE ENVIRONMENTAL POLICY

This section discusses the project's conformance and consistency with the pertinent goals, policies, and guidelines described under Chapter 344, HRS, State Environmental Policy.

**Environmental Policy**

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

   The PBARC project is consistent with this policy as it will conserve natural resources by reducing pollution of natural resources during construction of the facility. Further, the State's unique natural environment will be safeguarded as development of the facility will foster conditions where man and nature can co-exist, while fulfilling a portion of the island's and State's social and economic requirements.

2. *Enhance the quality of life by:*

   A. *Setting population limits so that the interaction between the natural and artificial environments and the population is mutually beneficial.*

   B. *Creating opportunities for the residents of Hawaii to improve their quality of life through diverse economic activities which are stable and in balance with the physical and social environments.*

   This project is consistent with these policies as the PBARC facility is not anticipated to significantly increase population of Hilo or the island of Hawaii. No dwelling units, hotel accommodations, or other forms of permanent living spaces are proposed for this project. Furthermore, development of the property is consistent with the County's *General Plan* objectives and policies which indicate an expansion of University use for the site and surrounding area.

   As development of the PBARC facility is completed, additional staff may be needed. This may cause a small increase in the population of Hilo as employees may in-migrate from other Hawaiian islands, the Pacific Basin, or the mainland United States. This in-migration is not anticipated to generate a significant increase population in the area, as qualified individuals from the Hilo area will also vie for positions needed by the new facility.

The PBARC project will also improve the quality of life for residents as it creates opportunities for residents to take part in a diversified agricultural or agricultural-related economic activity. The economic activity generated from the PBARC facility is in balance with the physical and social environments of the Hilo area.

**Guidelines**

1. ***Population***

   A. *Recognize population impact as a major factor in environmental degradation and adopt guidelines to alleviate this impact and minimize future degradation.*

   The project is consistent with this guideline as the project is not anticipated to significantly increase population in the Hilo area. As discussed previously, the PBARC facility will not include construction of dwelling units, hotel or short-term accommodations, or other permanent or temporary housing.

   As development of the PBARC facility is completed, additional staff may be needed. This may cause a small increase in the population of Hilo as workers relocate from other Hawaiian islands, the Pacific Basin, or the mainland United States. This in-migration is anticipated to be minimal as qualified employees currently residing in the Hilo area may be selected to fill job openings. Therefore, this in-migration is not anticipated to significantly increase population in the area.

2. ***Land, water, mineral, visual, air, and other natural resources.***

   A. *Encourage management practices which conserve and fully utilize all natural resources.*

   B. *Promote irrigation and waste water management practices which conserve and fully utilize vital water resources.*

   C. *Encourage management practices which conserve and protect watersheds and water sources, forest, and open space areas.*

   D. *Establish and maintain natural area preserves, wildlife preserves, forest reserves, marine preserves and unique ecological preserves.*

   The PBARC project is consistent with these guidelines. Management practices during and after construction of the facility will encourage conservation of natural resources, including those of water resources. Watersheds, water sources, forest and open space areas will be protected as the project site is not in close proximity to these important resources.

   Natural area preserves, wildlife preserves, forest reserves, marine preserves and other unique ecological preserves will be maintained as the project site is located away from these ecological areas. As discussed in this Draft EA, the project is not anticipated to significantly impact such ecological areas. Furthermore, some of the research programs being conducted by this project support the establishment and maintenance of natural area preserves and forest reserves.

*3. Flora and fauna*

*A. Protect endangered species of indigenous plants and animals and introduce new plants or animals only upon assurance of negligible ecological hazard.*

As discussed in this Draft EA, no endangered species or indigenous plants or animals were identified or are known to existing within the project site and surrounding areas. Therefore, the PBARC project is not anticipated to significantly impact habitats of endangered species, or indigenous plants and animals.

In selected areas, existing or native plants, shrubs, or trees may be incorporated into the landscaping for the proposed PBARC facility which will assist in maintaining the natural flora and fauna habitat in the area.

***4. Parks, recreation and open space***

*A. Establish, preserve and maintain scenic, historic, cultural, park and recreation areas, including the shorelines, for public recreational, educational and scientific uses.*

*B. Protect the shorelines of the State from encroachment of manmade improvements, structures, and activities.*

The PBARC project will be consistent with these guidelines as development of the facility will not impact any scenic, historic, cultural, park area, recreation area, or shoreline. Appropriate coordination with the SHPD has been and will continue to be conducted on this project and through construction. In addition, input received as part of the Section 106 consultation process being conducted with this EA process will appropriately address any historic and cultural issues. The project site is located a few miles inland away from the shoreline in the Hilo area, thus protecting the shoreline from encroachment of manmade structures.

***5. Economic Development***

*A. Promote and foster the agricultural industry of the State, and preserve and conserve productive agricultural lands.*

The project will be consistent with this economic development guideline as the new complexes will promote and foster the agricultural industry in the State. The services and research to be offered by the PBARC and IPIF programs will assist in preserving and conserving productive agricultural lands in Hawaii and the Pacific Basin.

*6. Citizen participation*

*A. Provide for expanding citizen participation in the decision making process as it continually embraces more citizens and more issues.*

The environmental review process undertaken for this project allows for sufficient public and government agency input to express concerns and comments associated with the project. Such opportunities include pre-assessment consultation and review of the Draft EA. Thus, the public consultation process incorporate within this environmental review process provides decision-makers with a diverse array of information to consider in evaluating this project.

## 8.3 CHAPTER 205A - COASTAL ZONE MANAGEMENT

This section addresses the project's conformance with applicable objectives, and policies of the Coastal Zone Management Program, set forth in Chapter 205A-2, Hawaii Revised Statutes.

***A. Objectives:***

1. *Provide coastal recreational opportunities accessible to the public.*
2. *Protect, preserve, and where desirable, restore those natural and man-made historic and pre-historic resources in the coastal zone management area that are significant in Hawaiian and American history and culture.*
3. *Protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources.*
4. *Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems.*
5. *Provide public or private facilities and improvements important to the State's economy in suitable locations.*
6. *Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.*
7. *Improve the development review process, communication, and public participation in the management of coastal resources and hazards.*
8. *Stimulate public awareness, education, and participation in coastal management.*
9. *Protect beaches for public use and recreation.*
10. *Implement the State's ocean resources management plan.*

A discussion of this project's conformance and consistency with the various applicable policies developed for each objective is provided. In summary, the PBARC project would be consistent with applicable objectives and policies. Therefore, the project would be consistent with these Coastal Zone Managment objectives.

## B. *Policies:*

1. *Recreational Resources:*

   The PBARC project is located some 5 miles away from the Hilo shoreline area. Therefore, many of the policies set forth for recreational resources of the coastal area would not be applicable to this project.

2 *Historic Resources:*

   a. *Identify and analyze significant archaeological resources;*
   b. *Maximize information retention through preservation of remains and artifacts or salvage operations; and*
   c. *Support state goals for protection, restoration, interpretation, and display of historic resources.*

   Two archaeological inventory surveys were performed for the entire PBARC project site. The first survey discovered Site No. 50-10-35-22080, which was identified as a prehistoric feature consisting of a lava sinkhole and associated human burial. Based upon consultations with SHPD, this site was considered significant under State and National Register of Historic Places Criterions D and E. A buffer zone of about 100 feet around the site is being provided.

   Based on the initial survey results, the project site was modified to avoid the archaeological site in its entirety, and additional land was added to the project site. A second archaeological survey was performed on approximately 10 acres of additional land. This second survey discovered two sites: No. 50-10-35-22734, and No. 50-10-35-22735. The first site (No. 50-10-35-22734) is thought to be historic and to have functioned as a planting feature or small platform for some small structure or tank. The second site (No. 50-10-35-22735) is thought to be a feature related to agricultural, dairy, or ranching activity within the project area.

   Documentation and information in the form of photographs, written descriptions, tape and compass maps, sub-surface testing and accurate location using GPS technology, was collected during the inventory survey field work. It was determined that no further work would be necessary, and the two sites would not require preservation. Consequently, the archaeological work conducted and mitigative measures being implemented for these sites would be consistent with the above policies.

3. *Scenic and open space resources:*

   b. *Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline.*

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

The PBARC project is consistent with these policies as the proposed facilities will be compatible with their visual environment. View planes to and from the shoreline from the project site will not be significantly impacted by the project. Further, the view planes of surrounding residences will not be significantly impacted by the PBARC facilities.

The project will incorporate existing trees and plants in the landscaping for the facilities, and there will be minimal alteration of natural landforms.

The PBARC facilities are not coastal dependent, but are agricultural dependent. Therefore, the project site is located on agricultural designated and zoned lands, away from the coastline, thus preserving important coastal areas.

4. *Coastal Ecosystems:*

c. *Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs.*

The PBARC project is consistent with this policy as it does not entail stream diversions or channelization of water systems that impact coastal water ecosystems. Further, water for the project will be provided through a county municipal system. Therefore the project will require applicable approvals from the County of Hawaii, who will review such requests for water use in light of competing water needs in the area.

## 8.4 COUNTY OF HAWAII GENERAL PLAN

This section discusses the project's conformance and consistency with pertinent goals, policies, and standards from the County of Hawaii *General Plan (1989)* along with proposed revisions under the present *General Plan* Update, December 2001.

***A. Economic***

1. *Goals:*

a. *Provide an economic environment that allows new, expanded, or improved economic opportunities that are compatible with the County's cultural, natural and social environment.*

b. *Strive for an economic climate that provides its residents an opportunity for choice of occupation.*

c. *Strive for diversification of the economy by strengthening existing industries and attracting new endeavors.*

d. *Promote and develop the island of Hawaii into a unique scientific and cultural model, where economic gains are in balance with social and physical amenities. Development should be reviewed on the basis of total impact on the residents of the County, not only in terms of immediate short run economic benefits.*

2. *Policies:*
   a. *Assist in the expansion of the agricultural industry through the protection of important agricultural lands, development of marketing plans and programs, capital improvements, and continued cooperation with appropriate State and Federal agencies.*
   b. *Encourage the expansion of the research and development industry by working with and supporting the University of Hawaii at Hilo and West Hawaii, the Natural Energy Laboratory at Hawaii Authority, and other agencies' programs that support sustainable economic development in the County of Hawaii.*
   c. *Continue to encourage the research, development and implementation of advanced technologies and processes.*
   d. *Support research and development that would lead to the removal of marketing restrictions on Hawaiian fruits and other perishables.*
   e. *Assist in the promotion of the agriculture industry whose products are recognized as being produced on the island of Hawaii.*
3. *Standards:*
   a. *The island of Hawaii should be developed into a unique scientific and cultural model. The island should become a model of living where economic gains are in balance with social and physical amenities. Development should be reviewed on the basis of total impact on the residents of the County, not only in terms of immediate short run economic benefits.*
4. *South Hilo Courses of Action:*
   a. *Support the construction and development of the USDA's PBARC facility.*

The PBARC project would be consistent with these policies, goals, and standards as it would create additional jobs for island residents, helping the County strive for full employment. Short-term construction related jobs as well as long-term jobs would be created by the development of the facility.

The project would also assist in the expansion of the agricultural research and production industries. Ongoing research at the facility would make attempts to remove market restrictions on Hawaiian fruits and encourage the implementation of technologies and processes. Further, research at the facility would encourage increased use of Hawaiian-grown fruits and produce, thus assisting those in the agricultural industry. Appropriate environmental documentation would address significant cultural, social, and physical impacts from the proposed project.

**B. *Environmental Quality***

1. *Goals:*
   a. *Define the most desirable use of land within the County that achieves an ecological balance providing residents and visitors the quality of life and an environment in which the natural resources of the island are viable and sustainable.*
   b. *Maintain and, if feasible, improve the existing environmental quality of the island.*
2. *Policies:*
   a. *Take positive action to further maintain the quality of the environment.*
   b. *Support programs to prevent harmful alien species from becoming established.*
3. *Standards:*
   a. *Pollution shall be prevented, abated, and controlled at levels that will protect and preserve the public health and well-being, through the enforcement of appropriate Federal, State and County standards.*
   b. *Federal and State environmental regulations shall be adhered to.*

The project would be consistent with these policies and standards to support the goal of improving the island's environmental quality. The efforts of the PBARC facility will take positive action to maintain the quality of the environment statewide. Research generated by the PBARC facility will assist the island of Hawaii to achieve a viable and sustainable environment.

The PBARC facility will be designed and constructed to meet all applicable Federal, State and County regulations to protect the environment. Best management practices and other design considerations would be implemented to address such items as short-term construction activities, erosion, and drainage conditions.

**C. *Flood Control and Drainage***

1. *Goals:*
   a. *Protect human life.*
   b. *Prevent damage to man-made improvements.*
   c. *Control pollution.*
   d. *Reduce surface water and sediment runoff.*

2. *Policies:*
   a. *Any development within the Federal Emergency Management Agency (FEMA) designated flood plain must be in compliance with Chapter 27.*
   b. *Promote and provide incentives for participation in the Soil and Water Conservation Districts' conservation programs for developments on agricultural and conservation lands.*
   c. *Development-generated runoff shall be disposed of in a manner acceptable to the Department of Public Works and in compliance with all State and Federal laws.*
   d. *The County and the private sector shall be responsible for maintaining and improving existing drainage systems and constructing new drainage facilities.*
   e. *Encourage and provide incentives for agricultural operators to participate in Soil and Water Conservation District Programs.*
   f. *Consider natural hazards in all land use planning and permitting.*
3. *Standards:*
   a. *"Storm Drainage Standards," County of Hawaii, October 1970, and as revised.*
   b. *Applicable standards and regulations of Chapter 27, "Flood Control," of the Hawaii County Code.*
   c. *Applicable standards and regulations of Chapter 10, "Erosion and Sedimentation Control," of the Hawaii County Code.*
   d. *Applicable standards and regulations of the Natural Resource Conservation Service (NRCS) and the Soil and Water Conservation Districts.*

Drainage improvements necessary for the PBARC project will be designed in conformance to County standards and other regulations identified here, as applicable. The project's design and construction will be appropriately coordinated with applicable County departments. Such coordination would include the project's design and review of construction plans by County agencies to ensure that concerns and requirements are properly addressed.

## D. *Historic Sites*

1. *Goals:*
   a. *Protect, restore, and enhance the sites, buildings and objects of significant historical and cultural importance to Hawaii.*
2. *Policies:*
   a. *Require both public and private developers of land to provide historical, archaeological, and cultural assessments, where appropriate, survey prior to*

*the clearing or development of land when there are indications that the land under consideration has historical significance.*

b. *Collect and distribute historic sites information of public interest and keep an inventory of sites.*

c. *Recognize the importance of certain natural features in Hawaiian culture by incorporating the concept of "cultural landscapes" in land use planning.*

3. *Standards:*

a. *Sites with a preponderance of original materials in context and complexes rather than single isolated sites unless they are of great significance.*

b. *Associated with a past or continuing institution that has contributed substantially to the life of the community.*

c. *Sites of traditional and cultural significance.*

Two archaeological inventory surveys were performed for the entire PBARC project site. The first survey discovered Site No. 50-10-35-22080, which was identified as a prehistoric feature consisting of a lava sinkhole and associated human burial. Based upon consultations with State Historic Preservation Division staff, this site was considered significant under State and National Register of Historic Places Criterions D and E. A buffer zone of over 100 feet around the site is being provided along with this area being set aside as a preserve under jurisdiction by the University.

Based on the initial survey results, the property was modified to remove the archaeological site from the project, and additional land was added to the project site. A second archaeological survey was performed on approximately 10 acres of additional land. This second survey discovered two sites: #50-10-35-22734, and 50-10-35-22735. The first site (#50-10-35-22734) is thought to be historic and to have functioned as a planting feature or small platform for some small structure or tank. The second site (#50-10-35-22735) is thought to be a historic feature related to agricultural, dairy, or ranching activity within the project area.

Documentation in the form of photographs, written descriptions, tape and compass maps, sub-surface testing and accurate location using GPS technology was collected during the inventory survey field work. No further work would be necessary, and the two sites would not require preservation. Consequently, the archaeological work conducted for these three historic sites are consistent with these policies.

### F. *Land Use – Agriculture*

1. *South Hilo Courses of Action*

   a. *Support the University of Hawaii at Hilo and Hawaii Community College and in their development of programs that assist agriculture.*

   The PBARC project is consistent with this course of action as the PBARC facility works closely with agricultural programs of the University of Hawaii at Hilo and Hawaii Community College. Development of the PBARC facility will provide additional resources that the University of Hawaii at Hilo and Hawaii Community College may be able to utilize to aid their agricultural programs.

### G. *Natural Beauty*

1. *Goals:*
   a. *Protect, preserve and enhance the quality of areas endowed with natural beauty, including the quality of coastal scenic resources.*
   b. *Protect scenic vistas and view planes from becoming obstructed.*
   c. *Maximize opportunities for present and future generations to appreciate and enjoy natural and scenic beauty.*
2. *Policies:*
   a. *Develop standard criteria for natural and scenic beauty as part of design plans.*
   b. *Protect the views of areas endowed with natural beauty by carefully considering the effects of proposed construction during all land use reviews.*
   c. *Do not allow incompatible construction in areas of natural beauty.*
3. *Standards:*
   a. *Natural or native vegetation attractive to a particular area.*

   The PBARC project would not have a significant negative impact on coastal scenic resources along the Hilo coastline as the project site is located some distance away. Design plans for the PBARC facility will incorporate natural and scenic beauty as an arboretum will feature plants and trees of the area, and will have views of downtown Hilo and Hilo Bay. Additionally, existing trees, shrubs, and plants may be incorporated into the landscaping for the facility. Thus, the project is consistent with these goals, policies and standards.

### H. *Natural Resources and Shoreline*

1. *Goals:*
   a. *Protect and conserve the natural resources of the County of Hawaii from undue exploitation, encroachment and damage.*
   b. *Provide opportunities for recreational, economic, and educational needs without despoiling or endangering natural resources.*

c. *Protect and promote the prudent use of Hawaii's unique, fragile, and significant environmental and natural resources.*

d. *Protect rare or endangered species and habitats native to Hawaii.*

e. *Protect and effectively manage Hawaii's open space, watersheds, shoreline, and natural areas.*

f. *Ensure that alterations to existing landforms, vegetation, and construction of structures cause minimum adverse effect to water resources, and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltation, or failure in the event of an earthquake.*

2. *Policies:*

   a. *Require users of natural resources to conduct their activities in a manner that avoids or minimizes adverse effects on the environment.*

   b. *Maintain the shoreline shall be protected from the encroachment of man improvements and structures.*

   c. *Protect the shoreline from the encroachment of man-made improvements and structures.*

   d. *Encourage public and private agencies to manage the natural resources in a manner that avoids or minimizes adverse effects on the environment and depletion of energy and natural resources to the fullest extent.*

   e. *Encourage an overall conservation ethic in the use of Hawaii's resources by protecting, preserving, and conserving the critical and significant natural resources of the County of Hawaii.*

   f. *Encourage the protection of watersheds, forest, brush, and grassland from destructive agents and uses.*

   g. *The installation of utility facilities, highways and related public improvements in natural and wildland areas should avoid the contamination or despoilment of natural resources where feasible by design view, conservation principles, and by mutual agreement between the County and affected agencies.*

   h. *Ensure that activities authorized or funded by the County do not damage important natural resources.*

3. *Standards:*

   a. *Lands with a general slope of 20% or more that provide open space amenities or possess unusual scenic qualities.*

   b. *Lands with topographic, locational, soils, climate or other environmental factors that may not be normally adaptable or required for urban, rural, agricultural or public use.*

   c. *The Coastal Zone and Special Management Area as defined by statute and in accordance with the adopted objectives and guidelines.*

The PBARC project would be consistent with these applicable goals, policies, and standards. There are no rare or endangered species or significant habitats present in the project area which would be adversely affected by the proposed facilities being considered. As discussed in previous chapters of this document, the project is not expected to have a significant impact of natural resources. Appropriate measures would be incorporated into the project's design to minimize construction related and other effects on natural resources which may be associated with this project.

***I. Public Facilities***

1. *Goal:*
   a. *Encourage the provision of public facilities that effectively service community and visitor needs and seek ways of improving public service through better and more functional facilities [which are] in keeping with the environmental and aesthetic concerns of the community.*
   b. *Coordinate with appropriate State agencies for the provision of public facilities to serve the needs of the community.*
2. *Government Operations Standards:*
   a. *Public office center sites shall satisfy modern and reasonable requirements of accessibility and compatibility with the surrounding neighborhood.*
   b. *Architectural and landscaping shall reflect as much as possible the community's attributes.*

The PBARC will improve public service through its new functional facility. Consolidation of PBARC offices on the islands of Hawaii and Oahu will allow the agency to further its agricultural research and mission in an efficient manner. The proposed facility will be designed to allow accessibility to those who have an interest in agriculture, researchers, academia, visitors and community individuals. The facility will reflect the immediate surrounding community's attributes, which is primarily one of a university campus. The new facility will also incorporate landscaping that is compatible with the surrounding community.

***J. Public Utilities***

1. *Goals:*
   a. *Ensure that properly regulated adequate, efficient and dependable public and private utility services are available to users.*
   b. *Maximize efficiency and economy in the provision of public utility services.*

2. *Policies:*
   a. *Improvement of existing utility services shall be encouraged to meet the needs of users.*
   b. *Encourage the clustering of developments in order to reduce the cost of providing utilities.*
3. *Water Policies:*
   a. *Water system improvements shall correlate with the County's desired land use development pattern.*
   b. *All water systems shall be designed and built to Department of Water Supply standards.*
   c. *Improve and replace inadequate systems.*
   d. *Cooperate with appropriate State and Federal agencies and the private sector to develop, improve and expand agricultural water systems in appropriate areas on the island.*
   e. *Expand programs to provide for agricultural irrigation water.*
4. *Water Standards:*
   a. *Public and private water systems shall meet the requirements of the Department of Water Supply and the Subdivision Control Code.*
5. *Telecommunications Policies:*
   a. *Encourage underground telephone lines where they are economically and technically feasible.*
   b. *Work closely with the telephone company to provide all users with efficient service.*
6. *Telecommunications Standards:*
   a. *In the development and placement of telephone facilities, such as lines, telecommunications and cellular towers, poles, and substations, the design of the facilities shall consider the existing environment, and scenic view and vistas shall be considered and preserved where possible.*
7. *Electricity Policies:*
   a. *Power distribution shall be placed underground when and where practical. Encourage developers of new urban areas to place utilities underground.*
   b. *Route selection for high voltage transmission lines should include consideration for setbacks from major thoroughfares and residential areas. Where feasible, delineate energy corridors for such high voltage transmission lines.*
   c. *Conform to safety standards as established by appropriate regulatory authorities.*

8. *Electricity Standards:*
   a. *There shall be minimal obstruction of scenic views and vistas by electrical facilities.*
9. *Sewer Policies:*
   a. *Require major developments to connect to existing sewer treatment facilities or build their own.*
   b. *Sewerage systems shall be designed for a particular area, depending on topography, geology, density of population, costs, and other considerations of the specific area.*

The PBARC project is consistent with the goals, policies, and standards. The project consists of two separate facilities to be constructed on the property. However, the two facilities will be in close proximity to each other. This will minimize the cost of providing utilities to the facilities.

Development of the PBARC project will meet applicable requirements of the Department of Water Supply, and other regulatory agencies. Utility companies will be contacted to coordinate utility work on the project.

### K. *Transportation*

1. *Thoroughfares And Streets Goals:*
   a. *Provide a system of roadways for the, safe, efficient, and, comfortable movement of people and goods.*
2. *Thoroughfares And Streets Policies:*
   a. *Encourage the programmed improvement of existing roadways by both public and private sectors.*
   b. *There shall be coordinated planning of Federal, State, and County street systems to meet program goals of the other elements such as historic, recreational, environmental quality, and land use.*
   c. *Transportation and drainage systems shall be integrated where feasible.*
   d. *Develop short and long range capital improvement programs and plans for transportation that are consistent with the General Plan.*
3. *Thoroughfares And Streets Standards:*
   a. *Primary Arterial: Includes major highways, parkways, and primary arterials that move vehicles in large volumes and at higher speeds from one geographic area to another; highest traffic volume corridor. Designed as a limited access roadway. Primary arterials shall have a minimum right-of-way of 120 feet.*

b. *Secondary Arterial: A street of considerable continuity that is primarily a traffic artery between or through large areas; interconnect with and augment primary system. Designed as a limited access roadway. Secondary arterials shall have a minimum right-of-way of 80 feet.*

c. *Major Collector [Street]: Any street supplementary to the arterial street system that is a means of transit between this system and smaller areas; used to some extent for through traffic and to access abutting properties; collect and distribute traffic between neighborhood and arterial system. Major collectors shall have a minimum right-of-way of 60 feet.*

d. *Local Streets-commercial/industrial: Local streets within commercial and industrial areas shall have a minimum right-of-way of 60 feet.*

e. *Minor Collector and Local Streets: Minor collectors are used at times as through-streets and for access to abutting properties. The principal purpose of a local street is to provide access to property abutting the public right-of-way. Minor collector and local streets shall have a minimum right-of-way of 50 feet.*

f. *These standards shall apply to new construction. The County shall determine standards for the dedication and upgrade of existing roads.*

The project would be consistent with these goals, policies, and standards as improvements proposed for surrounding streets in proximity to the proposed PBARC project would be constructed in conformance with County design standards, and drainage improvements would be provided as appropriate. Appropriate funding would be sought for construction of these improvements as part of the County's CIP budget.

## 8.5 HILO COMMUNITY DEVELOPMENT PLAN

This section discusses the project's conformance and consistency with the recommendations set forth in the County of Hawaii's Hilo Community Development Plan, which was adopted in May 1975 by the Hawaii County Planning Commission.

The Hilo Community Development Plan recommends that the project site be developed for single family housing with minimum 10,000 square foot lots. This recommendation was consistent with the County's *General Plan* at that time. However, the *General Plan* has been updated, and the *General Plan's* Land Use Pattern Allocation Guide Map designates the project site as "University Use" (*The General Plan*, County of Hawaii, 1989). The Hilo Community Development Plan has not been updated since its initial adoption by the Hawaii County Planning Commission.

Further, an Executive Order has been issued for the larger property for which the PBARC Project is on a portion of. The Executive Order transfers ownership of the property from the Department of Land and Natural Resources to the University of Hawaii for use as an expansion area for the University of Hawaii at Hilo, however, the lease for this project site will be obtained directly from the State DLNR.

The recommendation for the project site in the Hilo Community Development Plan is outdated and is not consistent with the current General Plan. Therefore, the current *General Plan* designation for the project site should be used as a guideline, and the PBARC project is consistent with the *General Plan* designation.

## 8.6 COUNTY ZONING DISTRICT

The project site associated with this PBARC project involves property that is zoned A-1a, Agriculture District. In a letter dated November 9, 2001, the County of Hawaii Planning Department confirmed the zoning designation for the project site.

Further, the Planning Department's letter stated that the proposed PBARC facilities (including the IPIF facility) is a permitted use under §25-4-11(c) and §25-5-72(a)(17) of the Hawaii County Code. Consequently, the project would be consistent with the County's zoning district for this 30-acre property.

The height limit in the Agriculture District for any non-residential structure is 45 feet. All facilities and accessory structures associated with this project would meet this height limit.

The minimum building site area in the Agriculture District is 1 acre because the zoning for the property is less than 5 acres (A-1a indicating a minimum of 1-acre for each building site). Thus, the project would meet these district requirements since it is located on a 30-acre property. The project site will also meet the minimum building site average width requirements.

The minimum yard setbacks for the property are 30 feet for front and rear yards, and 20 feet for side yards. All facilities would be setback a sufficient distance meeting these minimum yard setbacks. The specific setback distance would be determined during the design phase for this project.

# CHAPTER 9
# CONSULTATION EFFORTS

Consultation with various government agencies has been conducted for this project as part of the pre-assessment consultation process in preparing this document. Such efforts consisted of distributing solicitation letters to several agencies to obtain their input and comments on the project identifying issues which should be addressed. In addition, consultation with native Hawaiian organizations and the public was conducted as part of the Section 106 consultation process previously discussed in Chapter 4. These consultation efforts are discussed in this Chapter, and copies of comments received are included in Appendix B of this document.

## 9.1 DRAFT EA PRE-ASSESSMENT CONSULTATION

Consultation with various Federal, State, and County government agencies was conducted to obtain their comments and concerns associated with the project as part of the environmental assessment process. Letters providing project information along with a preliminary site plan was sent to these parties in October 2001 for their review.

A listing of agencies and organizations for which consultation letters were sent is provided below. Those providing written response are identified with a "»" symbol. Copies of their written comments received along with responses are included in Appendix B.

**Federal Agencies**

- Pacific Islands Ecoregion, Fish and Wildlife Service, Department of the Interior
- Water Resources Division, Geological Survey, Department of the Interior
- » U.S. Army Engineer Division, Department of the Army
- National Marine Fisheries Service, National Oceanic and Atmospheric Administration
- Federal Highways Administration, Department of Transportation
- Natural Resources Conservation Service, Department of Agriculture

**State of Hawaii Agencies**

- » Department of Accounting and General Services
- » Department of Agriculture
- Department of Agriculture, Agribusiness Development Corporation
- Department of Business, Economic Development & Tourism
- » Department of Education
- Department of Hawaiian Home Lands
- » Department of Health
- Department of Land and Natural Resources

- » Department of Land and Natural Resources, Historic Preservation Division[2]
- » Department of Transportation
- • Land Use Commission, Dept. of Business, Economic Development & Tourism
- » Office of Hawaiian Affairs
- » Office of Planning, Dept. of Business, Economic Development & Tourism

**County of Hawaii Agencies**

- » The Honorable Harry Kim, Mayor
- • The Honorable James Y. Arakaki, Council Chair
- • Civil Defense Agency
- » Department of Environmental Management, Solid Waste Division
- » Department of Environmental Management, Wastewater Division
- » Department of Parks and Recreation
- » Department of Public Works
- • Department of Water Supply
- • Hawaii Fire Department
- » Hawaii Police Department
- • Mass Transit Agency
- » Planning Department

## 9.2 SECTION 106 CONSULTATION

Efforts were conducted to initiate consultation with several native Hawaiian organizations and pertinent government agencies as part of this Section 106 consultation process. A listing of native Hawaiian organizations was compiled based upon information obtained from the SHPD and previous projects. Using this list, solicitation letters with project information were sent on October 16, 2001 to these parties giving them 30 days to provide any comments.

On March 19, 2002, follow-up letters were sent to those who didn't respond to the initial solicitation letter. These letters informed parties of the project, the forthcoming publication of the Draft EA document for public review, and whether they would like to receive a copy of the Draft EA. No further responses to these follow-up letters were subsequently received. However, copies of the Draft EA document were still provided to several of these Hawaiian organizations.

Public notices of the project and initiation of Section 106 consultation efforts were also published in the Hawaii Tribune Herald and West Hawaii Today newspapers on October 23 and 24, 2001. These notices were published in these local newspapers of general circulation on the Island of Hawaii to notify the general public and other potential Hawaiian organizations of these consultation efforts being initiated.

[2] SHPD consultation occurred as part of the review of inventory survey reports and meetings held in June and July 2000. Copies of SHPD letters concerning these reviews are included in Appendix H.

A listing of native Hawaiian organizations for which consultation letters were sent is provided below. Those providing written response are identified with a "»" symbol. Copies of written comments received are included in Appendix B.

**Government And Community Organizations**

- Ahahui Kaahumanu Society
- Daughters of Hawaii
- Department of Hawaiian Home Lands

» Department of Land and Natural Resources, Historic Preservation Division[3]

- East Hawaii District Office, Department of Hawaiian Home Lands

» Edith Kanakaole Foundation (see Note 1)

- Hale O Na Alii
- Ha'ola
- Hawaii Island Burial Council, State Historic Preservation Division
- Hawaiian Civic Club of Hilo
- Hui Malama I Na Kupuna' O Hawai'i Nei
- Hui Malama Ola Na O Iwi
- Hooulu Lahui
- Ka Lahui Hawai'i
- Kalo Moku O Keawe
- Kupuna O Hawaii
- Office of Hawaiian Affairs, Community Resident Coordinator
- Office of Hawaiian Affairs
- Panaewa Hawaiian Homestead Association

» Prince D. Kawananakoa Hawaiian Civic Club

- Royal Order of Kamehameha
- State Council of Hawaiian Homestead Associations

Note 1: On November 9, 2001, representatives from Hoakea, LLC met with Pua Kanahele Kanakaole, Professor of Hawaiian Studies with the University of Hawaii, Hilo Campus, and founding member of Hui Malama I Na Kupuna. Ms. Kanakaole is also a resident of Panaewa Hawaiian Homestead. She was briefed on the project, the archaeological finds, and burial sink found. She was not aware of the project, or of the burial find. She was informed that the University of Hawaii agreed to preserve the burial in place, establish a preserve for this site, and prepare a burial treatment plan. She had no objection to the project from a cultural perspective or otherwise.

[3] SHPD consultation occurred as part of the review of inventory survey reports and meetings held in June and July 2000. Copies of SHPD letters concerning these reviews are included here.

## 9.3 DRAFT EA COMMENTS

The Draft EA for this PBARC Project was published in the June 8, 2002 issue of the State Office of Environmental Quality Control's *The Environmental Notice* initiating a 30-day public comment period which ended on July 8, 2002. Copies of this Draft EA were distributed to the following parties for review and comments. Those parties which submitted comments are indicated by a "»" next to them. Comment letters received from these parties along with corresponding response letters are included in Appendix B.

**Federal Agencies**

- Pacific Islands Ecoregion, Fish and Wildlife Service, Department of the Interior
- » Water Resources Division, Geological Survey, Department of the Interior
- » U.S. Army Engineer Division, Department of the Army
- National Marine Fisheries Service, National Oceanic and Atmospheric Administration
- » Federal Highways Administration, Department of Transportation[4]
- Natural Resources Conservation Service, Department of Agriculture

**State of Hawaii Agencies**

- » Department of Accounting and General Services
- Department of Agriculture
- Department of Agriculture, Agribusiness Development Corporation
- Department of Business, Economic Development & Tourism
- » Department of Education
- Department of Hawaiian Home Lands
- » Department of Health
- » Department of Land and Natural Resources
- » Department of Land and Natural Resources, Historic Preservation Division
- » Department of Transportation
- » Environmental Center, University of Hawaii
- » Land Use Commission, Dept. of Business, Economic Development & Tourism
- » Office of Environmental Quality Control
- » Office of Hawaiian Affairs
- Office of Planning, Dept. of Business, Economic Development & Tourism

**County of Hawaii Agencies**

- The Honorable Harry Kim, Mayor
- The Honorable James Y. Arakaki, Council Chair

4 Telephone discussion with Mr. Clifford Chew indicated they didn't have any substantial comments on the project. They wouldn't be involved with this project unless there was a major traffic pattern change to the County roadways resulting from the project. If further consultation on traffic matters is needed with the State or County on highway facilities, they can be included as a source for involvement.

- Civil Defense Agency
- Department of Environmental Management
- Department of Environmental Management, Solid Waste Division
- Department of Environmental Management, Wastewater Division
- Department of Parks and Recreation
- Department of Public Works
- Department of Water Supply
- Hawaii Fire Department
- Hawaii Police Department
- Mass Transit Agency
- Planning Department

**Community Organizations**

- The Honorable David Matsuura, Senator
- *The Honorable Jerry Chang, Representative*
- Ahahui Kaahumanu Society
- Big Island Farm Bureau
- Edith Kanakaole Foundation
- Hawaii Economic Development Board
- Hawaii Island Burial Council, State Historic Preservation Division
- Hawaiian Civic Club of Hilo
- Hilo Public Library
- Hui Malama I Na Kupuna' O Hawai'i Nei
- Hale O Na Alii
- Hui Malama Ola Na O Iwi
- Ka Lahui Hawai'i
- Panaewa Hawaiian Homestead Association
- Prince D. Kawananakoa Hawaiian Civic Club
- Royal Order of Kamehameha

# CHAPTER 10
# FINDINGS AND ANTICIPATED DETERMINATION

To determine whether a proposed action may have a significant effect on the environment, the State Approving Agency and Federal Lead Agency need to consider every phase of the action, the expected primary and secondary consequences, cumulative effect, and the short- and long-term effects. The Approving Agency's review and evaluation of the proposed action's effect on the environment would result in a determination whether: 1) the action would have a significant effect on the environment, and an Environmental Impact Statement Preparation Notice should be issued, or 2) the action would not have a significant effect warranting a Finding Of No Significant Impact (FONSI).

## 10.1 FINDINGS UNDER STATE CHAPTER 343, HRS

This section discusses the results of the assessment conducted for the proposed PBARC Project in relation to the 13 Significance Criteria prescribed under the State Department of Health's Administrative Rules Title 11, Chapter 200. The purpose of this assessment was to consider the "significance" of potential environmental effects which includes the sum of effects on the quality of the environment along with the overall and cumulative effects. The resulting findings are discussed below for each criteria.

### 10.1.1 Findings

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

The project would not result in the irrevocable commitment to loss or destruction of any natural or cultural resource. As discussed in Chapter 4 of this document, the improvements would not negatively impact any natural or cultural resources of significance. There would be no destruction or loss of any significant, endangered, or threatened botanical, faunal, geological, or other natural resources.

In terms of archaeological resources and historic properties, the project should have no adverse effect. The two sites within the 30-acre portion of the property, State Sites #50-10-35-22734 and #50-10-35-22734, were only significant for their information content. Consequently, the inventory survey work conducted for these sites was adequate in collecting all the available information from these sites, and no further work is required such as additional data recovery or preservation of the sites. State Site #50-10-35-22080 (burial sink) would not be affected by development of the PBARC Project since this preserve area is not part of the 30-acre project site.

2. *Curtails the range of beneficial uses of the environment.*

The PBARC and IPIF complexes would not curtail the range of beneficial uses of the surrounding environment. The project site and surrounding area are undeveloped and intended for the future expansion of the U.H.-Hilo campus and related University research activities similar to the University Park development. These large undeveloped properties west of Komohana Street are under the jurisdiction of the University. Therefore, range of beneficial uses of the environment would not be negatively impacted by the project.

3. *Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.*

The project would not conflict with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS. This Draft EA addressed the probable environmental impacts associated with the project which have shown that the project is not expected to have a significant negative impact.

The new facilities constructed are not expected to have a significant impact on natural resources or the surrounding environment. There would be some effects on public facilities and infrastructure, however, the additional demands created would not have a significant impact. Off-site improvements to upgrade infrastructure facilities to serve this project as well as other University-related expansion developments are being provided by the University in consultation with the County.

4. *Substantially affects the economic, or social welfare, cultural practices of the community or State.*[5]

As discussed under Chapter 5, the project would not have any significant negative impacts on economic factors. This project would create some short-term construction related jobs and increased tax revenue which would have a beneficial affect on the overall economy of the County and State. The project would have some effects on the State and County's current revenues and expenditures, however, these changes would not be adverse. Although not quantified, benefits to the County and State's agricultural industry would result from this project along with supporting the expansion of U.H.-Hilo and their educational programs.

The project would inevitably have some effect on the social welfare of the Hilo town and East Hawaii due to the creation of new jobs associated with the research facilities and relocation of several Federal positions from Oahu. These changes would be minor when considered in relation to the larger district and County as a whole. Therefore, the project would not have a significant negative impact on the community's social welfare.

5 This significance criteria was modified to reflect the recent change to Chapter 343, HRS approved by the Governor as Act 50 on April 26, 2000. This Act added "cultural practices" as part of the factors considered in determining the significance of an effect.

The cultural assessment study conducted determined that the project is not expected to have negative cultural impacts. No concerns with the project were similarly identified after consultation with Hawaiian organizations, agencies, and community members. Therefore, the proposed project is not expected to have any short- or long-term impacts on traditional or cultural practices associated with the property.

5. *Substantially affects public health.*

The project is not expected to substantially affect public health since the project should not have an adverse impact on the surrounding environment. Additional vehicular traffic generated by the project would not result in emissions of air pollutants exceeding the National and State ambient air quality standards. Minimal increases in traffic noise levels would occur from the project which would not be perceptible to people along Komohana Street. Noise from facilities and research activities occurring on the property would be within the State DOH's permissible sound limits, and there are no sensitive land uses in the immediate vicinity of the project. Necessary on-site infrastructure improvements would be provided for the project which includes a wastewater treatment system to serve the project. Thus, these facilities will be connected to the County's sewer system and not utilize septic tank systems for wastewater disposal.

Short-term construction activities are similarly not expected to cause significant air pollution in the form of fugitive dust due to the Pahoehoe Lava soil type present nor generate any other type of pollutants which may have an adverse affect on public health. Construction activities would occur only during a short time period, and best management practices would be incorporated into the project's design to further minimize nuisances and other typical impacts associated with construction activity.

6. *Involves substantial secondary impacts, such as population changes or effects on public facilities.*

This project would result in the relocation of some existing positions on Oahu to Hilo with development of the new complexes, and would allow for hiring additional staff to expand programs and take on new research projects. As discussed in Chapter 5, these increases in the resident population of Hilo are small numbers that would occur incrementally as various phases of the facilities are constructed. Thus, this additional resident population would not result in substantial secondary impacts on the community and social environment. Similarly, the small number of additional residents relocating to Hilo as part of the project should have minimal effects on existing public facilities such as schools, parks, and medical facilities.

7. *Involves a substantial degradation of environmental quality.*

The development of the PBARC and IPIF complexes would not involve a substantial degradation to the quality of the surrounding environment. Chapters 4 through 7 of this document discussed the probable impact of several environmental factors associated with this project. The results of this assessment and technical studies performed determined that the project would not substantially impact or degrade the environmental quality of the project site and surrounding environment.

8. *Is individually limited, but cumulatively has considerable effect upon the environment or involves a commitment for larger actions.*

This document addressed the probable impacts resulting from the full development of both PBARC and IPIF complexes which included all the research facilities that would be constructed over phases. Impacts associated with the project were thus addressed cumulatively taking into account both the phased construction of facilities and the time allowed for relocating existing staff to Hilo. In addition, other developments planned in the immediate project vicinity were included in assessing and evaluating environmental impacts. Therefore, the cumulative impacts associated with this project was considered and addressed which determined that the project would not have a significant impact on the environment.

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

As discussed in Chapter 4, there were no known endangered, threatened, or rare species or critical habitat identified within the 30-acre project site. Botanical resources identified on the property can be found in similar vegetation types throughout the Hilo and Puna districts of the island. Mammalian species present on the property or in the surrounding area were comprised predominantly of alien species such as rodents or feral animals which are harmful to native avian and plant communities. Avian species identified to occur on the property consisted of alien species dominated by the Japanese White-eye and House Finch.

It is possible that Hawaiian hoary bats do fly over this project site and surrounding area, however, this bat would not be negatively affected and may continue to locate their prey, such as rodents and insects, present on the property and surrounding area with the project. Although not detected, the Dark-rumped Petrels and Newell's Shearwaters may fly over this property. To reduce the potential for interactions between nocturnally flying Dark-rumped Petrels and Newell's Shearwaters with external lights and man-made structures, any external lighting planned would be shielded. This measure would: 1) minimizing the threat of disorientation, and 2) comply with the County's policy concerning the shielding of exterior lights to lower the ambient glare on the astronomical observatories located on Mauna Kea.

10. *Detrimentally affects air or water quality or ambient noise levels.*

As discussed in Chapter 4 of this document, the project would not detrimentally affect air quality, ambient noise levels, or water quality in the vicinity of the project site. Short-term construction activities would be mitigated by complying with applicable State and County regulations and implementing best management practices to minimize potential nuisances from dust, noise, etc.

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

The PBARC Project site is not located within an environmentally sensitive area nor would its development adversely affect such areas. As discussed in Chapter 4, the property is not located within a flood zone or in an erosion-prone area. The property's soil is mainly Pahoehoe Lava making it less susceptible to severe erosion. Geologically, this project site, along with the entire Hilo town area, is located in an area having a lava flow hazard rating of 3 for areas a greater distance from active vents and topography making it less likely that flows will cover that area. There are no estuaries on the property or in the immediate vicinity. This property is also located miles from the coastline and thus not within the tsunami inundation area, near a beach, or near the shoreline which may affect coastal waters.

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

The project would not adversely affect scenic vistas, viewplanes, or other visual resources identified in the County's *General Plan* and *Hilo Community Development Plan.* As discussed in Chapter 4, there are no significant views or landforms in the immediate vicinity which would be adversely affected by the project.

13. *Requires substantial energy consumption.*

The project would create additional demands for electricity which would be supplied by HELCO. However, as discussed in Chapter 6, this increased demand would not be significant or require substantial energy consumption, and would be accommodated by HELCO's Komohana Substation which was upgraded in anticipation of serving the expansion of the University area.

### 10.1.2 Determination

A Finding of No Significant Impact (FONSI) determination is warranted for the Pacific Basin Agricultural Research Center Project based upon the information provided in this Final EA document. The results of the assessments conducted along with technical studies performed for various disciplines have determined that the PBARC and IPIF research facilities being developed on the 30-acre property should not have a significant impact on the surrounding environment. These assessment results are also based upon the agency and public comments received on the Draft EA published and distributed for public review. The findings supporting this determination are based upon the previous discussion of the project's affect on the environment in relation to the 13 Significance Criteria.

## 10.2 FINDINGS UNDER FEDERAL NEPA

This section discusses the results of the assessment conducted for the proposed PBARC Project to determine whether it would significantly affect the environment under the regulations prescribed under the Council on Environmental Quality NEPA Regulations (40 CFR, Part 1500 – 1508). The purpose of this assessment was to consider the "significantly" definition under these regulations which requires considerations of both context and intensity. The resulting findings are discussed below for these criteria.

### 10.2.1 Findings

**Context**

Context means that the significance of an action must be analyzed in several contexts such as society as a whole, the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action, and both short- and long-term effects are relevant.

This document has addressed and evaluated the significance of the proposed PBARC Project under this context. The assessment included the environment associated with the affected 30-acre project site, immediate surrounding vicinity, and the South Hilo district of the Island of Hawaii. Both short- and long-term effects were addressed under the various chapters of this document.

**Intensity**

Intensity refers to the severity of impact, and several criteria are identified which should be considered in evaluating impacts. A discussion of these intensity criteria is provided below.

1. *Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.*

   The project would not have significant negative impacts on the environment as discussed in the various chapters of this document. There are also beneficial effects resulting from the project such as economic benefits (jobs, income, supporting University and agricultural industry). However, a significant effect would not occur with this project even if considering both these benefits with environmental effects separately or on balance together.

2. *The degree to which the proposed action affects public health or safety.*

   As previously discussed under the State criteria (No. 5), the project would not adversely affect the public health or safety of the surrounding community and residents.

3. *Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.*

   The project site would not adversely impact historic or cultural resources as previously discussed under the State criteria (No. 1). Consultation with the SHPD has been conducted to address such resources, and no cultural issues have been identified based upon the cultural assessment study conducted. Section 106 consultation conducted has similar not identified any significant issues. The project would not affect any park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical area.

4. *The degree to which the effects on the quality of the human environment are likely to be highly controversial.*

The project is not expected to be highly controversial adversely effecting the surrounding community. Consultation efforts conducted with several government agencies and community organizations have not raised issues of a highly controversial nature.

5. *The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.*

The degree to which the probable effects on the human environment associated with the project is known and has been addressed and evaluated in this document. The new PBARC and IPIF research facilities would be used to consolidate and conduct research activities already being performed at various facilities spread throughout the State. Therefore, this project does not involve unique or unknown risks that cannot be addressed.

6. *The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.*

This project would not establish a precedent for future actions having significant effects on the environment. As discussed under the State criteria (No. 8), this document addressed the impacts resulting from the full development of both PBARC and IPIF complexes which included all the research facilities planned to be constructed over phases. Impacts addressed also took into account both the phased construction of facilities and the time allowed for relocating existing staff to Hilo.

7. *Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.*

As discussed under the State criteria (No. 8), this document addressed the cumulative impacts resulting from the full development of both PBARC and IPIF complexes which included all the research facilities planned to be constructed over phases. Impacts addressed took into account both the phased construction of facilities and the time allowed for relocating existing staff to Hilo. In addition, other developments planned in the immediate project vicinity were included in assessing and evaluating environmental impacts. Therefore, the cumulative impacts associated with this project was considered and addressed which determined that the project would not have a significant impact on the environment.

8. *The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.*

This project would not adversely affect or cause loss or destruction to significant historic properties as discussed in Chapter 4 of this document. Consultation with the SHPD has been conducted to address such resources which determined the project would have no adverse effect. The project would also not adversely effect any cultural resources based upon the cultural assessment study conducted.

9. *The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.*

As discussed under the State criteria (No. 9), the project would not adversely affect known endangered, threatened, or rare species or critical habitat identified within the 30-acre project site.

10. *Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.*

The project would not threaten or violate Federal, State, or County laws or requirements imposed for the protection of the environment.

### 10.2.2 Determination

Based upon the NEPA criteria of context and intensity, a Finding of No Significant Impact (FONSI) determination is warranted for the Pacific Basin Agricultural Research Center Project based upon the information provided in this Final EA document. The results of the assessments conducted along with technical studies performed for various disciplines have determined that the PBARC and IPIF research facilities being developed on the 30-acre property should not have a significant impact on the surrounding environment. These assessment results are also based upon the agency and public comments received on the Draft EA published and distributed for public review. The findings supporting this anticipated determination are based upon the discussion of the project's affect on the environment in relation to the 10 intensity criteria.

# CHAPTER 11
# BIBLIOGRAPHY

AECOS, Inc. (2002, May). *An Environmental Reconnaissance Survey, of Waiakea Stream for the USDA Pacific Basin Agricultural Research Center on the Island of Hawaii.* Honolulu, Hawaii: Author.

Agricultural Research Service (ARS). (2001). *Proposed Research and Staffing Approaches for the U.S. Pacific Basin Agricultural Research Center.* U.S. Department of Agriculture. Honolulu, Hawaii: Author.

Bank of Hawaii (BOH). (1999). *Hawaii 1998: Annual Economic Report.* Volume 47. Honolulu, Hawaii: Author.

Barrett Consulting Group, Inc. (BCGI). (1993, August). *Integrated Solid Waste Management Plan For The County Of Hawaii.* Prepared for County of Hawaii, Department of Public Works. Honolulu, Hawaii: Author.

B.D. Neal & Associates. (2002, April). *Air Quality Study, for the Proposed USDA Pacific Agricultural Research Center.* Kailua-Kona, Hawaii: Author.

Belt Collins & Associates, Ltd. (BCA). (1975, December). *Hilo Community Development Plan.* Prepared for County of Hawaii. Honolulu, Hawaii: Author.

Char & Associates. (2001,August). *Botanical Survey, USDA Pacific Basin Agricultural Research Center.* Honolulu, Hawaii: Author.

Commerce Business Daily (CBD). (1999) *CBDNet.* Submission No. 312168; Subject: Design of Pacific Basin Agricultural Research Center, Hilo, Hawaii. Department of Commerce, United States of America. Posted on CBDNet on March 24, 1999 from http://cbdnet.acces.gpo.gov.

Commission on Water Resource Management (CWRM). (1995, October). Maps and Illustrations; Ground water hydrologic units; Island of Hawaii. Retrieved April 26, 2002 from http://www.state.hi.us/dlnr/cwrm/data/maps.htm.

*CBDNet.* Submission No. 312168; Subject: Design of Pacific Basin Agricultural Research Center, Hilo, Hawaii. Department of Commerce, United States of America. Posted on CBDNet on March 24, 1999 from http://cbdnet.acces.gpo.gov.

Commission on Water Resource Management. (1990, June). *Water Resources Protection Plan; Hawaii Water Plan.* Volumes I and II. Prepared by George A.L. Yuen and Associates, Inc. Department of Land and Natural Resources, State of Hawaii. Honolulu, Hawaii: Author.

Commission on Water Resource Management. (1989, December). *Hawaii County Water Use and Development Plan; Hawaii Water Plan.* Prepared for Department of Water Supply, County of Hawaii. Prepared by Megumi Kon, Inc. Department of Land and Natural Resources, State of Hawaii. Honolulu, Hawaii: Author.

County of Hawaii (County). (2001, December). *The General Plan.* Proposed draft revisions dated December 21, 2001. Hilo, Hawaii: Author.

County of Hawaii (County). (1999). *The Hawaii County Code 1983(Revised and Republished 1995).* Hilo, Hawaii: Author.

County of Hawaii. (1989, November). *The General Plan; Hawaii County.* Adopted under Ordinance 89-142. Hilo, Hawaii: Author.

Cultural Surveys Hawaii, Inc. (CSH). (2002, January). *A Traditional and Cultural Practices Assessment, for the Proposed USDA Pacific Basin Agricultural Research Facility, South Hilo, Island of Hawaii (TMK 2-4-01:por. 122).* Honolulu, Hawaii: Author.

Cultural Surveys Hawaii, Inc. (2001, March). *Addendum To Archaeological Inventory Survey of an Approximately 20-Acre Parcel Proposed for the USDA Pacific Basin Agricultural Research Center, Located Near the Intersection of Komohana and Puainako Streets, South Hilo, Hawaii Island (TMK 2-4-01:por 122).* Honolulu, Hawaii: Author.

Cultural Surveys Hawaii, Inc. (2000, July). *Archaeological Inventory Survey, Approximately 20-Acre Parcel Proposed for the USDA Pacific Basin Agricultural Research Center located near the intersection of Komohana and Puainako Street, South Hilo, Hawaii Island (TMK 2-4-01:por 122).* Honolulu, Hawaii: Author.

Department of Education (DOE). (2001). *School Status and Improvement Report, 2000-01: School Complex Summary.* State of Hawaii. Honolulu, Hawaii: Author.

Department of Education. (2001a). *Chiefess Kapiolani Elementary School - School Status and Improvement Report.* Hawaii School Accountability System. School Year 2000-2001. State of Hawaii. Honolulu, Hawaii: Author.

Department of Education. (2001b). *Waiakea Elementary School - School Status and Improvement Report.* Hawaii School Accountability System. School Year 2000-2001. State of Hawaii. Honolulu, Hawaii: Author.

Department of Education. (2001c). *Waiakea Intermediate School - School Status and Improvement Report.* Hawaii School Accountability System. School Year 2000-2001. State of Hawaii. Honolulu, Hawaii: Author.

Department of Education. (2001d). *Waiakea High School - School Status and Improvement Report.* Hawaii School Accountability System. School Year 2000-2001. State of Hawaii. Honolulu, Hawaii: Author.

Department of Geography. (1998). *Atlas of Hawaii.* Third Edition. University of Hawaii at Hilo. University of Hawaii Press. Honolulu, Hawaii.

D.L. Adams Associates, Ltd. (2002, March). *Environmental Noise Assessment Study, USDA Pacific Basin Agricultural Center.* Honolulu, Hawaii: Author.

Engineering Concepts, Inc. (ECI). (1993, November). *Preliminary Engineering Report for the Proposed UH Hilo University Park.* DAGS Job No. 11-31-5724. Honolulu, Hawaii: Author.

Environmental Management Commission (EMC). (2001, September). Minutes from Wednesday, September 26, 2001 Environmental Management Commission meeting. County of Hawaii.

Federal Emergency Management Agency (FEMA). 1993. *Hazard Mitigation Report, Hurricane Iniki.* In Response to the September 12, 1992 Federal Disaster Declaration. FEMA-961-DR-HI. San Francisco, California: Author.

Hawaii Agriculture Research Center (HARC). (2001). *Hawaii Agriculture Research Center Homepage.* Retrieved November 29, 2001 from http://www.hawaiiag.org/harc/

Hawaii Agriculture Research Center (2000). *Hawaii Agriculture Research Center 1999 Annual Report.* Honolulu, Hawaii: Author.

Hawaii Agricultural Statistics Service (HASS). (2001, September). Diversified Agriculture Overcomes Adversity to Post Record Returns [Electronic version]. Hawaii Department of Agriculture and U.S. Department of Agriculture. Retrieved November 30, 2001 from http://www.nass.usda.gov/hi/speccrop/hiag.htm.

Hawaii Cooperative Park Service Unit (HCPSU). (1990). *Hawaii Stream Assessment; A Preliminary Appraisal of Hawaii's Stream Resources.* Report R84. Prepared for Commission on Water Resource Management, Department of Land and Natural Resources, State of Hawaii. Honolulu, Hawaii: Author.

Hawaii Police Department (HPD). (2001). *Hawaii Police Department 1999-2000 Annual Report.* County of Hawaii. Hilo, Hawaii: Author.

Hawaii Police Department. (1998). *Hawaii Police Department; District & Beat Boundaries.* General Order No. 204. Retrieved December 27, 2001 from http://www.hawaiipolice.com/genOrders/go204.html

Information Resource Management Branch (IRMB). (2000). Current official enrollment count and enrollment projections, 2000-01. Department of Education, State of Hawaii.

Institute of Pacific Islands Forestry (IPIF). (2001, November). U.S. Department of Agriculture; Forest Service. Retrieved November 14, 2001 from http://ipif.psw.fs.fed.us.

Land Study Bureau. (1965). *Detailed Land Classification – Island of Hawaii.* L.S. Bulletin No. 6. University of Hawaii. Honolulu, Hawaii: Author.

Leo A Daly. (2001). *Prospectus Development Study; USDA Forest Service; Pacific Southwest Research Station; Institute of Pacific Islands Forestry.* Honolulu, Hawaii: Author.

Macdonald, Gordon A., Abbott, Agatin T., and Peterson, Frank L. (1983). *Volcanoes in the Sea, The Geology of Hawaii.* Second Edition. University of Hawaii Press. Honolulu, Hawaii.

National Oceanic and Atmospheric Administration (NOAA). (1998). *Climatological Data Annual Summary; Hawaii and Pacific.* Volume 94, Number 13. Department of Commerce, United States of America. National Climatic Data Center. Asheville, North Carolina.

National Archives and Records Administration (NARA). (2000). *Federal Register.* Volume 65, Number 239, Tuesday, December 12, 2000. Part II, Advisory Council on Historic Preservation, 36 CFR, Part 800, Protection of Historic Properties, Final Rule.

Pacific Basin Agricultural Research Center (PBARC). (2002). *Pacific Basin Agricultural Research Center Homepage.* Retrieved January 22, 2002 from http://pbarc.ars.usda.gov/.

PBR Hawaii and Kajioka Okada Yamachi Architects (PBR). (1996, March). *University of Hawaii at Hilo Long Range Development Plan.* Prepared for University of Hawaii at Hilo. Honolulu, Hawaii: Author.

Office of the Federal Register (OFR). (2001). *Code of Federal Regulations.* Title 7, Agriculture; Subtitle B. Regulations of the Department of Agriculture. Chapter V, Agricultural Research Service; Part 520, Procedures for Implementing National Environmental Policy Act. National Archives and Records Administration.

Office of the Federal Register. (2001a) *Code of Federal Regulations.* Title 7, Agriculture; Subtitle B. Regulations of the Department of Agriculture. Chapter VI, National Resources Conservation Service; Part 650, Compliance with NEPA. National Archives and Records Administration.

Phillip Rowell and Associates. (Rowell). (2002, March). *Traffic Impact Assessment Report for U.S. Department of Agriculture Pacific Basin Agricultural Research Center.* Prepared for SSFM International, Inc. Honolulu, Hawaii: Author.

Rana Production, Ltd. (2001, December). *A Survey of Avian and Terrestrial Mammalian Species of the USDA Pacific Basin Agricultural Research Center Site.* Kailua-Kona, Hawaii: Author.

Richard Matsunaga & Associates Architects, Inc.(RMAAI). (2001, April). *U.S. Pacific Basin Agricultural Research Center; Final Program of Requirements.* Honolulu, Hawaii: Author.

Richard Matsunaga & Associates Architects, Inc. (2000, June). *U.S. Pacific Basin Agricultural Research Center; Draft Program of Requirements.* Honolulu, Hawaii: Author.

SMS. (2002, February). *Socio-Economic Impact Assessment, Pacific Basin Agricultural Research Center (Including Institute of Pacific Island Forestry).* Honolulu, Hawaii: Author.

State Health Planning and Development Agency (SHPDA). (2001, August). *Hawaii State Health Planning & Development Agency Inpatient Facilities and Home Health Services Utilization Report; 2000 Data* [Electronic version]. Department of Health, State of Hawaii. Retrieved March 5, 2002 from http://www.state.hi.us/health/shpda/shurpcov.htm.

State of Hawaii. (1998). *Hawaii Revised Statutes*. Chapter 343, Environmental Impact Statements.

State of Hawaii. (1996). *Hawaii Administrative Rules*. Title 11, Department of Health, Chapter 200, Environmental Impact Statement Rules.

State of Hawaii, Department of Health. (1996). *Community Noise Control*. Chapter 11-46, Hawaii Administrative Rules.

State of Hawaii. (1985). *Water Systems Standards*. Honolulu, Hawaii: Author.

Terry, Ron, Ph.D. and SSFM International, Inc. (Terry & SSFM). (2001, November). *Draft Environmental Impact Statement; China-U.S. Center*. Hilo, Hawaii: Author.

The Limtiaco Consulting Group (TLCG). (2002, March). *Industrial Wastewater Facilities for the Proposed USDA Pacific Basin Agricultural Research Center in Hilo, Hawaii*. Honolulu, Hawaii: Author.

Title 7, Agriculture; Subtitle B. Regulations of the Department of Agriculture. Chapter VI, National Resources Conservation Service; Part 650, Compliance with NEPA. National Archives and Records Administration.

U.S. Department of Agriculture (USDA). (2000, November). U.S. Department of Agriculture; Natural Resources and Environment Mission Area. Retrieved January 24, 2002 from http://www.usda.gov/mission/nre.htm.

U.S. Department of Agriculture. (1998). *USDA Final Report to Congress; The Establishment of U.S. Agricultural Research Center on the Island of Hawaii*. September 29, 1998 Response to Senate Report 105-15. P.L. 105-86; Appropriations for Agriculture, Rural Development, Food and Drug Administration, and Related Agencies, 1998.

U.S. Geological Survey (USGS). (1997). *Volcanic and Seismic Hazards on the Island of Hawaii*. Department of Interior.

U.S. Department of Agriculture, Soil Conservation Service (SCS). (1973). *Soil Survey of Island of Hawaii, State of Hawaii*. In cooperation with the University of Hawaii, Agricultural Experiment Station. Washington, D.C.

University of Hawaii at Hilo, Department of Geography. 1998. *Atlas of Hawaii*. Third Edition. University of Hawaii Press. Honolulu, Hawaii.

# APPENDICES

# APPENDIX A

## *Photographs Of Project Site And Surrounding Area*

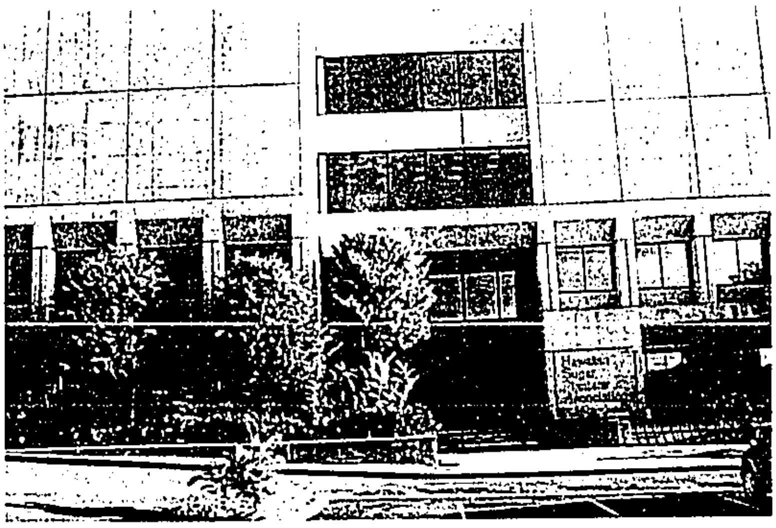


Photo 1
View Of Entrance To HARC Building Where PBARC Aiea Facility Located

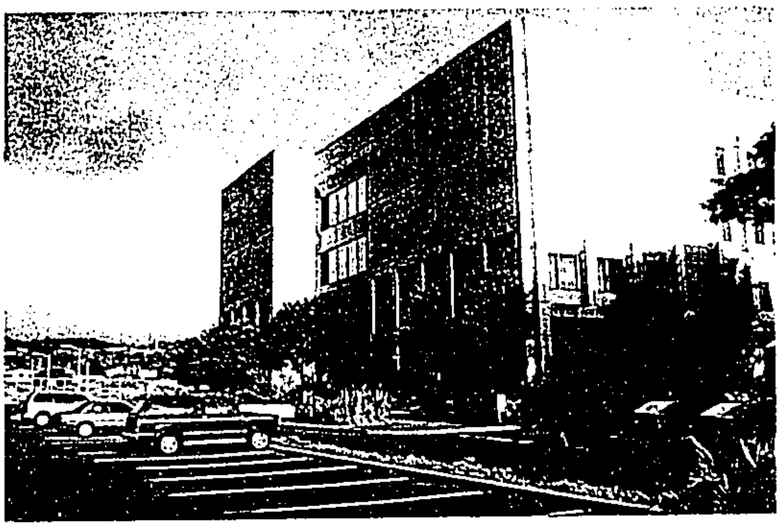


Photo 2
View Of HARC Building

Photo 3
View Of Entrance To PBARC's Manoa Facility

**PHOTOGRAPHS OF PBARC HARC AND MANOA FACILITIES**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

**Figure A-1**

*Source:*
*SSFM International, Inc.*

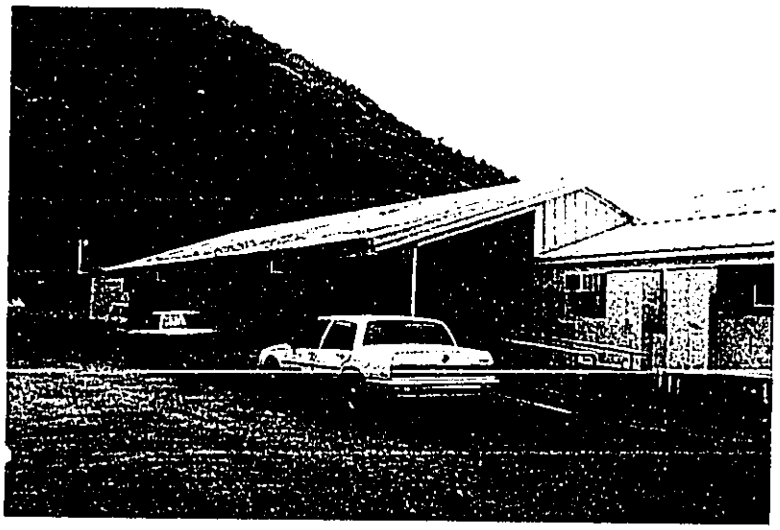


Photo 4
View Of PBARC's Manoa
Facility Buildings

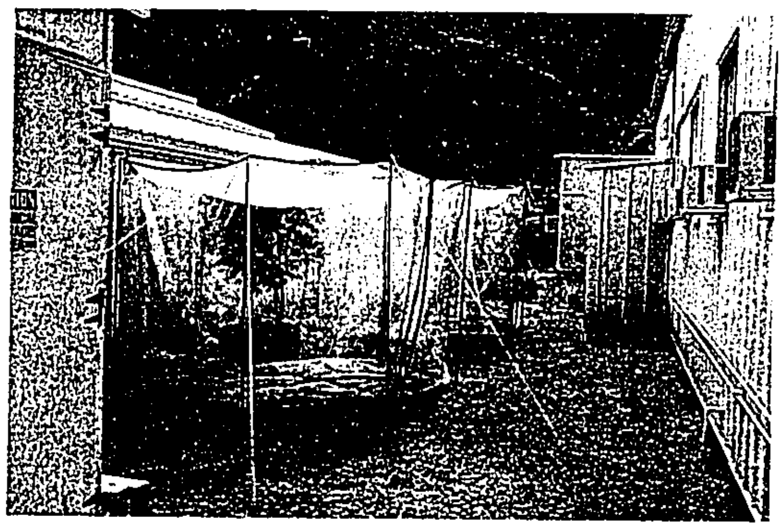


Photo 5
View Of Field Plots And
PBARC Manoa Facility Buildings

Photo 6
View Of PBARC's Buildings At
Manoa Facility

**PHOTOGRAPHS OF PBARC HARC AND MANOA FACILITIES**

**Figure A-2**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source:*
*SSFM International, Inc.*

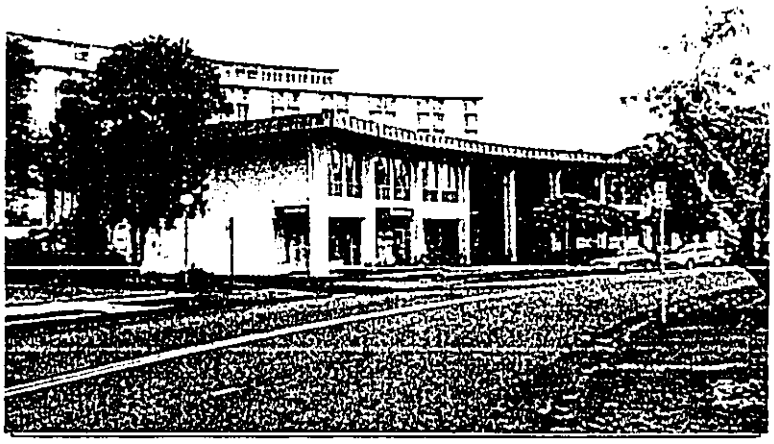


Photo 1
View Of PBARC's Administrative Office In Commercial Building In Hilo Town

Photo 2
View Of PBARC Stainback Facility And Entrance


Photo 3
View Of Building At PBARC's Stainback Facility

**PHOTOGRAPHS OF PBARC HILO FACILITIES**

**Figure A-3**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source:*
*SSFM International, Inc.*

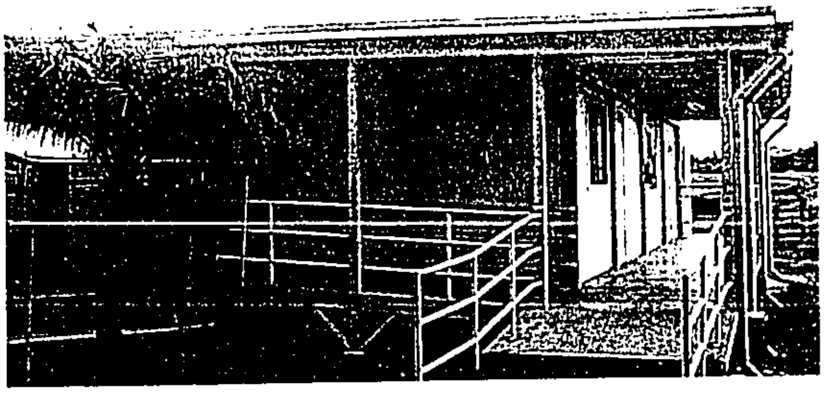


Photo 4
View Of Stainback Facility Building

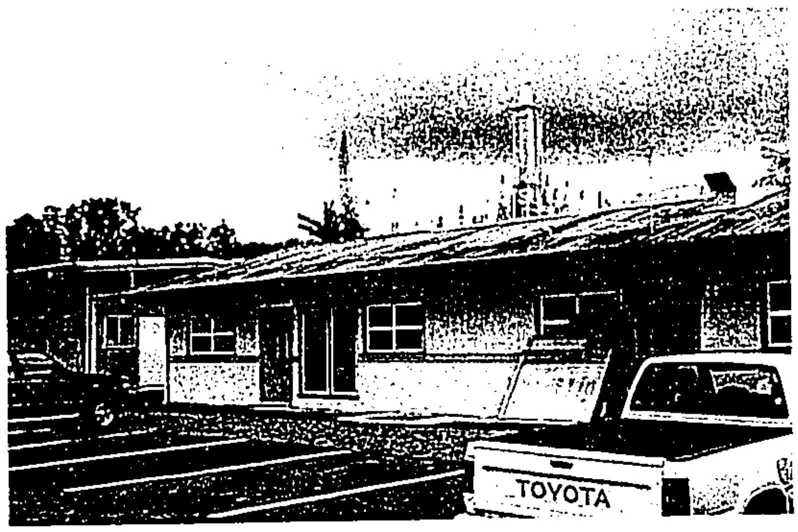



Photo 5
View Of Other Stainback Facility Buildings

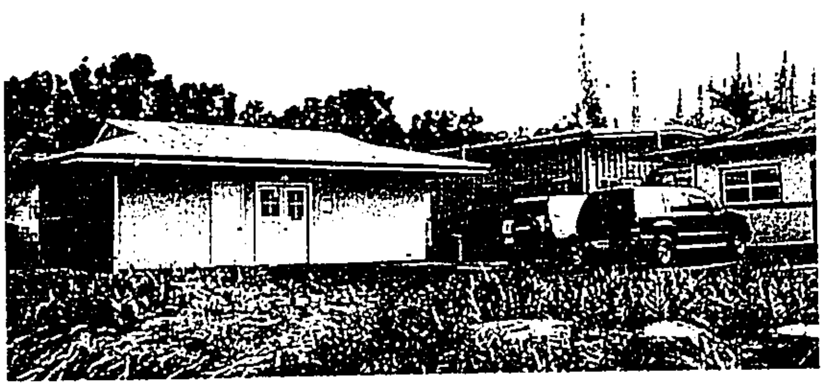


Photo 6
View Of Other Buildings At Stainback Facility

**PHOTOGRAPHS OF PBARC HILO FACILITIES**

**Figure A-4**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source:*
*SSFM International, Inc.*

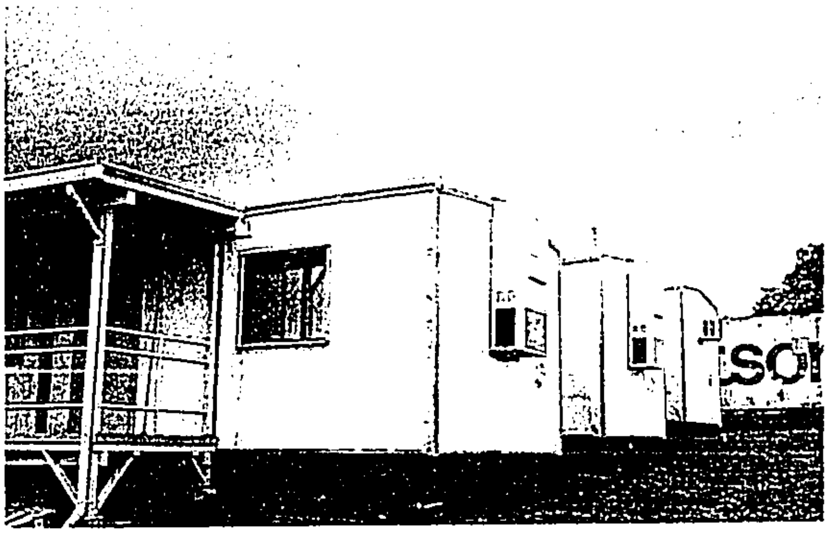
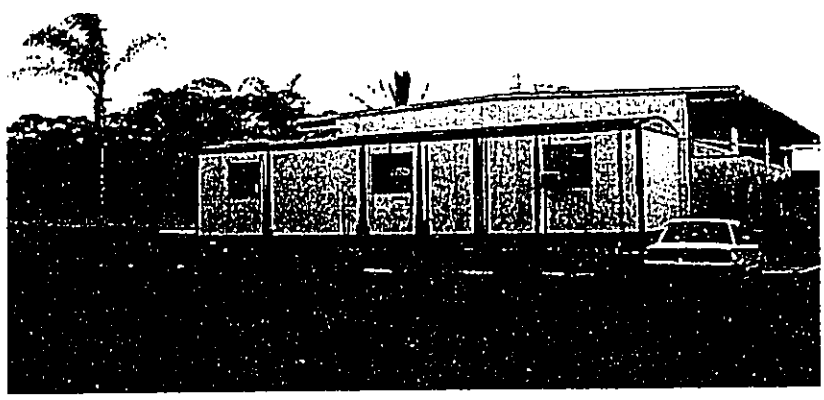


Photo 7
View Of Plastic Coverings
Around Trailers

Photo 8
View Of Temporary
Trailers Used For Facilities



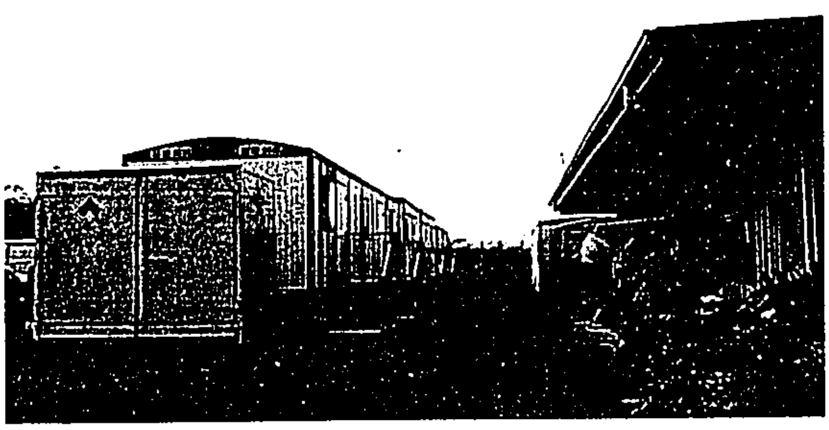


Photo 9
View Of More Trailers Used
For As Facilities

**PHOTOGRAPHS OF PBARC HILO FACILITIES**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

**Figure A-5**

*Source:*
*SSFM International, Inc.*

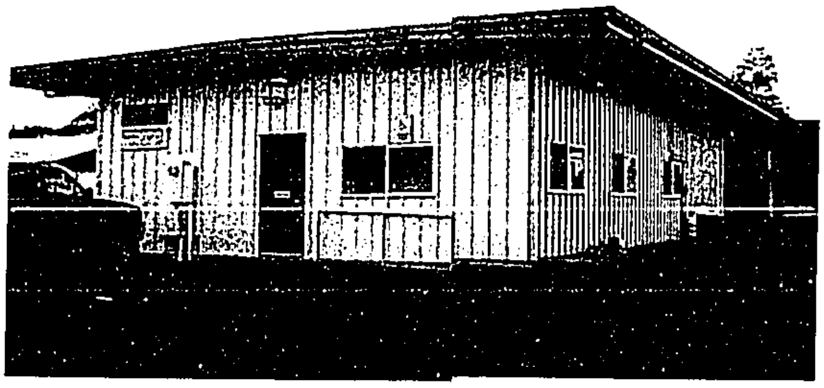


Photo 10
View Of NCGR Facility At
PBARC Stainback Site

Photo 11
View Of NCGR Greenhouses
At Stainback Site

Photo 12
View Of NCGR Area At
Stainback Site

**PHOTOGRAPHS OF PBARC HILO FACILITIES**

**Figure A-6**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source:*
*SSFM International, Inc.*

Photo 13
View Of PBARC Facility
In Kapaa

Photo 14
View Of Other Side Of
Kapaa Facility

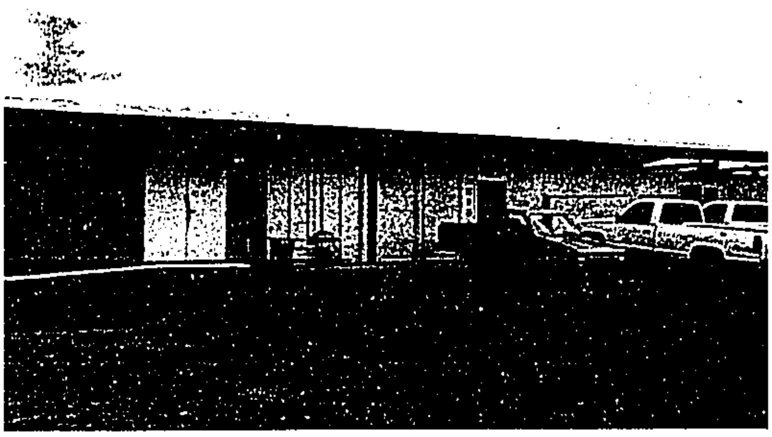


Photo 15
View Of Other Building At
PBARC Kapaa Facility

**PHOTOGRAPHS OF PBARC KAUAI FACILITIES**

**Figure A-7**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source:*
*SSFM International, Inc.*

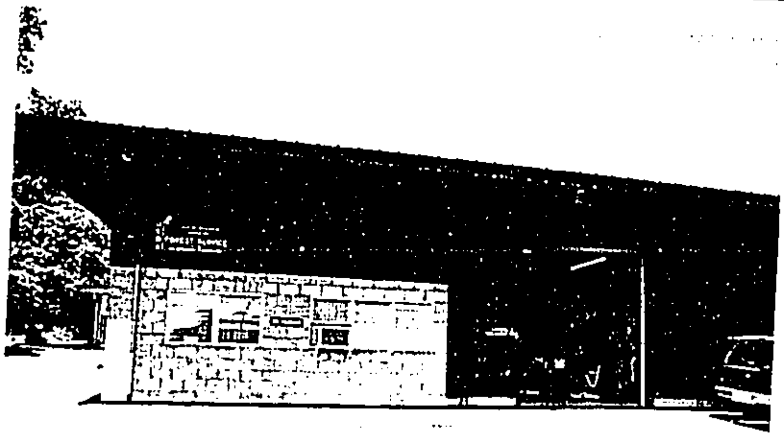


Photo 1
View Of IPIF Main Entrance

2002. 2. 7

Photo 2
View Of IPIF Facility Building

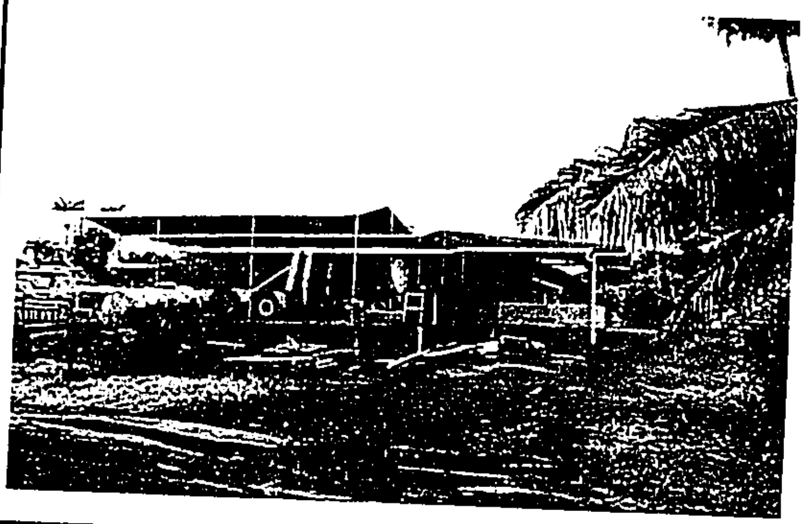


Photo 3
View Of Building Storage Area

**PHOTOGRAPHS OF IPIF HILO FACILITY**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

**Figure A-8**

*Source:*
*SSFM International, Inc.*

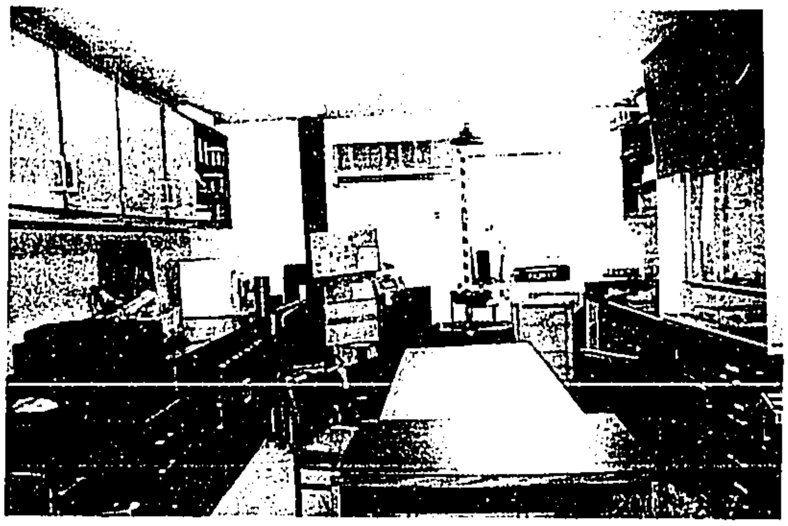
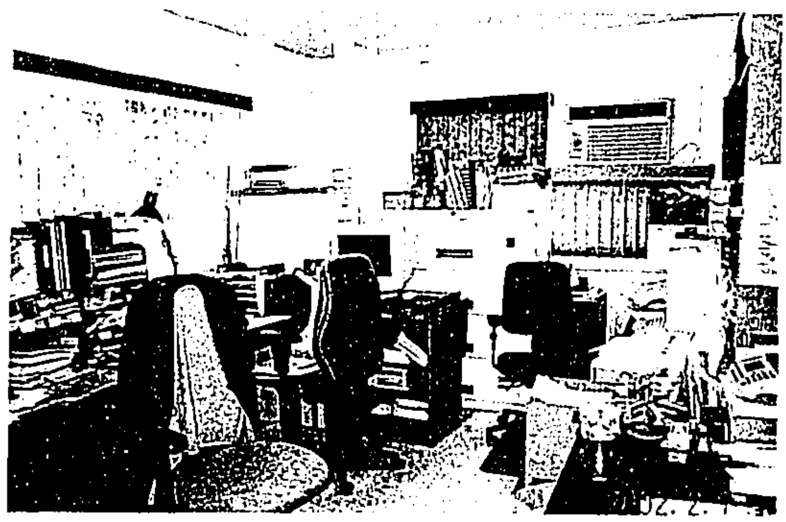


Photo 4
View Of IPIF Laboratory & Conference Room Area

Photo 5
View Of Office Working Space



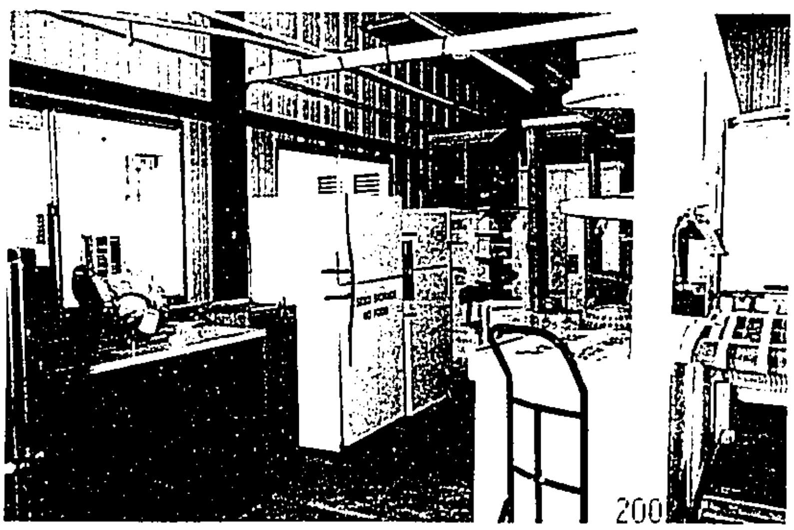


Photo 3
View Of Storage & Lab Area

| PHOTOGRAPHS OF IPIF HILO FACILITY | Figure A-9 |
|---|---|
| *USDA Pacific Basin Agricultural Research Center*<br>*USDA ARS & Forest Service* | *Source:*<br>*SSFM International, Inc.* |

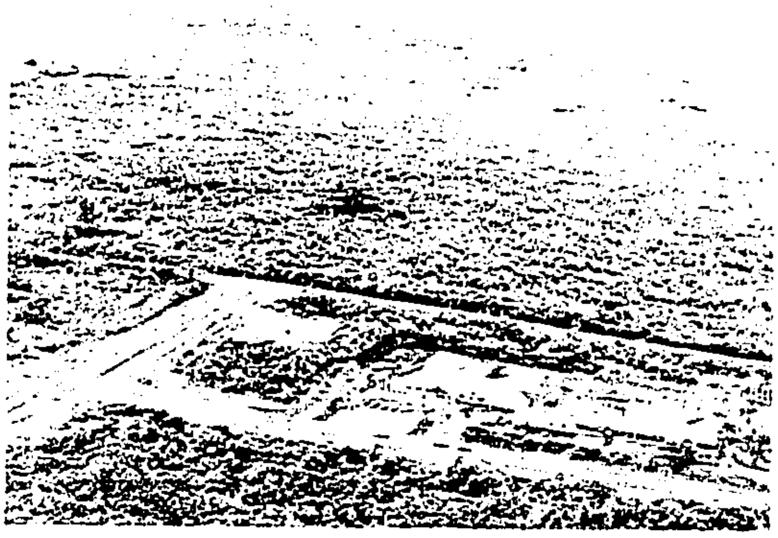


Photo 1
Aerial Westward View Of
PBARC Property And
Surrounding Area

Photo 2
View Of Nowelo Street
Intersection Near Project Site

Photo 3
East View From Project Site
Towards Nowelo Street

**PHOTOGRAPHS OF PBARC PROJECT SITE AND SURROUNDING AREA**

**Figure A-10**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

*Source:*
*SSFM International, Inc.*

Photo 4
Southwest View Along Komohana Street And PBARC Property

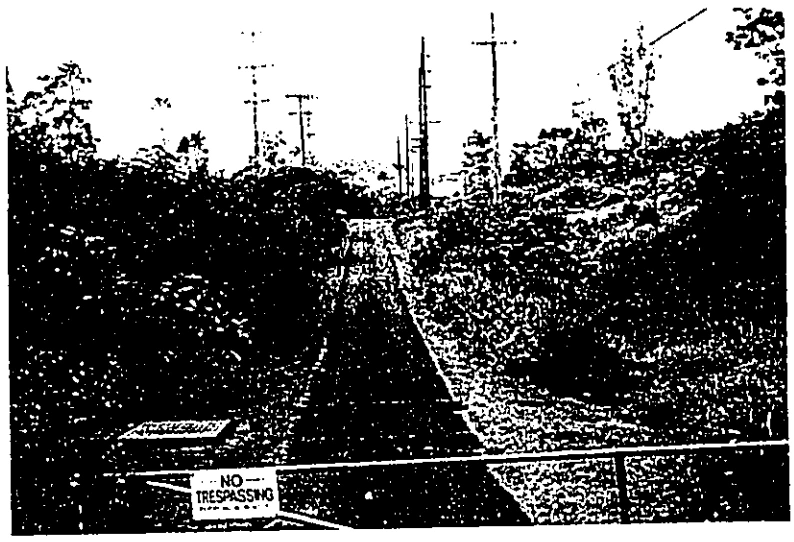



Photo 5
West View Of Private Driveway Forming Southern Border Of Project Site

Photo 6
West View From Private Driveway Of Project Site And Overhead Electrical Lines

| **PHOTOGRAPHS OF PBARC PROJECT SITE AND SURROUNDING AREA** | **Figure A-11** |
| --- | --- |
| *USDA Pacific Basin Agricultural Research Center*<br>*USDA ARS & Forest Service* | *Source:*<br>*SSFM International, Inc.* |

Photo 7
West View Along Private Driveway And Southern Boundary Of PBARC Property

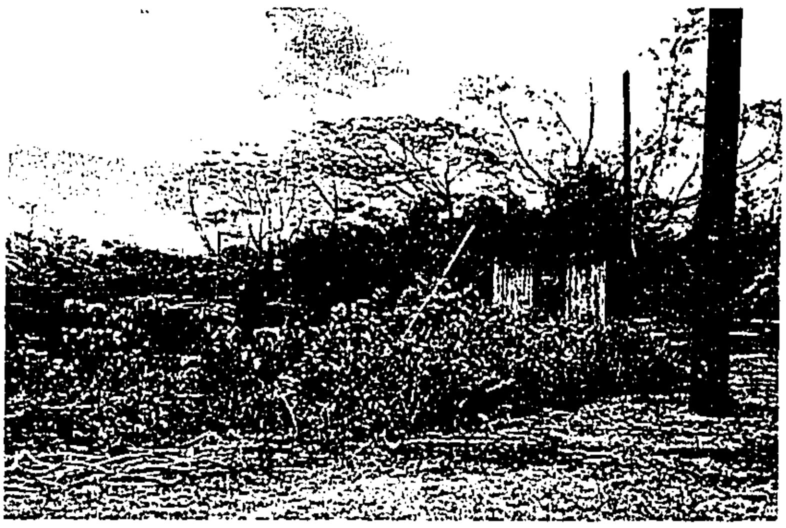


Photo 8
View Of Waiakea Reservoir South Of Property

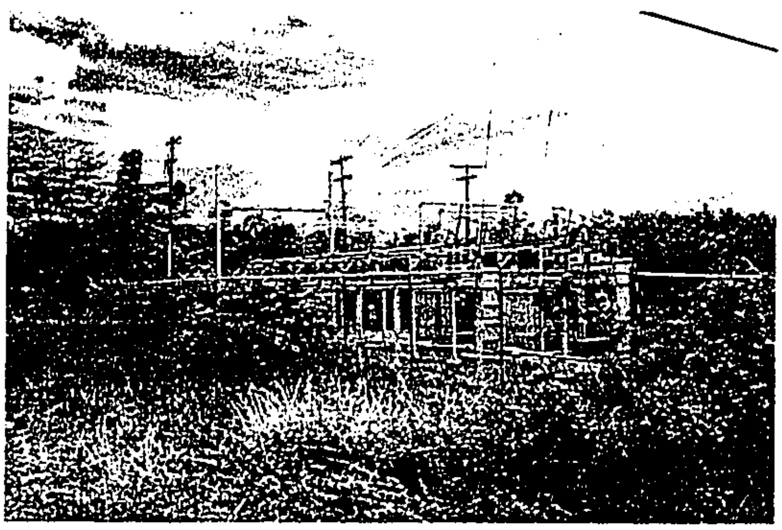


Photo 9
View Komohana Substation South Of Property

**PHOTOGRAPHS OF PBARC PROJECT SITE AND SURROUNDING AREA**

*USDA Pacific Basin Agricultural Research Center*
*USDA ARS & Forest Service*

**Figure A-12**

*Source:*
*SSFM International, Inc.*

# APPENDIX B

*Consultation Letters And Responses*

# APPENDIX B-1

*Pre-Assessment Consultation Comment Letters And Responses*

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

FILE COPY

SSFM INTERNATIONAL, INC.
RECEIVED
OCT 23 2001

FILE

REPLY TO
ATTENTION OF

October 22, 2001

Regulatory Branch

Mr. Ronald A. Sato, AICP
SSFM International, Inc.
560 Summer Street, Suite 502
Honolulu, Hawaii 96817

Dear Mr. Sato:

This letter responds to your request for comments on the Pre-Assessment Consultation for the USDA Pacific Basin Agricultural Center Project, dated October 16, 2001. Based on the information you provided I am unable to determine if a Department of the Army (DA) permit will be required for this project. Please put us on the mailing list for the Environmental Assessment and include in the document information concerning the presence or absence of streams or wetlands in the project area.

If you have any questions concerning this determination, please contact William Lennan of my staff at 438-6986 or FAX 438-4060, and reference File No. 200200041.

Sincerely,

William Lennan

George P. Young, P.E.
for Chief, Regulatory Branch

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

May 3, 2002

SSFM 9973000

Mr. George P. Young, P.E.
Chief, Regulatory Branch
U.S. Army Engineer District, Honolulu
Department of the Army
Fort Shafter, Hawaii 96858-5440

Dear Mr. Young:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated October 22, 2001, providing comments on the Pre-Assessment Consultation for Draft Environmental Assessment for the subject project.

The Draft EA will include information concerning the presence of any streams or wetlands located within the project site. A copy of the Draft EA published will be provided to your agency as part of the public review process.

If you have any questions on this matter, please contact me at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

BENJAMIN J. CAYETANO
Governor

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 South King Street
Honolulu, Hawaii 96814-2512

JAMES J. NAKATANI
Chairperson, Board of Agriculture

LETITIA N. UYEHARA
Deputy to the Chairperson

Mailing Address:
P.O. Box 22159
Honolulu, Hawaii 96823-2159

Fax: (808) 973-9613

FILE COPY

November 5, 2001

SSFM INTERNATIONAL, INC.
RECEIVED
NOV 0 8 2001
RAS
FILE

Mr. Ronald A. Sato, AICP
Senior Project Planner
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

Dear Mr. Sato:

This is in reply to your letter of October 6, 2001 in which you inquire whether the Hawaii Department of Agriculture (HDOA) has comments, concerns, or regulatory requirements that could impact the proposed development of the Pacific Basin Agriculture Research Center (PBARC) planned for Hilo, Hawaii.

Our comments are as follows:

1. If the facility proposed by the United States Department of Agriculture (USDA) or Forest Service will hold plants, animals or microorganisms that require a permit for entry into the State of Hawaii, the permit issued by the HDOA, Plant Quarantine Branch (PQB) may require that appropriate containment systems be in place to prevent the release of these plants, animals or microorganisms into the environment. Containment requirements will depend on the plant, animal or microorganism imported. For clarification regarding requirements that may apply to the planned research facilities, please contact Mr. Dennis Nagatani, Acting Branch Manager, HDOA, PQB, at 586-0846.

Crops of importance to Hawaii, such as banana, coffee, sugarcane, pineapple, etc., require permits and mandatory quarantine. Because of the shortage of quarantine space in the State facilities, we would recommend that a quarantine facility be built to hold such commodities. Otherwise, those crops could not be imported until space was available in the State facilities. (There are only four rooms available in PQB's quarantine facility on the island of Hawaii.) In addition, regulated transgenic work needs to be housed in approved greenhouse structures.

2. If the facility proposed above will include a quarantine holding area for insects or microorganisms for possible release as biocontrol organisms into the State of Hawaii, the quarantine holding area will have to be approved by the HDOA as well as USDA, Animal and Plant Health Inspection Service (APHIS). For the HDOA, please refer your questions to Mr. Nagatani, above. For USDA, APHIS, Mr. Vernon Harrington, State Plant Health Director, USDA, APHIS, (808-541-1980) would be your local contact.

3. If the facility above will be holding hazardous chemicals, including pesticides, appropriate storage of these chemicals in the facility for safety must be in place. For guidance on the proper storage of pesticide chemicals in the facility, your questions should be directed to Mr. Robert Boesch, Branch Manager, Pesticides, at 973-9404.

4. Apart from the above, the HDOA has no specific jurisdiction regarding the siting, construction, or operation of a research facility in the State of Hawaii relative to the requirements of an EA or EIS.

Sincerely,

JAMES J. NAKATANI
Chairperson, Board of Agriculture

JJN:LW:ss
RonaldSatoUSDAHiloFacility/Pi/Adm

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

SSFM 9973000

May 3, 2002

Mr. James J. Nakatani, Chairperson
Department of Agriculture
State of Hawaii
1428 South King Street
Honolulu, Hawaii 96814-2512

Dear Mr. Nakatani:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated November 5, 2001, providing comments on the Pre-Assessment Consultation for Draft Environmental Assessment (Draft EA) for the subject project.

If necessary, appropriate containment systems would be provided as part of facility's design requirements to hold plants, animals, or microorganisms requiring permit for entry into the State. Appropriate coordination will be conducted with your department to address such systems.

A quarantine facility is not being considered at this time as part of this project to hold those crops identified (ex. banana, coffee, etc.). However, the USDA would be willing to discuss this matter further with your department as part of the project's design phase. Regulated transgenic work would be housed in approved greenhouse structures.

Appropriate coordination will be conducted with your department to address quarantine holding area requirements as part of the facility's design. The PBARC project will be developed under the management of a comprehensive team that includes the USDA ARS for assuring construction compliance with all Federal and State rules and regulations along with the safety standards of OSHA, etc. The PBARC scientific and administrative staffs have experience in program compliance with Federal and State regulations for working with biological materials whatever the source and type. PBARC is especially alert to the problem of alien species in Hawaii and will thus avoid introduction of any biological species without a thorough justification and then only under the most secure conditions including proper oversight by regulatory agencies.

Storage facilities will be properly designed to hold hazardous chemicals such as pesticides. Appropriate coordination will be conducted with your department to address proper storage requirements.

If you have any further comments or questions on this matter, please contact me at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

WAYNE H. KIMURA
COMPTROLLER

MARY ALICE EVANS
DEPUTY COMPTROLLER

BENJAMIN J. CAYETANO
GOVERNOR

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

LETTER NO. (P)1668.1

FILE COPY

OCT 23 2001

SSFM INTERNATIONAL, INC.
RECEIVED
OCT 24 2001
RAS
FILE

Mr. Ronald A. Sato, AICP
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, HI 96817

Dear Mr. Sato:

Subject: USDA Pacific Basin Agricultural Research Center
Pre-Assessment Consultation for Draft Environmental Assessment
TMK (3) 2-4-1: 122

We have reviewed your October 16, 2001, letter which described the proposed project and have no significant comments at this time. We suggest the project also be coordinated with the University of Hawaii at Hilo and the Department of Land and Natural Resources.

Should there be any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Sincerely,

GORDON MATSUOKA
Public Works Administrator

BI:mo

c: Mr. Glenn Okada, DAGS-HI
Mr. Lo-Li Chih, UH-Hilo w/original letter
Mr. Harry Yada, DLNR Land Administrator w/original letter

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

May 3, 2002

SSFM 9973000

Mr. Gordon Matsuoka
Public Works Administrator
Department of Accounting and General Services
State of Hawaii
P.O. Box 119
Honolulu, Hawaii 96810

Dear Mr. Matsuoka

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated October 23, 2001 (Letter No. (P)1668.1), providing comments on the Pre-Assessment Consultation for Draft Environmental Assessment for the subject project. We note that your department has no significant comments to offer at this time.

The project will be coordinated with the University of Hawaii at Hilo, and the Department of Land and Natural Resources.

If you have any questions on this matter, please contact me at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

BENJAMIN J. CAYETANO
GOVERNOR

[redacted]
PATRICIA HAMAMOTO
INTERIM SUPERINTENDENT

**STATE OF HAWAI'I**
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

FILE COPY

OFFICE OF THE SUPERINTENDENT

SSFM INTERNATIONAL, INC.
RECEIVED
NOV 08 2001
FILE

November 2, 2001

Mr. Ronald A. Sato, AICP
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawai`i 96817

Dear Mr. Sato:

Subject: USDA Pacific Basin Agricultural Research Center
Pre Assessment Consultation

The Department of Education has no comment on the subject project.

Thank you for the opportunity to respond.

Very truly yours,

Patricia Hamamoto
Interim Superintendent

PH:hy

SSFM INTERNATIONAL
**SSFM INTERNATIONAL, INC.**
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

May 3, 2002

SSFM 9973000

Ms. Patricia Hamamoto, Superintendent
Department of Education
State of Hawaii
P.O. Box 2360
Honolulu, Hawaii 96804

Dear Ms. Hamamoto:

Subject: Pre-Assessment Consultation For Draft Environmental Assessment
USDA Pacific Basin Agricultural Research Center Project

Thank you for your letter dated November 2, 2001, providing comments on the Pre-Assessment Consultation for Draft Environmental Assessment for the subject project.

We note your comment that the Department of Education has no comment on the subject project.

If you have any questions on this matter, please give me a call at 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

FILE COPY

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

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

In reply, please refer to:
File:

EPO

SSFM INTERNATIONAL, INC.
RECEIVED
OCT 23 2001
√RAS
FILE

October 15, 2001

TO: Those Persons Requesting Department of Health Comments on Land Use Documents

FROM: June F. Harrigan-Lum, Manager, Environmental Planning Office *June F. Harrigan-Lum*

SUBJECT: Temporary Discontinuance of Coordinated Land Use Reviews

Our land use review coordinator position will be vacant beginning October 15, 2001. We will be filling this position as soon as possible. In the meantime, starting October 15, 2001, the Environmental Planning Office (EPO) will not be accepting any land use documents for coordinated replies.

If you would like staff in a specific branch or office (for instance, the Wastewater Branch) to comment on your proposal, you are welcome to contact the staff directly. A list of the Branch/Office names is enclosed for your reference. If you have already sent a copy of the document to the Department of Health (EPO), and wish to have us send it to a specific branch, you may call 586-4337 and ask for the clerical staff to send it to the appropriate branch. Please describe the document and the date of your cover letter.

You may call the above number and check with the clerical staff to see when coordinated responses from this office will resume.

Thank you for your cooperation and patience in this matter.

Enclosure

c: DDEH

Branches and Offices in the Environmental Health Administration

Hazard Evaluation and
Emergency Response Office----586-4249

Environmental Planning Office---586-4337

Clean Air Branch----------------586-4200

Clean Water Branch--------------586-4309

Safe Drinking Water Branch------586-4258

Solid & Hazardous Waste Branch--586-4226

Wastewater Branch---------------586-4294

Noise and Radiation Branch------586-4700

Sanitation Branch---------------586-8000

Food and Drug Branch------------586-4725

Vector Control Branch-----------831-6767

ERNATIONAL

SSFM INTERNATIONAL, INC.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817
Phone: (808) 531-1308
Fax: (808) 521-7348

Project Managers, Planners, & Engineers
American Consulting Engineers Council, Member

RECEIVED
FILE OF THE DIRECTOR
DEPT OF HEALTH

1 OCT 17 P3:30

SSFM 9973000

October 16, 2001

Mr. Bruce S. Anderson, Director of Health
Department of Health
State of Hawaii
Kinau Hale
1250 Punchbowl Street
Honolulu, Hawaii 96801

Dear Mr. Anderson:

Subject: USDA Pacific Basin Agricultural Research Center Project
Pre-Assessment Consultation For Draft Environmental Assessment

The U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS) is proposing to develop the Pacific Basin Agricultural Research Center (PBARC) in the town of Hilo on the Island of Hawaii. This PBARC would be a new facility developed on a 30-acre parcel situated along Komohana Street west of the University of Hawaii at Hilo. The Tax Map Key for this site is 2-04-01: portion of 122.

This PBARC project will be a new research center that includes state-of-the-art facilities serving the ARS. In addition to this PBARC facility, the USDA, Forest Service, Institute of Pacific Island Forestry (IPIF) will also be developing a new facility for their activities on a 3-acre portion of this property. Facilities constructed for this entire project will have a total of 137,225 square feet of floor area, and consist of offices, laboratories, and various support facilities. Enclosed is a project summary with exhibits showing the project's location and preliminary Site Plans for each of these developments.

A Draft Environmental Assessment (Draft EA) is now being prepared for this project to comply with both Federal (NEPA) and State (Chapter 343, HRS) environmental regulations along with conducting Section 106 consultation under the National Historic Preservation Act. Therefore, we would like to solicit any comments, concerns, or regulatory requirements your department may have on this project so that it may be addressed in the Draft EA.

We would greatly appreciate your cooperation in providing us with any written comments within 21 days of the date of this letter. If you have any questions on this matter, please give me a call at (808) 531-1308. Thank you.

Sincerely,

Ronald A. Sato, AICP
Senior Project Planner

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

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

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

FILE COPY

In reply, please refer to:
File:

01-142/epo

SSFM INTERNATIONAL, INC.
RECEIVED
JAN 17 2002

FILE

January 16, 2002

Mr. Ronald A. Sato, AICP
Senior Project Planner
SSFM International, Inc.
501 Sumner Street, Suite 502
Honolulu, Hawaii 96817

Dear Mr. Sato:

Subject: USDA Pacific Basin Agricultural Research Center Project
Pre-Assessment Consultation For Draft Environmental Assessment
Tax Map Key: 2-4-01: portion of 122

Thank you for the opportunity to review and comment of the subject proposal. The Pre DEA was routed to the various branches of the Environmental Health Administration. We have the following comments:

Clean Air Branch (CAB)

Control of Fugitive Dust:

For the proposed project, there is a significant potential for fugitive dust to be generated during all phases of construction activities. Therefore, it is recommended that a dust control management plan be developed which identifies and addresses activities having a potential to generate fugitive dust. Implementation of adequate dust control measures during all phases of the project is warranted. Construction activities must comply with the provisions of Chapter 11-60.1, Hawaii Administrative Rules, section 11-60.1-33 on Fugitive Dust.

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

a. Planning the different phases of construction, focusing on minimizing the amount of dust-generating materials and activities, centralizing material transfer points and on-site vehicular traffic routes, and locating potentially dusty equipment in areas of the least impact;

b. Providing an adequate water source at site prior to start-up of construction activities;

c. Landscaping and rapid covering of bare areas, including slopes, starting from the initial grading phase;

d. Controlling of dust from shoulders, project entrances, and access roads; and

5. Providing adequate dust control measures during weekends, after hours, and prior to daily start-up of construction activities.

If you have any questions on fugitive dust issues, please contact Mr. Timothy Carvalho of the Clean Air Branch at 586-4200.

Clean Water Branch (CWB)

Polluted Runoff Control

Proper planning, design and use of erosion control measures and management practices will substantially reduce the total volume of runoff and limit the potential impact to the coastal waters from polluted runoff. Please refer to the Hawaii's Coastal Nonpoint Source Control Plan, pages III-117 to III-119 for guidance on these management measures and practices for specific project activities. To inquire about receiving a copy of this plan, please call the Coastal Zone Management Program in the Planning Office of the Department of Business, Economic Development and Tourism at 587-2877.

The following practices are suggested to minimize erosion during construction activities:

1. Conduct grubbing and grading activities during the low rainfall months (minimum erosion potential);

2. Clear only areas essential for construction;

3. Locate potential nonpoint pollutant sources away from steep slopes, water bodies, and critical areas;

4. Protect natural vegetation with fencing, tree armoring, and retaining walls or tree wells;

5. Cover or stabilize topsoil stockpiles;

6. Intercept runoff above disturbed slopes and convey it to a permanent channel or storm drain;

7. On long or steep slopes, construct benches, terraces, or ditches at regular intervals to intercept runoff;

8. Protect areas that provide important water quality benefits and/or are environmentally sensitive ecosystems;

9. Protect water bodies and natural drainage systems by establishing streamside buffers;

10. Minimize the amount of construction time spent in any stream bed;

11. Properly dispose of sediment and debris from construction activities; and

12. Replant or cover bare areas as soon as grading or construction is completed. New plantings will require soil amendments, fertilizers and temporary irrigation to become established. Use high planting and/or seeding rates to ensure rapid stand establishment. Use seeding and mulch/mats. Siding is an alternative.

The following practices are suggested to remove solids and associated pollutants in runoff during and after heavy rains and/or wind:

1. Sediment basins;

2. Sediment traps;

3. Fabric filter fences;

4. Straw bale barriers; and

5. Vegetative filter strips.

Any questions regarding these matters should be directed to the Polluted Runoff Control Program in the Clean Water Branch at 586-4309.

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, Clean Water Branch; and

2. A National Pollutant Discharge Elimination System (NPDES) general permit is required for the following discharges to waters of the State.