BENJAMIN J. CAYETANO
GOVERNOR

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OFC. OF ENVIRONMENTAL
QUALITY CONTROL

EUGENE S. IMAI
COMPTROLLER
MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

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

IN REPLY REFER TO LETTER NO. PM-1102.5

FEB 24 1995

Mr. Gary Gill
Director
Office of Environmental Quality Control
220 South King Street, Suite 400
Honolulu, Hawaii 96813

Dear Mr. Gill:

Subject: Environmental Assessment (EA)
Negative Declaration for
Kauai Community Correctional Center
Sewage Pump Station and Force Main
D.A.G.S. Job No. 14-27-5719
TMK: KCCC - 3-9-05:13 Wailua, Kauai, Hawaii
WGC - 3-9-02

The State of Hawaii has reviewed the comments received during the 30-day public comment period which began on September 8, 1994. The agency has determined that this project will not have significant environmental effect and has issued a negative declaration. Please publish this notice in the March 8, 1995, OEQC Bulletin.

We have enclosed a completed OEQC Bulletin Publication Form and four copies of the final EA.

Please contact Eric Nishimoto at 586-0468 if you have any questions.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

EN/si
Encl.

19

1995-03-08-KA-FEA- Kauai Community Correctional Center Sewage Pump Station Forcemain Project

MAR - 8 1995

FINAL ENVIRONMENTAL ASSESSMENT

FOR THE

KAUAI COMMUNITY CORRECTIONAL CENTER

SEWAGE PUMP STATION
AND FORCEMAIN PROJECT

PREPARED FOR THE STATE OF HAWAII

Department of Public Safety

&

Department of Accounting andGeneral Services
Division of Public Works
DAGS Job No. 14-27-5719

Prepared By:

PARAMETRIX, INC.
1164 Bishop Street Suite 1600
Honolulu, HI 96813

December, 1994

TABLE OF CONTENTS

LIST OF FIGURES

EXHIBIT

I. SUMMARY

CHAPTER 343, HRS
ENVIRONMENTAL ASSESSMENT (EA)

Action:	Agency DAGS Job No 9. 14-27-5719
Project Name:	Kauai Community Correctional Center *Sewage Pump Station and Forcemain Project* Wailua, Kauai, Hawaii
Project Description:	The proposed project involves the construction of a sewage collection system and forcemain transmission system that will collect raw sewage from the existing Kauai Community Correctional Center and the Wailua Golf Course Club House. The sewage will be transported to an existing County sewer and the Wailua Sewage Treatment Plant for appropriate treatment and disposal.
Project Location:	Kauai Community Correctional Center (KCCC) and the Wailua Golf Course Club House (WGC). **(See Figure 1.)**
Tax Map Key:	KCCC: 3-9-05: 13 WGC: 3-9-02
Area:	KCCC: Approximately 400 square feet for structural improvements, i.e. sewage pump station, including headworks, sewage flow metering, odor scrubber and electrical power distribution enclosure. Standby electrical power for pump station operations are provided by other construction at KCCC. WGC: No above grade improvements.
State Land Use Designation:	KCCC: Agriculture WGC: Conservation
County Zoning Designation:	KCCC: Agriculture WGC: Conservation
Landowner:	KCCC: Dept. of Public Safety WGC: County of Kauai
Contact:	**c/o Parametrix Inc.** 1164 Bishop, Suite #1600 Honolulu, Hawaii 96813 Robert W. Purdie, Jr. 524-0594

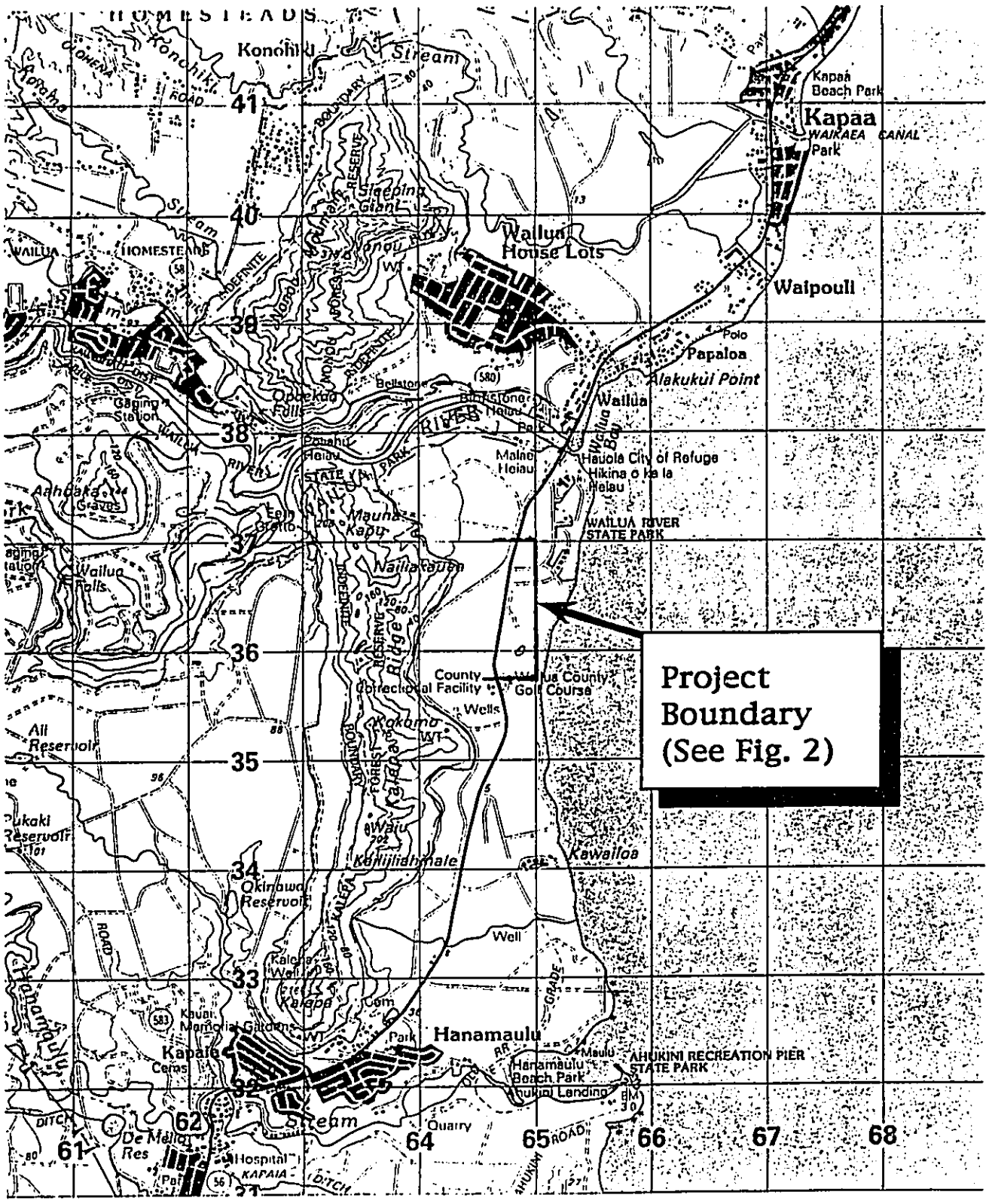


Figure 1
Location Map

II. PROJECT DESCRIPTION

A. Technical Characteristics

1. In order to provide for environmentally responsible wastewater disposal facilities and protection of near shore groundwater at Kauai Community Correctional Center (KCCC), it is proposed that the existing KCCC cesspools be removed and a raw sewage pump station and forcemain be constructed to convey sewage from KCCC to the Wailua Sewage Treatment Plant (STP) for ultimate treatment and disposal.

2. Similarly, the County of Kauai faces identical issues with the continued use of existing cesspools associated with the Wailua Golf Course Clubhouse . (WGC). Due to the close proximity of both venues to a desirable forcemain alignment to the Wailua STP, it is proposed that the project be developed to include gravity sewage collection facilities at the Wailua Golf Course Clubhouse. Because force- main service to these County facilities is desirable and environmentally appropriate, the project will convey generated wastewater from both KCCC and WGC to the Wailua STP and in the process, meet County needs and objectives.

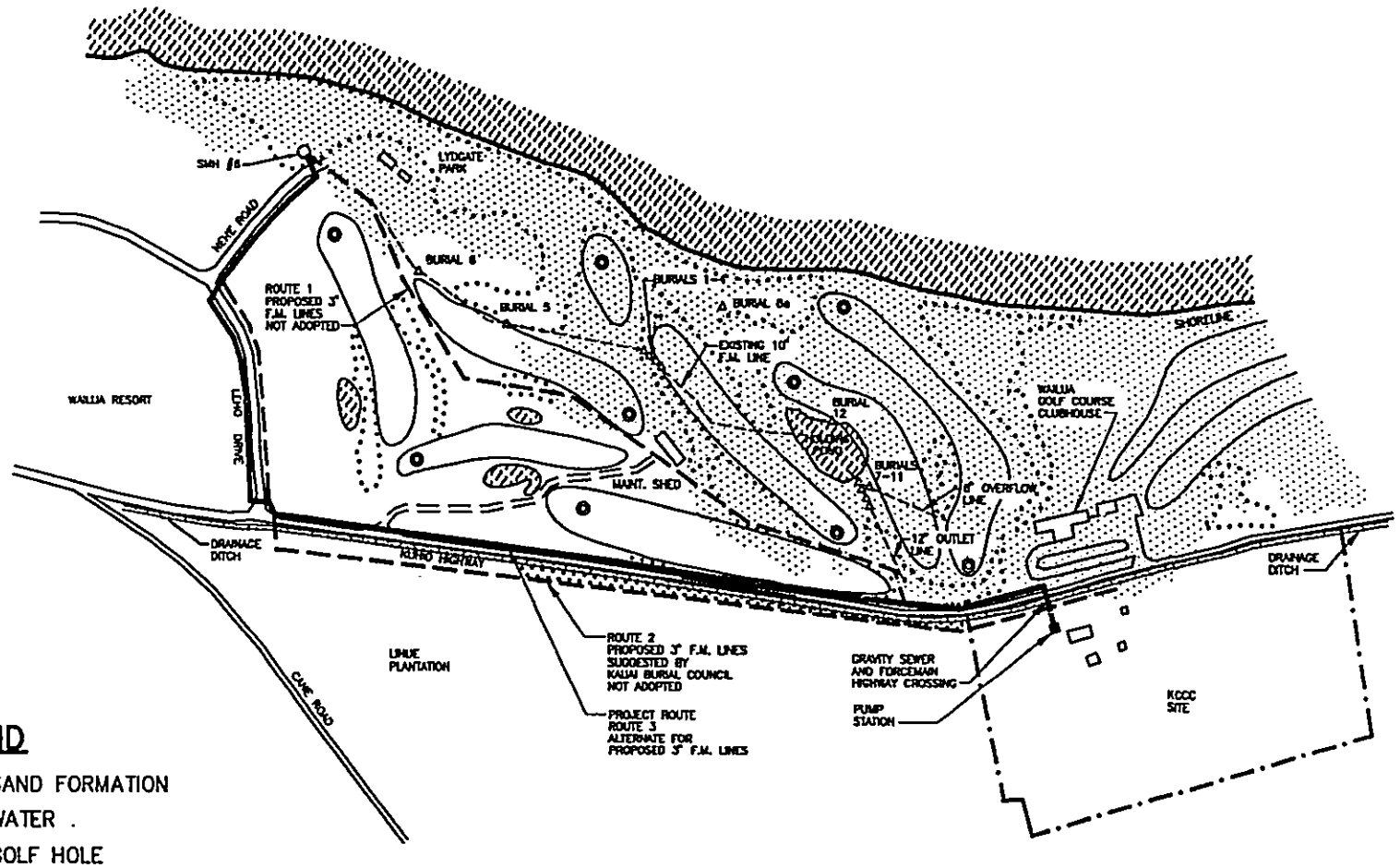
   a. Daily wastewater flows from the existing KCCC Facility average 12,800 gallons per days (gpd). Maximum average daily flows associated with future expansion from 80 to 168 beds are estimated to reach approximately 26,900 gpd. Current KCCC flows represent less than one percent (1%) of the theoretical hydraulic capacity of the Wailua STP, and impacts to this capacity due to the proposed expansion at KCCC are not anticipated. Water usage at the Wailua Golf Course Clubhouse estimate average wastewater cesspool discharge at approximately 12,000 gpd .

   b. Project elements for each planned improvement are described as follows with the proposed force main alignment presented in **Figure 2.**

3. KCCC Facilities:
   KCCC Pump Station:

   Construct a triplex 70-110 gallons per minute (gpm) macerating raw sewage pump station, including headworks, flow metering, odor scrubber and electrical distribution enclosure.

   Cross below Kuhio Highway via horizontally drilled casing.



LEGEND

- SAND FORMATION
- WATER
- GOLF HOLE
- BURIAL LOCATION
- VEGETATION ZONE
- FAIRWAY

FILE: C:\CAD\2172-02\17202F04

BASE MAP REFERENCE: INTERNATIONAL ARCHALOGICAL RESEARCH INSTITUTE, INC.

0 300' 600'
SCALE IN FEET

N

Figure 2
Project Alignment Plan

Convey wastewater via forcemain at the perimeter of the Wailua Golf Course to the existing County Sewer Manhole (SMH) No. 6 located makai of the Kaha Lani Condominiums, and 12-inch gravity sewer to the Wailua STP.

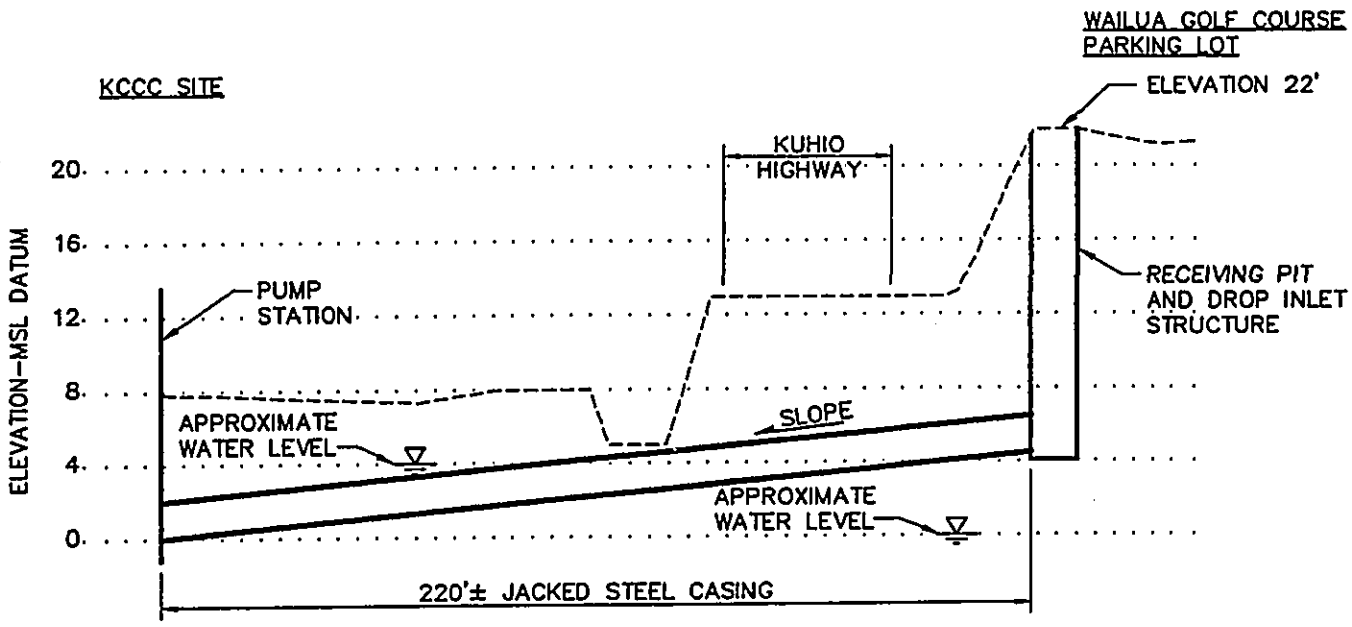
Close and remove existing cesspools.

The KCCC site is located in an area subject to flooding. Flood flow elevations from high mountain discharge up gradient of the site and the Wailua River have been determined by HUD and FEMA to be Zone A, an area inundated by a 100 year storm (Panel N-140 dated 3-4-87). Existing ground elevations in the vicinity of the Pump Station vary from 6 to 8 feet above mean sea level. The finish floor elevation of the pump station has been set at elevation 14.0 with no penetrations below 12.0 . **A drainage report was prepared for the project by Imata & Associates, July, 1994 and the 100 year flood elevation at the pump station site was 11.60 feet, mean sea level datum, and the 500 year flood elevation was 11.75 feet, mean sea level and the finish floor of the existing correctional facility is at elevation 11.5, requiring sandbagging during rare 100 year flood events.**

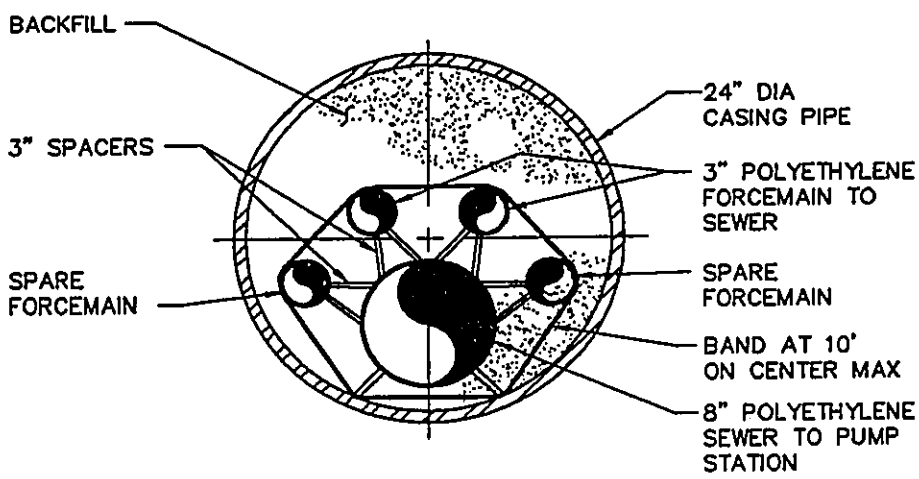
Forcemain: The forcemain between KCCC and Sewage Manhole No. 6 will consist of two 3-inch minimum polyethylene pipe lines. Two lines are provided for peak discharge or in the event that one line requires cleaning or maintenance. Normally, one forcemain will carry all wastewater flow. The alternate line will be maintained filled with water. Wet well controlled valving will automatically redirect flows to the alternate force main under high head (plugged line) conditions. Forcemain installation shall be limited to 2.0 feet of excavation in non-traffic areas wherever possible. Deeper excavations of not less than 4 feet will be limited to highways and traffic crossing areas.

KCCC Cesspool Closures: Following the Pump Station construction, testing and acceptance, the eleven existing cesspools serving the main KCCC building and auxiliary structures will be cut over to the Pump Station system , dewatered and residue sludge removed and disposed in accordance with Kauai County requirements. After cleaning, the cesspools will be filled and compacted to grade with granular material.

Kuhio Highway Crossing: Twin 3-inch force mains and an 8-inch gravity collector are to be located in a horizontal drilled 24-inch casing. Installed between a jacking pit and the pump station excavation, the casing will be filled with blown sand after installation and closed with grout to prevent groundwater infiltration. Clearance between the crown of the casing and any part of Kuhio Highway will not be less than four feet.



HIGHWAY CROSSING PROFILE
NO SCALE



CASING SECTION
NO SCALE

FILE: C:\CAD\2172-02\17202F03

Figure 3
Microtunnel Crossing Under Kuhio Highway

Operation and Maintenance: KCCC staff or contracted operators will maintain and operate the on-site pump station and associated facilities with the joint use force main. Perpetual easements for both Kauai County Land Department and State of Hawaii Department of Public Safety will be required through the Wailua Golf Course and on the KCCC grounds for maintenance access.

4. Golf Course Facilities:

Construct a gravity sewer from the Wailua Golf Course Club House facilities, and convey the raw sewage under Kuhio Highway to the KCCC Pump Station.

Close and remove all cesspools at the WGC concurrent with forcemain operations.

Gravity sewer : Sewage from the WGC will be conveyed to the KCCC pump station in an 8-inch sewer passing within the Kuhio Highway crossing. Because of the required depth of the highway crossing , a portion of the sewer alignment will lie below the hydraulic water surface of the KCCC pump station. Access manholes for the sewer are required at 200 to 300 foot intervals. Manholes on the KCCC grounds and within the WGC parking lot will be located in areas of potential flooding, and consequently will be "pressure manholes" to prevent groundwater infiltration into the collection system. Fusion butt-welded polyethylene pipe is proposed for the gravity sewer to facilitate solids transport and pressure flushing, if required.

WGC Cesspool closure: Following the KCCC pump station construction, testing and acceptance, the existing cesspools serving the WGC will be cut over and dewatered with residue sludge removed and disposed at the County Landfill. After cleaning, the cesspools will be filled and compacted to grade with granular material.

Operation and Maintenance: Kauai County wastewater management staff will maintain its' gravity sewer facilities to the KCCC pump station wet well. Perpetual easements will be required through the KCCC site to the County of Kauai for its sewer maintenance access.

B. Social and Economic Characteristics

The proposed facility improvements to the KCCC and the WGC will remove a long standing use of cesspools for wastewater disposal. This will reduce the potential negative impacts to the Kauai coastal zone along the WGC and enable the expansion of the KCCC facility to accommodate overcrowding at the KCCC. Project costs are estimated at **$1.7 million**

dollars with a total construction time of approximately 12 months after award of contract. As a matter of concern, the Wailua Golf Course will be hosting the 1996 United States Public Links Tournament during July, 1996. It is of mutual advantage to the County as well as the State that all improvements be designed and completed 12 months prior to the start of the Tournament, or July, 1996.

C. Environmental Characteristics

Both the KCCC and WGC sites are improved sites with terrain alterations completed and in place for the current land uses. On site flora and fauna are not endangered or protected, and have been installed for aesthetic enhancement (WGC) or minimum maintenance (KCCC). Existing terrain or topographical features are level or nearly level, with the exception being the WGC, which is undulating and sloping to accommodate the recreational use, i.e. golf.

III. AFFECTED ENVIRONMENT

A. Geographical Characteristics

1. Topography: Onsite topography is considered flat with the exception of the sewer line alignment at the perimeter of the WGC fairways to SMH No. 6. The terrain features will not present any construction difficulties since the basic facility structures will take place at the KCCC and WGC locations.

2. Soils: Both sites are defined as Mokuleia Fine Sandy Loam (Mr). "This soil occurs on the eastern and northern coastal plains of Kauai. It is nearly level and has a profile similar to Mokuleia clay loam, except for the texture of the surface layer." U.S. Dept. of Agriculture Soil Survey of the Islands of Kauai, Oahu, Molokai, Maui, and Lanai. Aug. 1972

3. Vegetation: Both sites have been landscaped with exotic or introduced species and these include common hibiscus; pink and white oleander; Bermuda grass, and coconut trees. There are no indigenous or protected plant species at the proposed construction sites.

B. Hydrological Characteristics

1. Drainage: Storm drainage occurs by sheet flow across the site and discharges to a drainage way paralleling Kuhio Highway. This existing drainage pattern will not be impacted by the proposed project improvements.

2. Coastal Zone Management Program: The proposed improvements will be an enhancement of current conditions with the closure of the cesspools and the elimination of wastewater effluent percolation into the coastal zone. The Project is also outside the Kauai County Special Management Area (SMA) and will not require a permit.

C. Biological Characteristics

1. Onsite fauna will not be impacted with the implementation of the planned improvements. The existing avifauna are introduced species which include the common Indian mynah; common gray dove; English sparrow; and red vented bulbul. Mammal species would include the common field mice, Norway rat, and the occasional feral dog and cat.

IV. SUMMARY OF MAJOR IMPACTS AND MITIGATIVE MEASURES

There are no major adverse impacts anticipated with the implementation of this proposed project. Lesser impacts are listed below and are as follows:

The temporary construction impacts will result in possible **air and noise quality impacts,** but these will be of short term and limited to construction activity related vehicles and equipment. The abatement controls are available to the contractor and he will be responsible for complying with the applicable State Dept. of Health regulations on Community Noise and Ambient Air quality.

Temporary and minor disturbances (play will not be interrupted) to golf course play will result during the installation of the sewer line within the Wailua Golf Course. Once the installation and landscaping repairs are completed, the play at WGC will resume without incident.

Potential soil runoff during construction can be prevented with a soil erosion control plan, and the contractor will be responsible to comply with the County requirements for soil and erosion control.

Traffic control of construction related activities, materials delivery, excavation or trenching equipment will be the contractor's responsibility to insure against traffic delays or interruption on Nehe Road or Leho Drive during normal construction hours.

Undetermined burials have been investigated in a specific study conducted by International Archaeological Research Institute, Inc. This study and the attendant results are being coordinated with the Historic Preservation Division, State DLNR and the Kauai Burial Council.
At this point the retained consultant has stated the following: " An intensive archaeological subsurface inventory survey was conducted for the proposed Kauai Community Correctional Center and the Wailua Golf Course sewer line route to the Wailua Sewage Treatment Plant in Wailua, Puna, Kauai. The subsurface testing resulted in the excavation of thirty nine trenches, placed at regular intervals along the nearly two kilometer alignment. One burial of unknown age and ethnic identity was encountered at the base of a large dune on the grounds of the Wailua Golf Course.
The burial possibly pertains to an existing site identified in 1931 by Bennet-Site 50-30-08-103, Dune Burials; however, osteological analysis will be needed to make a determination. The only other cultural material observed within the project area is historical in nature, the result of nearby agricultural activity and development projects.
Landscape change dominated the information content of stratigraphic profiles across the proposed sewer alignment. There was a visible shift from a landscape of dunes, wetlands, alluvium, and lava flows to one in which agricultural activity becomes

the predominant agent of change, replacing some earlier land forms, impacting others, and obscuring boundaries.
The significance of the burial discovered during the project work cannot be determined until additional analyses are completed. The age, ethnicity, and context of the burial, as well as it's relationship to Site 50-30-08-103, require clarification. With respect to the actual sewer line construction, the presence of the burial, in addition to the co-occurrence of buried utility lines along many segments of the sewer line route, indicates the need for an archaeological monitor throughout the duration of the project excavation work. If the discovered interment cannot be avoided, then additional archaeological exploration, analysis, and possible data recovery are recommended in the immediate vicinity of the burial, with all work coordinated, as appropriate with the Kauai Burial Council and the State Historic Preservation Division." **(Page iii of Abstract from 'Dune Burials and Landscape Change: Archaeological Subsurface Testing Inventory Survey, Kauai Community Correctional Center and Wailua Golf Course Sewage Force Main Project, Wailua, Kauai. April, 1994.)**

Further work on this aspect of effort has been developed and discussed in principle with the Kauai Burial Council and the State Historic Preservation Division, Department of Land and Natural Resources. The further work consists of a **Burial Treatment Plan** (June, 1994, International Archaeological Research Institute, Inc.) which deals with the discovery of a human burial by IARII during archaeological testing of the proposed route for a new sewage force main to be installed by DAGS in Wailua, Kauai. This discovery has prompted in turn the development of the Burial Plan. The subject Burial Plan is attached in it's entirety as an exhibit for public review. The Plan should not be considered final or conclusive in it's findings; it is provided as an example of the uncertainties that may be encountered during the balance of the sewer force main excavation process. It also supports previous recommendations that an archaeological monitor be employed during the duration of the project excavation work. Further, the discussions with the Kauai Burial Council have been productive in the sense that disclosure of this finding has resulted in continued discussion, and more importantly, the opportunity to treat future discoveries with appropriately solemn practices as stipulated by HRS 6E. Alignment shifts for the proposed excavation have been made and continuous attention to the prospect of future discoveries are now included in the process of constructing the proposed sewer force main and transmission line.

In summary, the long term beneficial impacts will outweigh the temporary construction related impacts to the ambient air and noise levels. These include: the closure of existing cesspools and the cessation of discharging approximately 24,000 to 37,000 gpd of unreclaimed sewage into the ground. This volume of wastewater will now be treated at the Wailua STP and reclaimed for irrigation use at the WGC. Beyond the temporary physical impacts normally associated with site excavation, construction equipment, and transport of building materials, the single potentially significant impact will the historic-archaeological impact of cultural and ethnic discoveries along the alignment. The studies prepared to date, have been reviewed

and discussed with the Kauai Burial Council and the State Historic Preservation Division, State Department of Land and Natural Resources as an ongoing process.

V. ALTERNATIVES CONSIDERED

1. The "Do-Nothing" or status quo alternative was considered and discarded in view of the Department of Health policy to discontinue cesspool usage and the availability of funds to treat and recycle the sewage from both the KCCC and WGC facilities for irrigation purposes.

2. Small package treatment plants onsite at each facility was also considered and discarded. This is due to the historically poor record of treatment plants to function efficiently. The recycling potential for golf course irrigation and the close proximity of the end user made this proposed project the most cost efficient and environmentally beneficial alternative.

VI. DETERMINATION, FINDINGS, AND REASONS SUPPORTING DETERMINATION

After completing an assessment of the potential environmental effects of the project's implementation, and evaluating the long term future impacts of the project, it has been determined that an Environmental Impact Statement (EIS) is not required. Reasons supporting the determination are as follows, using as the criteria, the policy, guidelines, and provisions of Chapters 342, 343, and 344 Hawaii Revised Statutes.

1. The proposed project will not adversely affect the physical and social environment.

2. There will be no permanent degradation to the ambient air and noise quality or levels.

3. No residences or businesses will be disrupted or affected by the proposed project's implementation.

4. There are no endangered plant or animal species at the construction sites.

5. There are undetermined burials possibly located on the WGC site. The Department of Land and Natural Resources, State Historic Preservation Division, is coordinating the specific studies and attendant project mitigation measures necessary to determine the extent of these burials. The Kauai Burial Council will also be a consulted party insofar as the final disposition of the burials. Appropriate measures to insure compliance with HRS 6E will be taken by State and County agencies.

6. There are no significant or adverse secondary impacts on population, and future development due to the proposed project. The KCCC facility will be allowed to increase its capacity due to this project.

7. This assessment will be reviewed by government agencies, community and private citizens, in accordance with Act 241, HRS. The Preliminary Agency consultation process has been completed and the Draft Environmental Assessment in anticipation of a Negative Declaration will be published in the OEQC Bulletin.

VII. LIST OF PREPARERS

Thermal Engineering Corp.
Parametrix, Inc.
International Archaeological Research Institute, Inc.

VIII. LIST OF AGENCIES CONSULTED DURING THE PREPARATION OF THE ENVIRONMENTAL ASSESSMENT

ORGANIZATIONS AND AGENCIES

Agency	Date of Consultation November 6, 1992	Date Comment Received
State of Hawaii		
Office of State Planning		
Department of Land and Natural Resources		
Division of Land Management		12-11-92
Chairman - BLNR		12-15-92
State Historic Preservation Division		11-30-92
State Department of Health, Kauai District Office		11-27-92
State Department of Transportation		
Highways Division		11-23-92
County of Kauai		
Planning Department		12-03-92
Department of Public Works, Division of Engineering		1-05-93
Department of Water Supply		11-17-92
Office of Economic Development		

Parametrix, Inc.
Consulting Engineering and Environmental Science
1164 Bishop Street, Suite 1600 Honolulu Hawaii 96813
808-524-0594 • Fax 808-523-2995

March 19, 1993

Mr. Kiyoji Masaki, Chief
Division of Engineering
Department of Public Works
County of Kauai
3021 Umi Street
Lihue, HI 96766

Dear Mr. Masaki,

Subject: Draft Environmental Assessment for proposed Kauai Community Correctional Center Sewage ForceMain DAGS Job No. 14-27-5719

We have received your agency's comments dated January 5, 1993 and we respond as follows:

a. We will delete governmental nomenclature as to source of sewage.

b. The final alignment of the force main will need to be reviewed and approved by the County golf Course administration, State DOH, Kauai Burial Council, State DLNR, and the County Department of Public Works. Affected irrigation lines will be considered in the final alignment selected.

c. Figure 2 will be revised to reflect the accurate location of the connection manhole within the grounds of the Kaha Lani Condominiums.

d. Thank you for your information on the HUD and FEMA updates as per panel N-140 of the FIRM dated march 4, 1987. We will revise the narrative references accordingly, and also, the commensurate flood studies and building plans will be submitted for review and acceptance by the County DPW.

e. References to the acceptance or approved disposal of dewatered and residue sewage sludge will be revised on pp. 3 and 5.

f. Kuhio Highway minimum cover will be in accordance with the State DOT, Highways as well as County DPW. Corrections on page 4 will be made to reflect the four foot minimum coverage depth.

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g. Cesspools to be used for emergency overflow would be subject to the review and approval by the State Department of Health. The request can be made, but final determination will be by the State DOH.

h. The page 5 reference of $1.5 million is only for the Sewage ForceMain project and the KCCC expansion is prepared under a separate budget program.

Thank you for your continuing cooperation and timely response.

Very truly yours,
Parametrix, Inc.

Robert W. Purdie, Jr.
Project Manager

2/72
21-2??-02

JOANN A. YUKIMURA
MAYOR

COUNTY ENGINEER
TELEPHONE 245-3318

EDMOND P.K. RENAUD
DEP. COUNTY ENGINEER
TELEPHONE 245-3602

87-kccc

AN EQUAL OPPORTUNITY EMPLOYER
COUNTY OF KAUAI
DEPARTMENT OF PUBLIC WORKS
3021 UMI STREET
LIHUE, KAUAI, HAWAII 96766

January 5, 1993

PARAMETIX, INC.
1164 Bishop Street, Suite 1600
Honolulu, HI 96813

ATTENTION: MR. ROBERT W. PURDIE, JR.

Gentlemen:

RE: DRAFT ENVIRONMENTAL ASSESSMENT FOR PROPOSED KAUAI COMMUNITY CORRECTIONAL CENTER SEWAGE FORCEMAIN

We have finally completed our review of the subject document and offer the following for your consideration:

a. The last sentence of the second paragraph on page 2 does not appear accurate with the reference to "County generated wastewater from both KCCC and WGC to the Wailua STP."

b. The alignment of the forcemain within the golf course will affect irrigation control lines. The final alignment must be resolved with the golf course persons.

c. The terminus of the forcemain shown in Figure 2 is not accurate. The connection manhole is located beyond Nehe Road within the grounds of Kaha Lani Condominiums.

d. The paragraph on flooding on page 3 indicates that flood elevations have not been determined by HUD and FEMA at this time. Panel H-140 of the Federal Insurance Rate Maps (FIRM) dated March 4, 1987 show the area inundated by the 100 year storm. The flood zoning is a Zone A. Flood studies must be done to determine flood elevations and the lowest floor must be at or above the determined 100 year flood elevation. The building plans must be stamped by either a structural engineer or architect registered in the State of Hawaii. The designer will also need to submit a structural certification.

e. KCCC cesspool closures, page 3: Dewatered and residue sludge that is removed will be disposed only at the County landfill. Dewatered sludge is not accepted at our treatment facilities. Also applies to page 5, WGC Cesspool closure.

f. The second sentence on page 4 indicates a minimum cover within Kuhio Highway of three feet. The minimum should be four feet.

g. Golf Course Facilities, page 4: The last sentence indicates that all cesspools will be closed and removed at the WGC. Would it be possible to maintain them for emergency overflow?

h. Social and Economic Characteristics, page 5: The project cost is estimated to be $1.5 million. Does this also include the KCCC expansion or only the SPS and forcemain project?

All improvements must be designed and construction completed by the July 1994 deadline.

Should you have any questions please contact Harry Funamura at 241-6616.

Very truly yours,

KIYOJI MASAKI, Chief
Division of Engineering

HF

cc: Mayor
Parks & Recreation

Parametrix, Inc.
Consultants in Engineering and Environmental Sciences
1164 Bishop Street, Suite 1600, Honolulu, Hawaii 96813
808-524-0594 • Fax 808-523-3955

March 19, 1993

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

Dear Mr. Hibbard,

Subject: Draft Environmental Assessment - Kauai Correctional Facility Sewage ForceMain Project, TMK: 3-9-05: 13, and 3-9-02 Wailua, Kauai, Hawaii

We are in receipt of your agency comments dated November 30, 1992 and we respond as follows:
In the period following your November 30, 1992 comment, the project has retained the services of Conrad Erkelens dba International Archaeological Research Institute, Inc. who has recently completed the first phase site survey. Also, there have been a series of meetings with your Kauai County archaeologist, Nancy McMahon, and Edward Ayau, Burial Program Coordinator. They have been in contact with the Kauai Burial Council and relaying back to DAGS, our prime contractor, Thermal Engineers, and the Corrections Department the Burial Council's feelings towards pursuing a recommended alignment through the Wailua Golf Course. The ongoing discussions have now reached the stage where DAGS will pursue the onsite investigation of an alignment that will be "clean" and will meet the Burial Council's approval.

Pending this second phase investigations, the proposed project will continue to pursue the economically cost effective alternatives of sewage collection, transmission, and treatment at the Wailua Sewage Treatment Plant. Your office will be kept apprised of the work progress so that all concerned parties are in agreement as to the final determination of alignment and installation of the sewage ForceMain.

Thank you for your continuing cooperation.

Very truly yours,
Parametrix, Inc.

Robert W. Purdie, Jr.
Project Manager

RECEIVED
DEC 0 2 1992
PARAMETRIX, INC.
HONOLULU

November 30, 1992

LOG NO: 6840
DOC NO: 9211NM13

MEMORANDUM

TO: Roger Evans, Administrator
OCEA

FROM: Don Hibbard, Administrator
State Historic Preservation Division

SUBJECT: Historic Preservation Review -- Draft Environmental Assessment for the Kauai Correctional Facility Sewage Forcemain Project (Parametrix, Inc.)
TMK: 3-9-05: 13 and 3-9-02
Wailua, Lihue, Kaua'i

We have reviewed the EA for the Kauai Correctional Facility Sewage Forcemain Project. The EA lacks information about significant historic sites in or near the project area. Our records show that several known burials sites exist in the Wailua Golf Course. We believe that this project could well have an "adverse effect" on significant historic sites. The EA should address this background information and the possibility that historic sites may exist in the project area.

It is stated in the EA that our office will be called if something is found (page 9). This is not an acceptable procedure for compliance with the State's historic preservation laws. It does not allow for adequate identification of significant historic sites in the project area, and if such sites are present, it does not allow for suitable and timely mitigation planning.

Since this project is a State project and since there is the possibility of burial sites and habitation deposits existing below the surface (based on prior work in the general area), in order to comply with Chapter 6E, (the State's historic preservation laws) an archaeological inventory survey with subsurface excavations must be done to determine if significant historic sites and burials are present. If such sites are not present, then a "no effect" determination can be given. If such sites are present, then acceptable mitigation plans

must be devised in order for our department to give a "no adverse effect determination". The copy of the survey report must be sent to our Division for review.

If you have any questions, please contact Ms. McMahon, our staff archaeologist for the County of Kauai, at 587-0006. We will be glad to assist the agency to understand the steps of the process, so they can get this historic preservation work done in a timely fashion.

NM:sty

bcc: R. Purdie, Parametrix, Inc.

Parametrix, Inc.
Consultants in Engineering and Environmental Sciences
1164 Bishop Street Suite 1600 Honolulu Hawaii 96813
808-523-0594 • Fax: 808-523-2995

March 19, 1993

Mr. Keith Ahue, Chair
Board of Land and Natural
Resources
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Ahue,

Subject: Draft Environmental Assessment for the Kauai Community Correctional Center Sewage Force Main DAGS Job. No., 14-27-5719

We have received your department comments dated December 15, 1992 and we respond as follows:

Specific responses to the concerns expressed regarding historic sites and particularly references to undetermined burials have been the subject of serious discussion with Nancy McMahon, Edward Ayau, and the project's retained archaeologist, Conrad Erkelens. We attach a copy of this advice for Sam Lemmo's information and files.

Regarding the preparation and processing of a CDUA, DAGS will advise whether they will undertake this process. We will assist in any way possible.

Thank you for your continuing interest and cooperation.

Very truly yours,
Parametrix, Inc.

Robert W. Purdie, Jr.
Project Manager

1

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DEC 16 1992

PARAMETRIX, INC.

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

WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
DEPUTIES
JOHN P. KEPPELER, II
DONA L. HANAIKE
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION PROGRAM
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF:OCEA:SKK

FILE NO.: 93-265
DOC. NO.: 1880

DEC 15 1992

Mr. Robert W. Purdie, Jr.
Parametrix, Inc.
1164 Bishop Street, Suite 1600
Honolulu, Hawaii 96813

Dear Mr. Purdie:

SUBJECT: Environmental Assessment for the Kauai Correctional Center Sewage Force Main Project at Wailua, Kauai

Thank you for giving our Department the opportunity to comment on this matter. We have reviewed the materials you submitted and have the following comments.

We have reviewed the EA for the Kauai Correctional Facility Sewage Forcemain Project. The EA lacks information about significant historic sites in or near the project area. Our records show that several known burial sites exist in the Wailua Golf Course. We believe that this project could well have an "adverse effect" on significant historic sites in the project area, and if such sites are present, it does not allow for suitable and timely mitigation planning.

It is stated in the EA that our office will be called if something is found (page 9). This is not an acceptable procedure for compliance with the State's historic preservation laws. It does not allow for adequate identification of significant historic sites in the project area, and if such sites are present, it does not allow for suitable and timely mitigation planning.

Since this project is a State project and since there is the possibility of burial sites and habitation deposits existing below the surface (based on prior work in the general area), an archaeological inventory survey with subsurface excavations must be done to determine if significant inventory survey with subsurface excavations must be done to determine if significant historic sites and burials are present. This must be done to comply with the State's Historic Preservation Laws (Chapter 6E). If such sites are not present, then a "no effect" determination can be given. If such sites are present, then acceptable mitigation plans must be devised in order for our department to give a "no adverse effect determination". The copy of the survey report must be sent to our Division for review.

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To Jeff Overfield	From Bob Purdie, Jr.
Co.	Co.
Dept.	Phone #
Fax #	Fax #

If you have any questions regarding historic preservation, please contact Ms. McMahon, our staff archaeologist for the County of Kauai, at 587-0006. We will be glad to assist the agency to understand the steps of the process, so they can get this historic preservation work done in a timely fashion.

In addition, the draft EA does not discuss the effects of the proposed activities relative to Conservation District Rules and Regulations (Title 13, Chapter 2, Hawaii Administrative Rules).

Any new, greater, or different use of land within the Conservation District requires a Conservation District Use Application and the approval of the Board of Land and Natural Resources (BLNR). You must indicate whether a CDUA will be submitted for the proposed improvements.

Thank you for your cooperation in this matter. Please feel free to call Sam Lemmo at our Office of Conservation and Environmental Affairs, at 587-0377, should you have any questions.

Very truly yours,

WILLIAM W. PATY

Parametrix, Inc.
Consulting Engineering and Environmental Science
1164 Bishop Street, Suite 1601, Honolulu, Hawaii 96813
808-524-0554 • Fax 808-533-2955

March 19, 1993

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

Dear Mr. Hibbard,

Subject: Draft Environmental Assessment - Kauai Correctional Facility Sewage ForceMain Project, TMK: 3-9-05: 13, and 3-9-02 Wailua, Kauai, Hawaii

We are in receipt of your agency comments dated November 30, 1992 and we respond as follows:
In the period following your November 30, 1992 comment, the project has retained the services of Conrad Erkelens dba International Archaeological Research Institute, Inc. who has recently completed the first phase site survey. Also, there have been a series of meetings with your Kauai County archaeologist, Nancy McMahon, and Edward Ayau, Burial Program Coordinator. They have been in contact with the Kauai Burial Council and relaying back to DAGS, our prime contractor, Thermal Engineers, and the Corrections Department the Burial Council's feelings towards pursuing a recommended alignment through the Wailua Golf Course. The ongoing discussions have now reached the stage where DAGS will pursue the onsite investigation of an alignment that will be "clean" and will meet the Burial Council's approval.

Pending this second phase investigations, the proposed project will continue to pursue the economically cost effective alternatives of sewage collection, transmission, and treatment at the Wailua Sewage Treatment Plant. Your office will be kept apprised of the work progress so that all concerned parties are in agreement as to the final determination of alignment and installation of the sewage ForceMain.

Thank you for your continuing cooperation.

Very truly yours,
Parametrix, Inc.

Robert W. Purdie, Jr.
Project Manager

Parametrix, Inc.
Consultants in Engineering and Environmental Sciences
1164 Bishop Street Suite 1600 Honolulu Hawaii 96813
808-524-0594 • Fax 808-523-2995

March 19, 1993

Mr. W. Mason Young
Division of Land Management
Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Young,

Subject: Draft Environmental Assessment for the Kauai Community Correctional Center Sewer ForceMain DAGS Project No. 14-27-5719

We have received your agency comments dated December 11, 1992 and we respond as follows:

All appropriate land use policy approvals that will require the Land Board approval, as well as Governor Waihee's concurrence, will be prepared and processed by the applicant, Department of Accounting & General Services. Your continuing interest and cooperation are appreciated.

Very truly yours,
Parametrix, Inc.

Robert W. Purdie, Jr.
Project Manager

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JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF LAND MANAGEMENT
PO BOX 621
HONOLULU, HAWAII 96809

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION PROGRAM
LAND MANAGEMENT
STATE PARKS
WATER RESOURCE MANAGEMENT

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DEC 16 1992
PARAMETRIX, INC.

93-265

Ref.:LM-GM

DEC 11 1992

KA-92:1318

MEMORANDUM

TO: Mr. Roger Evans, Administrator
Office of Conservation and Environmental Affairs

ATTN: Mr. Sam Lemmo, Planner

FROM: W. Mason Young, Administrator
Land Management Division

SUBJECT: EA for the Kauai Correctional Center Sewage Forcemain Project, Hailua, Kauai

According to our inventory records, the site of the Kauai Community Correctional Center (KCCC) which is identified as Tax Map Key: 3-9-05:13 on the above subject draft EA is state-owned and encumbered by Governor's Executive Order No. 3168 to the Department of Social Services and Housing for a correctional facility.

Accordingly, the on-site improvements planned for KCCC that are disclosed on page one of the subject EA will require the Land Board's approval in granting easements for their purposes. Also, as the subject site is encumbered by executive order, the Governor's concurrence must be obtained.

Should you have any questions, please contact Mr. Gary Martin at 587-0414.

Thank you for this opportunity to comment on the above.

W. MASON YOUNG

cc: Kauai Land Board Member
Kauai District Land Office

Parametrix, Inc.
Consulting Engineering and Environmental Science
1164 Bishop Street Suite 1600 Honolulu, Hawaii 96813
808-524-0594 • Fax 808-523-2995

March 19, 1993

Mr. Raymond H. Sato
Department of Water
County of Kauai
P.O. Box 1706
Lihue, HI 96766-5706

Dear Mr. Sato,

Subject: Draft Environmental Assessment for the Kauai Community Correctional Center Sewage ForceMain project. DAGS Job No. 14-27-5719

Thank you for your timely response of "No Comment" dated November 17, 1992 on the above proposed project. Your prompt attention is greatly appreciated.

Very truly yours,
Parametrix, Inc.

Robert W. Purdie, Jr.
Project Manager

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NOV 16 1992
PARAMETRIX, INC.

DEPARTMENT OF WATER
COUNTY OF KAUAI
P.O. BOX 1706
LIHUE, HAWAII 96766-5706
FAX NO. 245-5813

November 17, 1992

Mr. Robert W. Purdie, Jr.
PARAMETRIX, INC.
1164 Bishop Street, Suite 1600
Honolulu, HI 96813

Re: Draft Environmental Assessment for the Kauai Community Correctional Center Sewage Forcemain Project, Wailua, Kauai

We reviewed the draft environmental assessment for the subject project and have no comments to offer at this time.

Thank you for the opportunity to comment.

Raymond H. Sato
Manager and Chief Engineer

WH:rm

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Parametrix, Inc.
Consulting Engineering and Environmental Services
1164 Bishop Street Suite 1600 Honolulu, Hawaii 96813
808-524-2552 • Fax 808-523-2995

March 19, 1993

Mr. Clyde Takekuma
Kauai District Health Office
Department of Health
3040 Umi Street
Lihue, HI 96766

Dear Mr. Takekuma,

Subject: Kauai Community Correctional Center New Sewer Line
DAGS Job No. 14-27-5719

We have received your agency's comments dated November 27, 1992 and respond as follows:

1. All final construction plans will be submitted for review and approval to your Kauai District Health Department Office.

2. The final location of the failure local alarm service will be selected in conjunction with the operators of the facility. At the present time, the County Department of Public Works and/or the KCCC staff will be working on which agency will serve in this capacity.

3. All fugitive dust and construction related emissions will be the responsibility of the contractor to comply with the Chapter 11-60, Air Pollution Control, Title 11, Chapter 200 Administrative rules.

4. Contractor will also be responsible to comply with the Chapter 11-55, Water Pollution Control, and Chapter 11-54, Water Quality Standards, Title 11, State Administrative Rules to insure that Best management practices are employed during the construction of the sewer ForceMain.

5. Contractor will also be responsible for the compliance with Chapter 11-58, Solid Waste Management Control , Title 11, State Administrative Rules in terms of disposal of grub material, demolition waste, and construction waste in an approved manner.

6. If appropriate, the Contractor will also be responsible to obtain the applicable permits for the Department of Health for NPDES permits for storm water runoff, hydrostatic testing and dewatering.

Thank you for your continuing interest and cooperation.

Very truly yours,
Parametrix, Inc.

Robert W. Purdie, Jr.
Project Manager

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
KAUAI DISTRICT HEALTH OFFICE
3040 UKE STREET
LIHUE, HAWAII 96766

November 27, 1992

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Nov 30 8 56 AM '92
DIV. OF PUBLIC WORKS
DAGS

JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

DON METZLER, M.B.
U.S. SERVICES ADMINISTRATOR

DIVISION OF PUBLIC WORKS
TO: [illegible]
Staff P.W. Engr — Appraiser
P.W. Secy — Supt.
Staff Serv. Br — Info
Planning Br. — Fac
Proj. Mgmt. Br. — Serv
Design Br — Contracts
Insp. Br — Interest
Qual. Cont. Engr — Asst
Leasing Serv. Br.

Mr. Gordon Matsuoka
State Public Works Engineer
State of Hawaii
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaii 96810

Dear Mr. Matsuoka:

Subject: Kauai Community Correctional Center (KCCC)
New Sewer Line
D.A.G.S. Job No. 14-27-5719

Thank you for giving us the opportunity to review and comment on the subject matter. The following comments are submitted for your consideration.

1. The proposed project shall comply with the minimum applicable requirements of Chapter 11-62, Wastewater Systems, Hawaii Administrative Rules. The construction plans shall be forwarded to the Wastewater Branch of the the Department of Health for review and approval.

2. The pump station failure local alarm service should not be located at the Wailua Gold Course Maintenance Building where personnel are not present twenty-four (24) hours a day. The alarm service should be located at the KCCC or a county facility which have personnel on duty twenty-four (24) hours a day.

3. In accordance with Chapter 11-60, Air Pollution Control, Title 11, State Administrative Rules, the property owner/developer shall be responsible for ensuring that effective control measures are provided to minimize or prevent any visible dust emission caused by the construction work from impacting the surrounding areas including the off-site roadways used to enter/exit the project. These measures include but are not limited to the use of water wagons, sprinkler systems, dust fences, etc.

6. In accordance with Chapter 11-55, Water Pollution Control and Chapter 11-54, Water Quality Standards, Title 11, State Administrative Rules, the property owner/developer shall be responsible for ensuring that the best management practices (BMP) is provided to minimize or prevent the discharge of sediments, debris, and other water pollutant into state waters. The owner or developer is advised to check with the Army Corp of Engineer for any permit that may be required.

7. In accordance with Chapter 11-58, Solid Waste Management Control, Title 11, State Administrative Rules, the property owner/developer shall be responsible for ensuring that grub material, demolition waste and construction waste generated by the project are disposed of in a manner or at a site approved by the State Department of Health. Disposal of any of these wastes by burning is prohibited.

8. The property owner/developer shall be responsible for obtaining all applicable permits from the Department of Health including but not limited to National Pollution Discharge Elimination System (NPDES) permits for storm water, hydrostatic test and dewatering prior to commencing construction.

9. Due to the general nature of the application submitted, we reserve the right to implement future environmental health restrictions when more detailed information is submitted.

Should you have any questions, please do not hesitate to call me or Gerald Takamura at 241-3323.

Sincerely,

Clyde Takekuma

Clyde Takekuma
Environmental Health Program Supervisor
Kauai District Health Office

gt

Parametrix, Inc.
Consultants in Engineering and Environmental Sciences
1164 Bishop Street, Suite 1600 Honolulu Hawaii 96813
808-524-0594 • Fax: 808-523-2935

March 19, 1993

Mr. Jeffrey Lacey,Director
Planning Department
County of Kauai
4280 Rice Street
Lihue, HI 96766

Dear Mr. Lacey,

Subject: Draft Environmental Assessment for the Kauai Community Correction Center DAGS Job No. 14-27-5719

We have received your department comments dated December 3, 1992 and we will incorporate the references to the County Land Use and Zoning designations in the appropriate narrative sections of the E.A. document. DAGS will be maintaining contact with the DLNR as to the preparation and processing of the CDUA, and also the contact with the DLNR Historic Sites Division.

Thank you for your continuing interest and cooperation.

Very truly yours,
Parametrix, Inc.

Robert W. Purdie, Jr.
Project Manager

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JOANN A. YUKIMURA
MAYOR

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HONOLULU

COUNTY OF KAUAI
PLANNING DEPARTMENT
4280 RICE STREET
LIHUE, KAUAI, HAWAII 96766

JEFFREY R. LACY
PLANNING DIRECTOR

DEPUTY PLANNING DIRECTOR

TELEPHONE (808) 245-3919

December 3, 1992

Mr. Robert W. Purdie, Jr.
Parametrix, Inc
1164 Bishop street Suite 1600
Honolulu, HI 96813

RE: Kauai Community Correction Center (KCCC) Sewage Forcemain Project, Wailua, Kauai

Dear Mr. Purdie,

The part of the project on the KCCC side is land zoned Agricultural and can be considered an accessory structure and use, and thus requires a non-hearing permit from the Planning Department.

The project does not fall within the SMA and therefore does not need an SMA review.

This is a permitted use within the State Land Use, and does not require a special permit.

The major part of the project is makai of Kuhio Highway in the Conservation district. You should consult the Department of Land and Natural Resources relative to permit requirements within the Conservation District and contact the Division of Historic Sites, DLNR, for their roview.

Thank you for the opportunity for early comment. Please call us with any questions at 245-3919.

Yours truly,

JEFFREY LACY
Planning Director

cc: Mayor
DLNR

22-7172-02

Parametrix, Inc.
consultants in engineering and environmental sciences
1164 Bishop Street, Suite 1600, Honolulu, Hawaii 96813
808-521-0200 • Fax 808-523-2005

November 30, 1992

Mr. Rex D. Johnson, Director
Department of Transportation
869 Punchbowl Street
Honolulu, HI 96813

Dear Mr. Johnson,

We are in receipt of your agency comments dated November 23, 1992 on the pre-agency Environmental Assessment prepared for the Kauai Community Correctional Center, Sewage Force Main Project. We have been in contact with your Kauai County District Engineer on the project and will provide final construction drawings for review and approval by the Highways Division as the project is cleared by the County Council and other reviewing groups.

Thank you for your continuing interest and cooperation.

Very truly yours,

Robert W. Purdie Jr.

Robert W. Purdie, Jr.
Project Manager

22-2172-02

JOHN WAIHEE
GOVERNOR

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

REX D. JOHNSON
DIRECTOR

DEPUTY DIRECTORS
JOYCE T. OMINE
AL PAHO
JEANNE H. SCHULTZ
CALVIN M. TSUDA

IN REPLY REFER TO:

HWY-PS
2.4642

November 23, 1992

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NOV 2 3 1992
PARAMETRIX, INC.

Mr. Robert W. Purdie, Jr.
Parametrix, Inc.
1164 Bishop Street, Suite 1600
Honolulu, Hawaii 96813

Dear Mr. Purdie:

Draft Environmental Assessment for the Kauai
Community Correctional Center Sewage Force Main Project
TMK: KCCC: 3-9-05: 13; WGC: 3-9-02, Island of Kauai

Thank you for your letter of November 6, 1992, transmitting the above document for our review and comments.

A construction permit from our Highways Division, Kauai District, is required prior to the installation of the sewer force mains which cross Kuhio Highway.

Sincerely,

for Rex D. Johnson
Director of Transportation

22-2172-02

Parametrix, Inc.
Consultants in Engineering and Environmental Sciences
1164 Bishop Street, Suite 1600 Honolulu, Hawaii 96813
808-524-0594 • Fax 808-523-2995

March 23, 1993
22-2172-02

John C. Lewin, MD., Director
Department of Health
P.O. Box 3378
Honolulu, HI 96801

Subject: DOH comments dated 12-7-92 on the Kauai Community Correctional Center Sewage Force Main Project and Wailua Golf Course Club House/Maintenance Shed
Wailua, Kauai, HI

Dear Dr. Lewin:

Thank you for your agency comments and we respond as follows:

1. Wastewater

Your department position on all wastewater treatment and disposal being connected to the public systems has been duly noted, with advice to the Kauai County Public Works by this response.

Thank you for your continuing interest and cooperation.

Sincerely,

Robert W. Purdie, Jr.
Project Manager

RWP:ljf

cc: Thermal Engineering Corp.

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JOHN WAIHEE
GOVERNOR OF HAWAII

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HONOLULU

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

JOHN C. LEWIN, M.D.
DIRECTOR OF HEALTH

In reply, please refer to:

December 7, 1992

92-412/epo

Mr. Robert W. Purdie, Jr.
Parametrix, Inc.
1164 Bishop Street, Suite 1600
Honolulu, Hawaii 96813

Dear Mr. Purdie:

Subject: Kauai Community Correctional Center (KCCC)
Sewage Force Main Project and Wailua Golf Course Club House/Maintenance Shed (WGC)
Wailua, Kauai
KCCC - TMK: 3-9-05: 13
WGC - TMK: 3-9-02

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

Wastewater

We have no objections to the proposed Kauai Community Correctional Center Sewage Forcemain Project at Wailua, Kauai, and the Wailua Golf Course Club House and Maintenance Shed. We prefer to see all wastewater connected to the public sewers.

The developer should work closely with the County to assure the availability of additional treatment capacity and adequacy for the project.

If you should have any questions on this matter, please contact Ms. Lori Kajiwara of the Wastewater Branch at 586-4290.

Very truly yours,

JOHN C. LEWIN, M.D.
Director of Health

c: Wastewater Branch
Kauai District Health Office

Parametrix, Inc.
Consultants in Engineering and Environmental Sciences
1164 Bishop Street, Suite 1600 Honolulu, Hawaii 96813
808-524-0594 • Fax 808 523-2995

March 23, 1993
22-2172-02

Mr. Wilfred N. Kimura
State of Hawaii
Department of Accounting and General Services
Kauai District Office
3059 Umi Street
Lihue, Hawaii 96766

Subject: Draft Environmental Assessment for the Kauai Correctional Center Sewage Forcemain Project at Wailua, Lihue, Kauai
Tax Map Keys: 3-9-05: 13 and 3-9-02

Dear Mr. Kimura:

We are in receipt of your agency's comments dated November 25, 1992 indicating "no comments to offer."

Thank you for your continuing interest and cooperation.

Sincerely,

Robert W. Purdie, Jr.
Project Manager

RWP:ljf

cc: Thermal Engineering Corp.

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DEC 03 '92 08:49 THERMAL ;INEERING 809 833-9179 P.5

JOHN WAIHEE
GOVERNOR

Robert P. Takushi
COMPTROLLER

Lloyd I. Unebasami
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
KAUAI DISTRICT OFFICE
3060 UMI STREET
LIHUE, HAWAII 96766-1800

LETTER NO. K-659.2

November 25, 1992

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Nov 27 8 38 AM '92
DIV. OF PUBLIC WORKS
DAGS

MEMORANDUM

TO: Mr. Gordon Matsuoka

FROM: District Engineer, Kauai

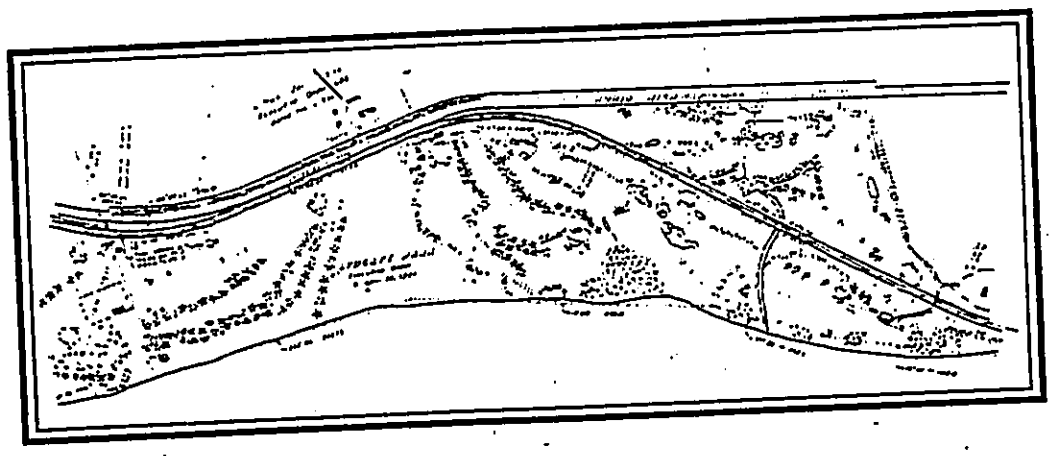
SUBJECT: Kauai Community Correctional Center
New Sewer Line
D.A.G.S. Job No. 14-27-5719

We have reviewed the Schematic Design Concept Submittal for the proposed Kauai Community Correctional Center Sewage Forcemain Project and have no comments to offer.

WILFRED N. KIMURA

DIVISION OF PUBLIC WORKS
TO: INITIAL FOR YOUR:
State P.W. Engr ___ Approval ___
P.W. Secty ___ Sign. ___
Staff Serv. Br ___ Info ___
Planning Br. ___ File ___
Proj. Mgmt. Br. ___ See me ___
Design Br ___ Comments ___
Insp. Br ___ Invest & Rept ___
Qual. Cont. Engr ___
Leasing Serv. Br. ___

Dune Burials and Landscape Change: Archaeological Subsurface Testing Inventory Survey, Kauai Community Correctional Center and Wailua Golf Course Sewage Force Main Project, Wailua, Kauai



by

Felicia Rounds Beardsley

International Archaeological Research Institute, Inc.

April 1994

EXHIBIT A

DUNE BURIALS AND LANDSCAPE CHANGE: ARCHAEOLOGICAL SUBSURFACE TESTING INVENTORY SURVEY, KAUA'I COMMUNITY CORRECTIONAL CENTER AND WAILUA GOLF COURSE SEWAGE FORCE MAIN PROJECT, WAILUA, KAUA'I

by

Felicia Rounds Beardsley, Ph.D.

Report submitted in partial fulfillment of:

Contract Number 35887
DAGS Job Number 14-27-5719 KCCC New Sewer Line

Division of Public Works
Department of Accounting and General Services
State of Hawai'i
1151 Punchbowl Street, Room 427
P.O. Box 119
Honolulu, Hawai'i 96810

International Archaeological Research Institute, Inc.
949 McCully Street, Suite 5
Honolulu, Hawai'i 96826

April 1994

This document is printed on acid-free, archival bond paper.
It is intended to be a long term record of the cultural heritage of Hawai'i.

ABSTRACT

An intensive archaeological subsurface inventory survey was conducted for the proposed Kaua'i Community Correctional Center and Wailua Golf Course sewer line route to the Wailua Sewage Treatment Plant, in Wailua, Puna, Kaua'i. The subsurface testing resulted in the excavation of 39 trenches, placed at regular intervals along the nearly 2 km long alignment. One burial of unknown age and ethnic identity was encountered at the base of a large dune on the grounds of the Wailua Golf Course.

The burial possibly pertains to an existing site identified in 1931 by Bennett – Site 50-30-08-103, Dune Burials; however, osteological analysis will be needed to make a determination. The only other cultural material observed within the project area is historical in nature, the result of nearby agricultural activity and development projects.

Landscape change dominated the information content of stratigraphic profiles across the proposed sewer alignment. There was a visible shift from a landscape of dunes, wetlands, alluvium, and lava flows to one in which agricultural activity becomes the predominant agent of change, replacing some earlier landforms, impacting others, and obscuring boundaries.

The significance of the burial discovered during the project work cannot be determined until additional analyses are completed. The age, ethnicity, and context of the burial, as well as its relationship to Site 50-30-08-103, require clarification. With respect to the actual sewer line construction, the presence of the burial, in addition to the co-occurrence of buried utility lines along many segments of the sewer line route, indicates the need for an archaeological monitor throughout the duration of project excavation work. If the discovered interment cannot be avoided, then additional archaeological exploration, analysis, and possible data recovery are recommended in the immediate vicinity of the burial, with all work coordinated, as appropriate, with the Kaua'i Burial Council and the State Historic Preservation Division.

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ACKNOWLEDGMENTS

The author wishes to thank the field crew for their hard work, dedication, and cooperation during the testing work. Chris Fadden directed the backhoe excavations, working closely with the backhoe operator, Earl Lemn; Roger Blankfein took photographs of the project area, cleaned trench walls, and drew the profiles during the first week of the testing; and Tim Coleman cleaned trench walls and drew profiles during the second week of testing. Our work would not have been possible were it not for the skill and artistry of Earl and his backhoe, which at times seemed to be a living extension of him.

Special thanks are also extended to Marvin Dye, who coordinated our excavations in the Wailua Golf Course parking lot and provided all the materials and labor needed. Alan Ziegler identified the small amount of bone material recovered from the trench walls; Rona Ikehara re-examined the bone fragments identified as possible human; Jerome Ward completed the palynological analysis; and Gail Murakami identified the small bits of charcoal collected from the trench walls. The comments of Ziegler, Ikehara, Ward, and Murakami are incorporated into Chapter VI of this report.

Additional thanks need to be extended to David Welch, Steve Athens, and Conrad Erkelens, all of whom provided useful comments during the initial days of preparation just prior to fieldwork and over the course of the project work. Roger Blankfein, in addition to working as a member of the field crew, also completed the drafting work seen in the following pages; he has been particularly patient with regard to the changes that inevitably come with an undertaking of this nature.

I: INTRODUCTION

In the last weeks of November 1993, International Archaeological Research Institute, Inc. (IARII) conducted an inventory survey with subsurface testing along the proposed Kaua'i Community Correctional Center (KCCC) and Wailua Golf Course (WGC) sewer line corridor. The project was conducted in advance of construction planned by the State of Hawai'i that would connect KCCC and WGC to the Kaua'i County sewer system and Wailua Sewage Treatment Plant. The proposed route, which generally follows Kuhio Highway, is the preferred alternative among several alternate routes recommended for facilities improvements at KCCC and WGC. It is intended to hasten abandonment of the long standing use of cesspools at these locations, as well as reduce potential adverse effects to the Kaua'i coastal zone and near shore groundwater, and facilitate the expansion of KCCC to accommodate the current overcrowding at that facility. The archaeological survey and testing was contracted by the Division of Public Works, Department of Accounting and General Services, State of Hawai'i, Contract Number 35887, in association with DAGS Job Number 14-27-5719 KCCC New Sewer Line. It consisted of a series of backhoe trenches (up to a total of 40) excavated along the length of the project corridor for the express purpose of determining if significant historic sites and burials are present in the proposed alignment, evaluating those resources, and making recommendations concerning their preservation, avoidance, and/or mitigation.

One burial was encountered in the course of the archaeological work, as well as other cultural material definitely historical in nature. The nature of the burial – its age, ethnicity, and circumstance or context – relative to the known Site 50-30-08-103, Dune Burials, remains unknown and requires further analysis in order to resolve this relationship. The additional discovered cultural material stands as mute testimony to the agencies of development and agricultural activity that have dominated the general area during the past century. These have produced a series of landscape changes with a shift from dunes, alluvium, wetlands, and lava flows to a landscape dominated by agricultural land with extant remnants of dunes, alluvium, and wetlands.

The fieldwork was conducted over an eight day period between 15 and 24 November 1993 by a team of three archaeologists and a backhoe operator under the field direction of Felicia Rounds Beardsley, Ph.D. Field assistants included Chris Fadden, B.A., Roger Blankfein, B.A. (16 to 19 November), Tim Coleman, B.A. (22 to 24 November), and Earl Lemn, the backhoe operator. David J. Welch, Ph.D., served as the principal investigator for this project and was on-site for the first day of fieldwork, 15 November. In all, a total of 30 person days of effort was expended on fieldwork for this project.

Project Area

The project corridor consists of a narrow alignment nearly 2 km long on the windward side of Kaua'i, roughly 2 km south of the Wailua River (Figs. 1, 2, 3). The alignment extends from the WGC clubhouse and KCCC, across (actually under) Kuhio Highway to a point on the seaward side of the highway within the WGC parking lot; it then proceeds north on a route parallel to the highway and generally stays within or just outside the vegetation screen between the highway and WGC. and is just within the fence line on the property of George Fernandes; the alignment then turns seaward on Leho Road, remaining on the north shoulder of the road to its intersection with Nehe Road; it continues seaward on Nehe Road, on the western shoulder of the road, for about 150 m where it then turns northward, crosses the road, and enters the grounds of the Kaha Lani condominium complex; it continues for another 95 to 100 m to the termination point at the existing Sewer Man Hole 6, which connects the sewer line with the Kaua'i County sewer system and the Wailua Sewage Treatment Plant. The alignment crosses a number of ownerships dominated by Kaua'i County and including the grounds of KCCC, WGC, and the road rights-of-way along Leho and Nehe Roads; the State of Hawai'i, which includes the land parcel leased to Mr. George Fernandes; and the Kaha Lani condominium complex, which partially encompasses the State of Hawaii's sanitary and sewer easement and the former Ahukini Terminal and Railway Company, Ltd., grant lands. All are within the traditional land unit comprising Wailua Ahupua'a, in the Puna district of Kaua'i, and covered by Tax Map Keys (TMK) 3-9-05: 13 (KCCC), 3-9-02 (WGC), and 3-09-06 (the Fernandes property, Leho and Nehe Roads, Kaha Lani).

The proposed sewer line project involves the design and construction of a sewage force main transmission and collection system that will collect raw sewage from KCCC and the WGC clubhouse and transport it to an existing County sewer and the Wailua Sewage Treatment Plant for appropriate treatment and disposal (Parametrix 1992), with a portion of the water probably reclaimed for irrigation use at WGC. Planned facilities improvements include sewage pump stations, sumps, and alarm systems, all of which are expected to facilitate an estimated increase in the average daily wastewater flows from both KCCC and WGC – increases are expected from the current 25,000 gallons per day (gpd) to about 39,000 gpd upon the expansion of KCCC. Construction plans include:

1) Installation of two parallel 3 inch diameter pipes to serve as the force main between KCCC and Sewer Man Hole 6 and placed within 1 m of the ground surface.

2) Installation of a horizontal 18 inch diameter casing in a tunnel drilled under Kuhio Highway between two jacking pits. The casing will be placed about 1.5 to 2 m below the surface of the highway; the jacking pits will be excavated to depths of about 3 to 4 m below surface on the KCCC side of the highway and to nearly 5 m on the WGC side of the highway.

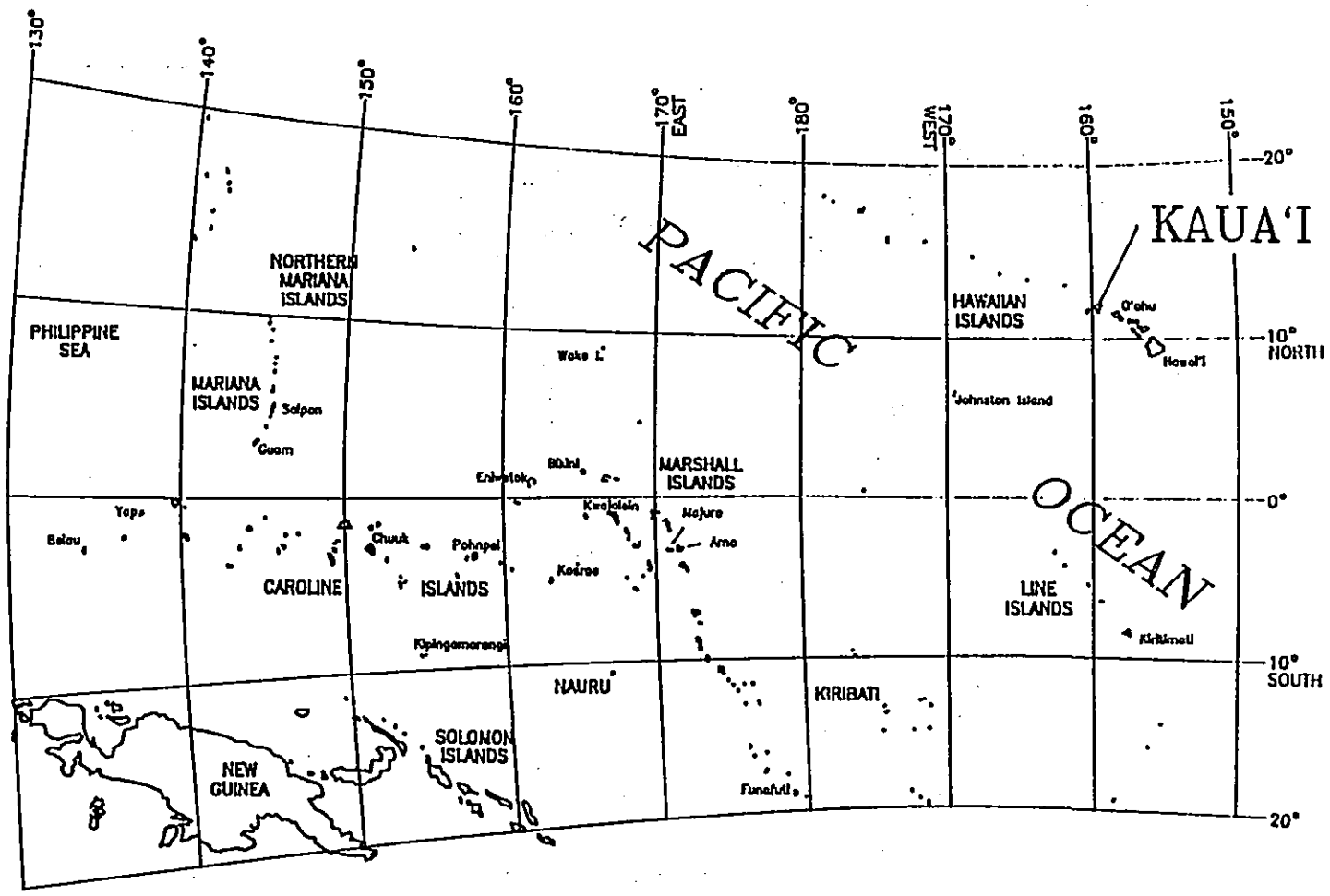


Figure 1. Location of the Island of Kauai in the Pacific Ocean.

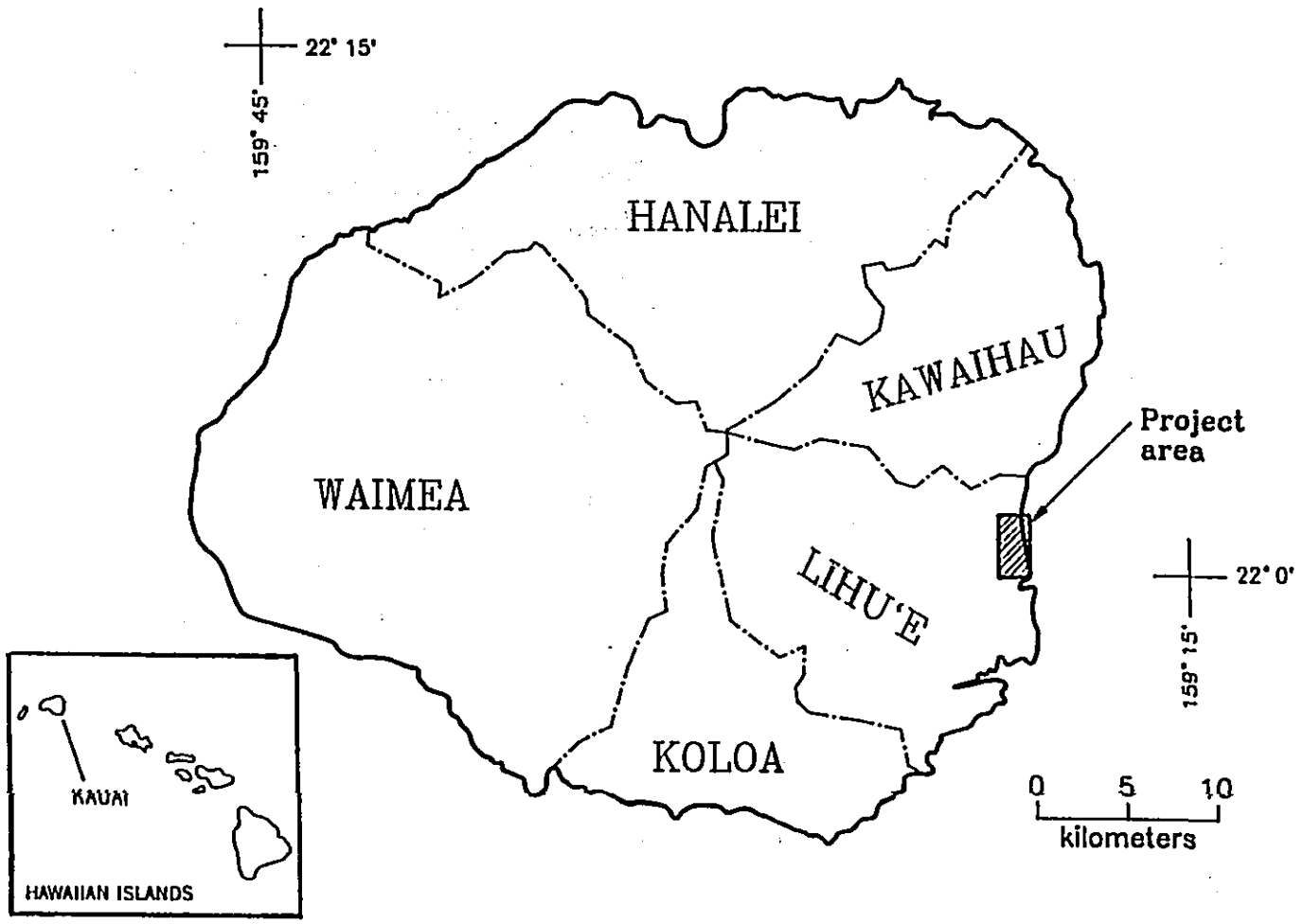


Figure 2. Location of the KCCC-WGC Sewer Line Project Area on the Island of Kauai.

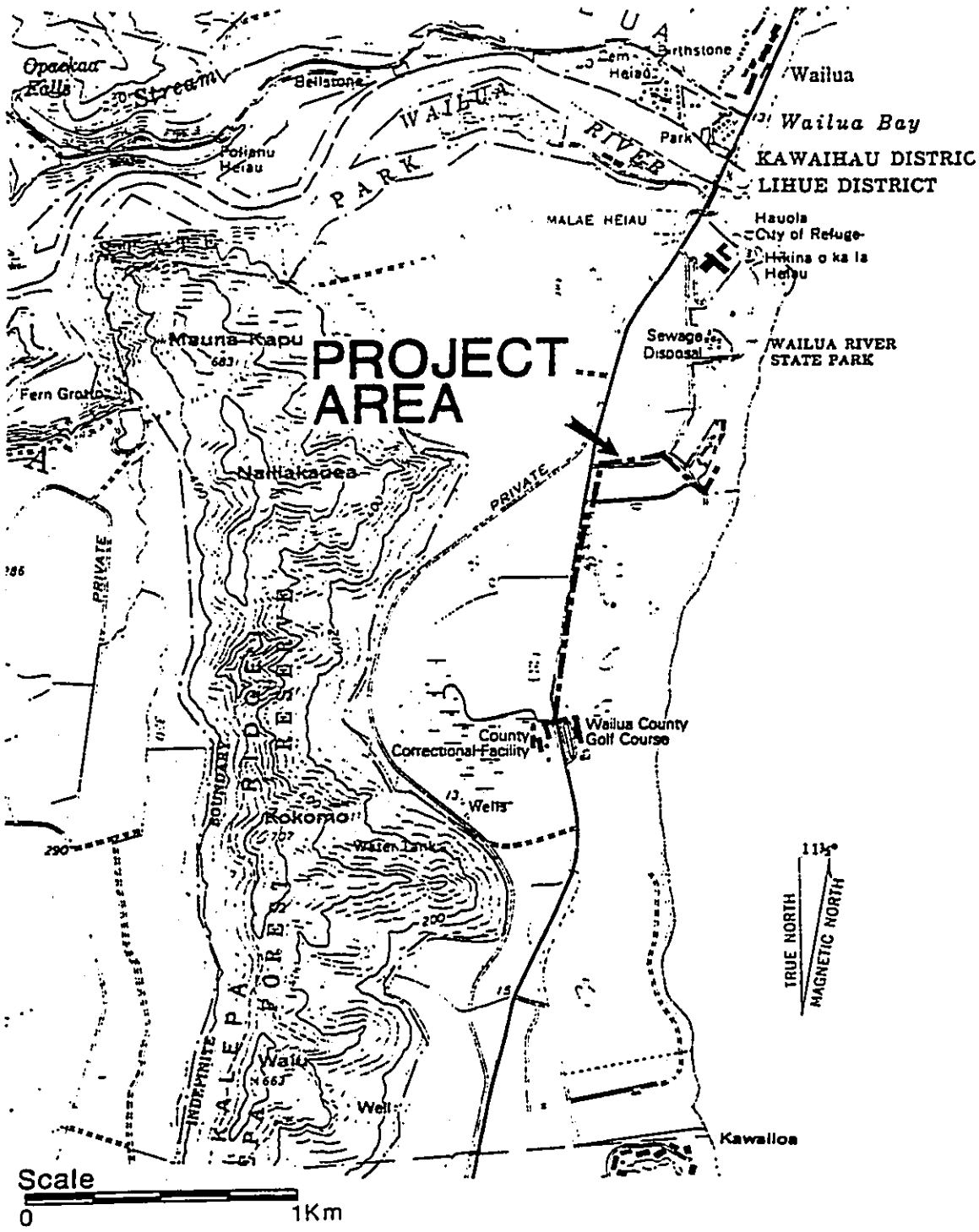


Figure 3. Location of the KCCC-WGC Sewer Line Project Area on USGS Map.

3) Installation of the planned facilities improvements listed above, including pressurized man holes on the grounds of KCCC and the WGC parking lot to prevent groundwater infiltration into the collection system.

4) Closure of the existing cesspools will then be closed, which will then be filled and compacted to grade.

Immediately prior to the archaeological work and other planning efforts such as soils analyses, the centerline of the sewer alignment was surveyed and marked with flagged wooden stakes at every turning point and at intervals of 60 m (200 ft) between the turning points. Excavation of the backhoe trenches for the archaeological testing and exploration were confined to the centerline alignment, or as close as possible given the hidden hazards of buried utility lines.

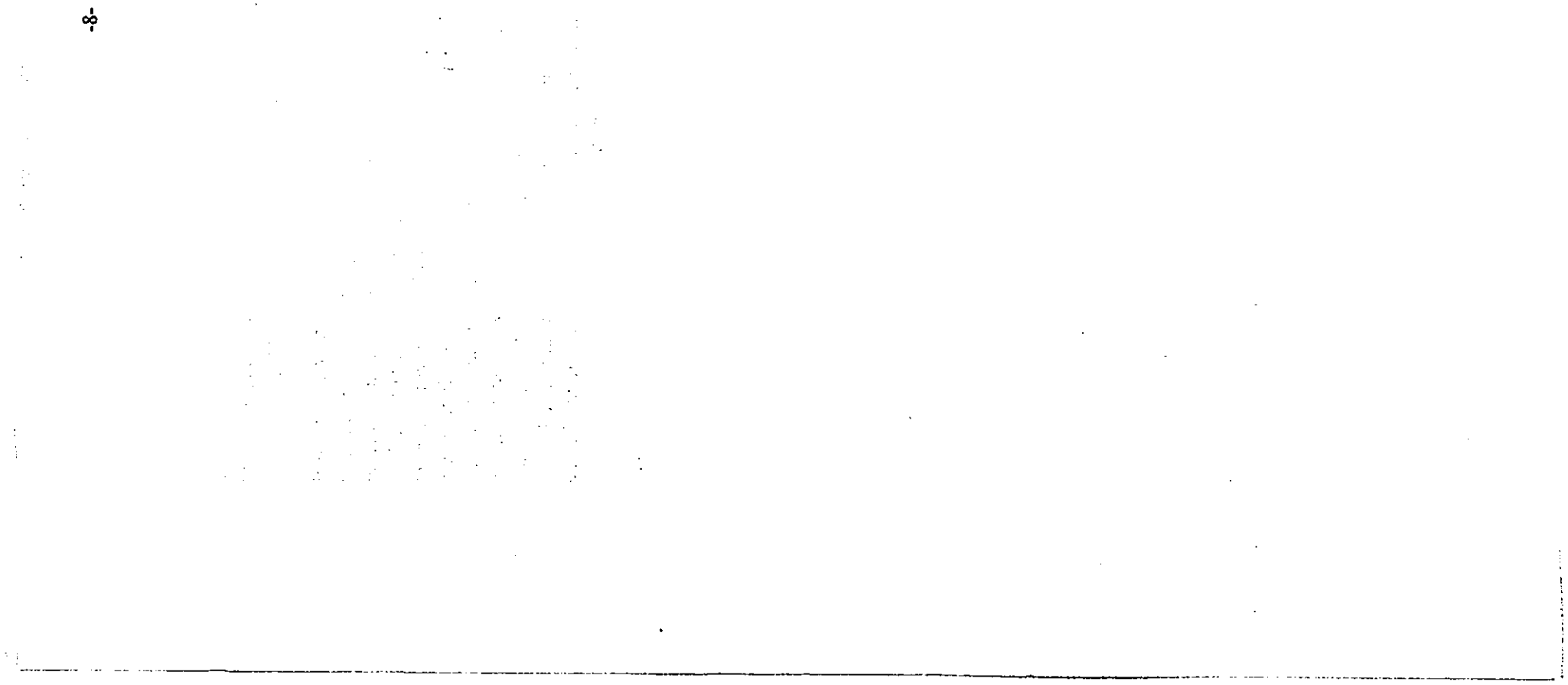
Research Objectives and Scope of Work

The scope of work for this project was set forth in the project contract and in the 4 August 1993 letter to Mr. Eric Nishimoto, Project Coordinator, at the Division of Public Works, DAGS. It is discussed in detail below, in Chapter IV, and will be only briefly summarized here. Essentially, the scope of work outlines the basic tenets and tasks to be completed in the field and the requirements and protocols in the event human remains are encountered during the course of fieldwork. It also lists the reporting requirements upon completion of the fieldwork. This includes a letter report within two weeks from the close of fieldwork summarizing the results of the field research and providing a preliminary evaluation of those results as well as recommendations concerning the need for preservation of sites, data recovery mitigation of adverse effects, and suggested changes in the route to avoid burials. Within two months of the fieldwork, a draft final report must be submitted for review by the State Historic Preservation Division (SHPD). This report is to provide a complete record of both a literature review and the fieldwork, placing them within the context of East Kaua'i archaeology, as well as a significance assessment of any sites found, and recommendations for preservation, data recovery mitigation, and avoidance. Naturally, all the testing, recording, evaluative, and documentary work will be conducted in accordance with the highest professional standards and in close coordination with the SHPD and the Kaua'i Burial Council.

The overall research objectives guiding this project range from generic questions of settlement patterns in Wailua Ahupua'a to more specific questions on prehistoric/early historic burial patterns, location, and context within sand dunes, landscape change, and geomorphology. Of relevance to the latter two are questions on the introduction of commercial agriculture, primarily sugarcane, and the associated sedimentation, progradation of the alluvial plain and its gradational contact with the dune land, as well as the ensuing implications for the ongoing geomorphological processes relevant to discussions of past human activity. In addition, consideration will be given to the structural changes precipitated

by the construction of Kuhio Highway, which has blocked the movement of the dunes and led to the formation of more humic sediments on the landward side of the highway.

IARII completed all tasks outlined in the scope of work, with the final task, the final report laid out in the succeeding pages. Part II presents a description of the general and specific environment of the project area. Part III provides background information, including summaries of the prehistoric and historic eras as well as the pervious archaeological work in the project area vicinity. It is intended to establish a context by which to view the current project work. Part IV outlines the field methods, modification, and schedule. Part V is a presentation of the fieldwork results, with a description of the excavations, each stratigraphic profile, and the dearth of cultural features and material exposed. Part VI summarizes the various analyses conducted on the collected material and discusses the stratigraphic correlation. Part VII, the final section, presents a summary of the project investigations, a discussion of the significance of the findings, and a series of recommendations for the succeeding construction work within the project corridor.



II: ENVIRONMENT

The Hawaiian archipelago is located in the Tropic of Cancer. in the north central Pacific between 154°49′ to 178°20′ west longitude and 18°55′ to 28°25′ north latitude. and extends over a distance of 2,400 km (1,500 mi) along a northwest-southeast trending axis. Kaua'i is one of eight major islands in the chain, all of which are confined to the eastern third of the island group; the remainder of the archipelago consists of over 100 smaller islets, reefs, and shoals, nearly all of which are included within the boundaries of the State of Hawai'i (only Midway is excluded from the state boundaries; it is administered by the United States Navy). Relative to other known geographic locations, Honolulu. the state capital and primary location reference, is 3,346 km (2,091 mi) southwest of San Francisco, over 5,600 km (3,500 mi) southeast of Tokyo, and over 7,369 km (4,600 mi) from Anchorage, Alaska. In relation to Honolulu, which is on the island of Oahu, Kaua'i is the next island to the northwest, across the deep, clear, 101 km (63 mi) wide Kaua'i Channel.

With a land area of 1,432 sq km (533 sq mi.), Kaua'i is the fourth largest island in the state. It lies at 159°35′ west longitude and 22°02′ north latitude, and is nearly circular with an east-west axis 53 km (33 mi) long and a north-south axis 40 km (25 mi) long. This subtropical high island is the oldest and most geologically complex of the eight major islands in the state. It is the summit of a basalt shield volcano built up through numerous eruptions from a rift in the ocean floor nearly 5 km below the surface, just like the other major islands in the chain; however, as volcanic activity has moved northwest to southeast in the Hawaiian arc, the position of Kaua'i as the northwesternmost island of all the major islands also makes it the oldest at roughly 3.3 to 5.6 million years (Macdonald and Abbott 1970: 268). Thin bedded pahoehoe and aa lava flows formed the surface of this shield cone, leaving it quite rugged. The actions of the wind, rain, sun, ocean waves, and streams subsequently weathered and eroded this surface, creating deeply dissected canyons, high peaks, steep cliffs, ridges, plateaus, valleys, alluvial fans, and coastal plains. And, as the Hawaiian Islands are near the northern limits of reef development, a coral reef nearly 0.5 km wide in places appears off-shore in a discontinuous ring around the island.

The north, west, and central part of the island is defined by canyons, high bluffs, steep mountain slopes that descend in jagged ridges, and the Alakai Swamp. The east and south sides of the island are characterized by gentle slopes cut by numerous gulches. The north and east sides support the majority of streams (this is also where the heaviest rainfall occurs), with their headwaters in the dense, massive rocks of the original caldera of the volcano that forms the island. With the rise and fall of the sea level over time, as well as the effects of isostasy, the lower portions of some river valleys were drowned, only to be refilled by sediments, while estuaries were formed in others. This has resulted in the formation of 11 distinctive bays from drowned river valleys and 15 streams with significant estuarine lower reaches (Grace 1974). Other geographic features of the island include a low sedimentary

coastal plain that extends westward from Waimea on the south end of the island; a coastline that, with the exception of the northwest section, is mostly low and rocky with scattered coral sand beaches; a narrow coastal shelf; the Waimea River, the longest river in Hawai'i at nearly 32 km (20 mi); Kawaikini Point, the highest point on the island with an elevation of 1,576 m (5,170 ft), near the center of the island; and Haupu Point, a dome shaped peak in the southeast part of the island, that reaches an elevation of 695 m (2,280 ft).

The climate has been described as unusually pleasant for the tropics (Grace 1974), with mild temperatures throughout the year. The average annual temperature ranges between 72° and 75° F near sea level, decreasing about 3° for every 305 m (1,000 ft) of elevation; although it tends to be higher in sunny dry areas like the leeward lowlands. At least three factors affect the weather of this region – the ocean and its moderating influence; the Pacific Anticyclone, a semi-permanent high pressure cell over this part of the Pacific, from which the trade winds flow; and the ruggedness of the topography, where each valley floor, slope, and steep sided ridge has its own local climate. There are only two seasons during the year – summer, from May to October, when the northeastern trade winds prevail and the weather tends to be warm and dry, and winter, from November to April, when the weather is cooler and wetter. August and September are the warmest months of the year; January and February are the coolest. On Kaua'i, the difference between summer and winter is slight – summer is somewhat warmer with less rainfall than winter; more pronounced is the distinction between the windward and leeward sides of the island, with the latter consistently drier and warmer than the former throughout the year.

The rainfall pattern differs remarkably over short distances, owing to the orographic effect. The average annual rainfall is about 2,400 mm (93 in), but it varies from a high of 12,300 mm (486 in) per year on Mt. Waialeale (elevation 1,548 m, 5,080 ft), the wettest spot on earth according to the Kaua'i Chamber of Commerce, to less than 500 mm (20 in) a year at Barking Sands, just 25 km (15 mi) away on the southwest coast; the windward coast receives greater than 1,000 mm (40 in) of rain per year. The rainfall is heaviest on the windward slopes and mountain crests, where the higher peaks are nearly always covered in clouds; it is lowest in the leeward lowlands. In the areas where the trade winds dominate, on the north and east sides of the island, the rains are heavier at night than during the day; daytime showers tend to be light.

The prevailing wind is the east-northeast trade winds, which tend to be more persistent in summer than winter but which will blow throughout the year. They vary frequently and can be absent for long periods of time or they can blow for weeks on end. By far the most damaging winds are those which accompany winter storms, which can blow from almost any direction; those from the south are harbingers of what is referred to as Kona weather, bringing warmer temperatures and higher humidity (Grace 1974). The local topography also exerts some influence on the strength, effect, and direction of the wind, deflecting and accelerating it through passes, narrow valleys, and over crests or completely sheltering an area from the wind.

Major Pacific storms rarely make landfall owing to the location of the Hawaiian archipelago – on the extremities of the western north Pacific typhoon area and the eastern north Pacific hurricane area. Tropical cyclones are rare and tornadoes almost always fail to reach ground, although they have been observed off-shore as funnel clouds or water spouts. Hurricanes are infrequent, but when they do occur it is more likely between May and November with storms originating on the western coast of North America, between 10° and 20° north latitude. Kaua'i is the only major island in the chain that has been directly struck by hurricanes. Tsunamis, or seismic sea waves, strike the island chain from time to time, often with catastrophic results.

Soils across the island are generally deep and well drained, derived from the volcanic parent material, coral, and seashells. The volcanic based soil is developed mostly from weathered igneous rock (primarily basalt) and covers the majority of the land area; in the river valleys and coastal lowlands, it occurs primarily as alluvium. The sediments along the coastal margin are derived from coral and seashells, which have been reduced to sand sized particles in the marine environment, then drifted and piled onto shore by wave action; wind, rain, and waves shift, mix, and rearrange these sandy sediments, creating the dunes and prograding beach fronts.

Plants, animals, and insects thrived once they were introduced to the island. Initially, they arrived in the plumage of far-ranging birds, cast ashore in trunks of trees or bushes uprooted from distant shores and carried by the currents, or landed by chance after being set adrift on the upper air currents. The vegetation assemblage prior to the arrival of the Polynesian colonizers is largely unknown; however, recent work on Oahu and isolated studies on some of the other major islands in the Hawaiian chain suggest an environment dominated by lowland *Pritchardia* palm forests, *Dodonaea* shrubland, a legume shrub, and a mixed mesic forest with a multitude of plant species (Athens, Ward, and Wickler 1992; Athens and Ward 1993). The arrival of the Polynesian founder population, with their standard array of plants and animals, precipitated a transformation of this pristine environment to a landscape dominated by grasses, shrubs, herbs, and ferns; replacing the mature plant community with an immature one (Athens and Ward 1993). Among the floral and faunal species introduced were pig, chicken, dog, and rat, and taro, sugarcane, coconut, kukui nut, breadfruit, yam, mountain apple, bamboo, sweet potato, and gourds. The arrival of the European explorers and missionaries brought still more changes to the plant and animal communities fostered by the Polynesians. Today some of the plants found across the island include such historic period introductions as *kiawe*, *klu*, *koa haole*, grasses such as feather finger grass, bermuda grass, sandbur, pangola grass, kikuyu grass, molasses grass, guinea grass, elephantopus, *joee*, yellow foxtail, lantana, rhodomyrtus, guava, Java plum, *ohio*, Sensitive plant, Japanese tea, *pilipiliula*, ferns, ironwood trees, and tropical almond. In general, the rich vegetation is divided into a series of successive zones by altitude, with the vegetation community shifting from grasses, vines, and palms on the beaches to ironwood in the valleys to ferns and shrubs on the plateaus.

The fauna populating the island today consists of a wide array of indigenous and introduced species including birds such as the common Indian mynah, the common gray

dove, English sparrow, and red vented bulbul, and domestic chicken, horse, the Indian mongoose, common field mice, feral dogs and cats, pig, sheep, goat, and the black rat and Norway rat. The marine fauna is quite diverse and includes tuna, sailfish, whales, dolphins, and shark in the open ocean. In the shelter provided by the fringing coral reef, one finds bone fish, jacks, parrot fish, file fish, surgeon fish, mullet, *nehu* (anchovy), turtles, crabs, eels, shrimp, lobster, octopus, clams, and oysters.

The Project Area

The project area is located on the east coast of Kaua'i in the dune land and along the inland edge of the dunes, south of the Wailua River. It is within the Lihue Basin, the coastal plain which is in part defined by Kalepa Ridge, a north-south trending ridge line about 2 km inland from the coast. Kalepa Ridge is a prominent landmark that extends from the Wailua River Gorge in the north to the Hanamaulu River Gorge in the south. At its north end, there is the 208 m high peak of Mauna Kapu; its south end terminates in a distinctive, 213 m high point used for sightings and orientation by seamen (Grace 1974). The alluvial deposit that forms the coastal plain at the foot of the ridge extends seaward to the shoreline, where it mixes with the zone of active coral sands in the dune lands and prograding beach deposits. A coral reef, just off-shore and continuous from Kapa'a to Hanamaulu Bay, defines and protects the coastline.

The Wailua River, another prominent geographic feature in this landscape, is the major drainage in the Basin. It is fed by its North and South Forks, which originate in the Forest Reserve on the steep eastern face of Waialeale. Each river fork, fed in turn by other tributaries with headwaters in the Forest Reserve, plunges over spectacular falls and into canyons cut into the volcanic lava. They finally meet just inland of the Kalepa Ridge and its northern extension, the Nonou Mountain Ridge, and form the main branch of the Wailua River. This main branch flows for another 3.2 km before it empties into the very shallow Lehuawehe Bay. In its course across the coastal plain, the river flows through and supports a series of estuaries. At the river mouth, the point where the river meets the sea, a shifting sandbar changes in length, depth, and width in response to the variable river discharge, and creates an unpredictable and ever-changing configuration that makes boat passage difficult for all but shallow draft vessels.

The dune land on which the project area is primarily located extends southward from the mouth of the Wailua River. From this northern point at the river mouth, the dunes extend linearly along the shore, gradually shifting inland about 1,200 m (0.75 mi) from the river. From this inland location, the high dunes extend another 1,300 m (about 0.8 mi) to a point just north of the WGC clubhouse and 400 m inland from the beach. The dunes continue for another 1,500 m or so to the south before they gradually diminish and disappear. They are composed of soft white coralline beach sand that accumulates from east to west, blown by the prevailing wind. This is an active landform that shifts over time; however, a few episodes of stabilized surfaces, that is surfaces which have supported the establishment of vegetation and development of an A horizon, appear at variable depths throughout the dunes. The inland

edge of the dunes has likely been more variable over time, because it is at this point that the dunes meet the alluvium of the prograding coastal plain, creating an environment of transition with the inevitable shifting gradational contact between these two formations. In the recent past the dunes have been modified by the development of the WGC. Landscaping activities have been the primary agent of modification, although construction of some of the fairways, where dunes have been leveled, artificially enhanced, or cut in two, has also contributed to the changes in the dune land.

The project area, the alignment of the main sewer line and its lateral lines from the KCCC facility and WGC clubhouse to its termination in Sewer Man Hole 6, crosses over the transition zone between the dune land and coastal plain at the KCCC facility, enters the dune land within WGC, passes into the alluvium of the coastal plain at the north end of WGC, and reenters the dunes on the grounds of Kaha Lani at the end of the line. The terrain is mostly a shallow rolling topography; the only steep portion of the alignment is on the inland face of what at one time had been a very large dune (according to golf course personnel, the dune had been cut down and divided into two mounds to create a fairway during construction of the golf course). Vegetation consists mostly of introduced species, the result of both landscaping on the grounds of KCCC, WGC, and Kaha Lani, and agricultural activity on the property of George Fernandes and in the sugarcane fields on the County right-of-way by the resort site. It includes ironwood, Norfolk pine, *hau* (*Hibiscus tileaceus*) thickets, *niu* (*Cocos nucifera*), pink and white oleander, bermuda grass, and sugarcane; according to the environmental assessment for this project, there are no protected plant species along the proposed construction line. The fauna includes many different species of birds such as the Indian mynah, gray dove, English sparrow, and red vented bulbul, and a variety of mammals such as the Indian mongoose, common field mice, the Norway rat, and an occasional feral dog or cat.

Soils along the project alignment are divided into four series – the Kalepa series, the Lihue series, the Mokuleia series, and Dune Land (Fig. 4). The south end of the project area, by KCCC and WGC, is defined as Dune Land and Mokuleia fine sandy loam. Dune Land (DL) is characterized as hills and ridges of sand sized particles drifted and piled by the wind. The hills and ridges are actively shifting or are so recently fixed that no soil horizons have developed (USDA Soil Conservation Service 1972); the sand is predominately from coral and seashells.

Mokuleia fine sandy loam (Mr) is a well drained soil deposit found along the coastal plain. It is developed in recent alluvium deposited over coral sand, and tends to have a surface of very dark brown, friable sandy loam with a substratum of dark brown to dark grayish brown, loose, fine sand (USDA Soil Conservation Service 1972).

The northern half of the project area – the north end of WGC, the Fernandes property, the County right-of-way on Leho and Nehe Roads, and the grounds of Kaha Lani – crosses segments of Mokuleia fine sandy loam (defined above), Mokuleia clay loam (MtA), Lihue silty clay (LhC, LhD), and Kalepa silty clay (KdF). The type of Mokuleia clay loam

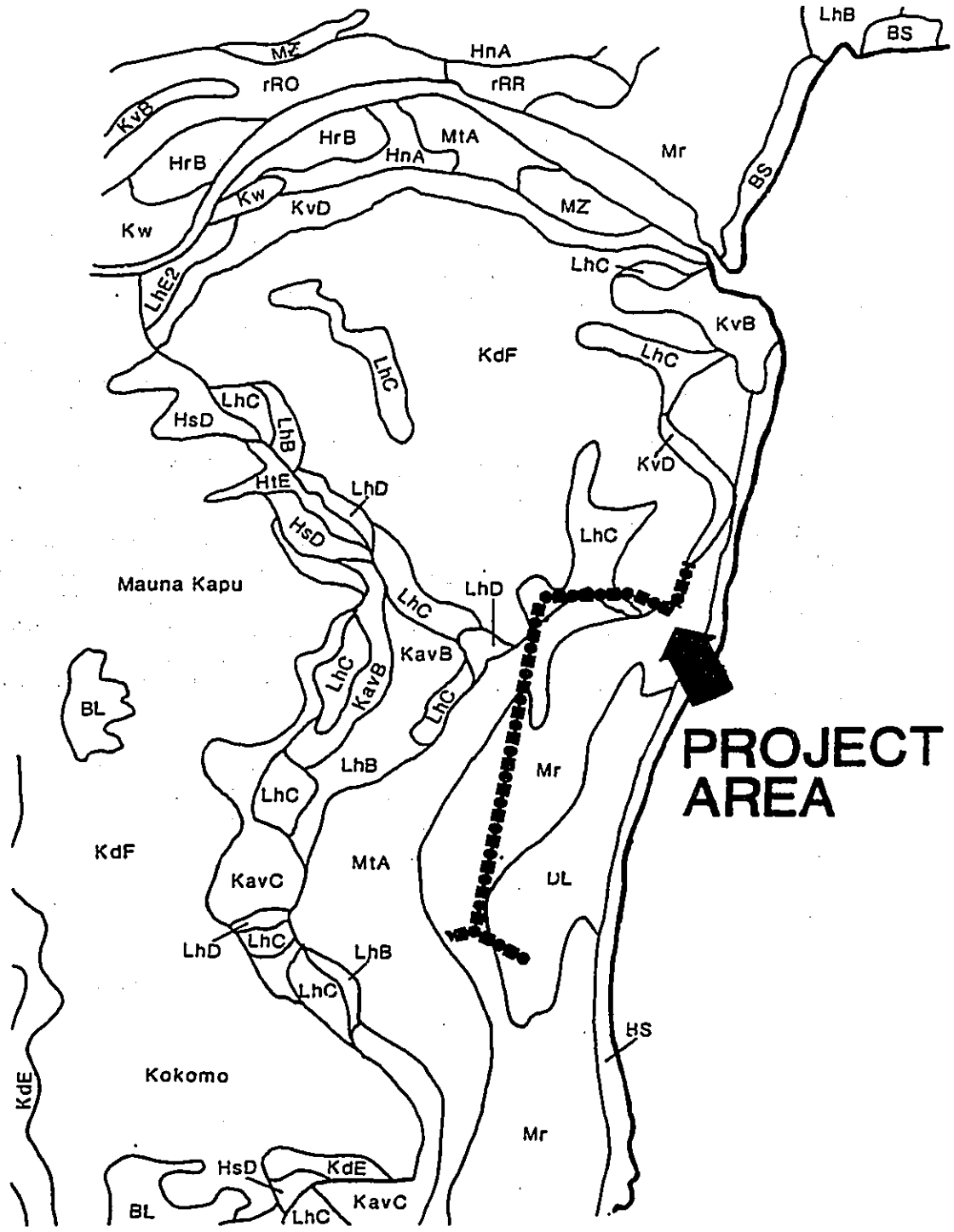


Figure 4. Soil Types within the KCCC-WGC Sewer Line Project Area.

(MtA) present in the project area is a poorly drained variant of Mokuleia clay loam. Like the Mokuleia fine sandy loam, it is formed in recent alluvium deposited over coral sand, with a surface that is dark brown to black and tends to be mottled (USDA Soil Conservation Service 1972).

The two variants of Lihue silty clay (LhC, LhD) differ only in slope gradient – LhC is found on slopes of 8 to 15 percent; LhD is associated with slopes of 15 to 25 percent. Both are well drained soils developed in material weathered from basic igneous rock; they generally occur in the uplands on the south and east sides of Kaua'i. These soils tend to have surfaces of dusky red to dark reddish brown, firm to friable silty clay; subsoils of dark red to dark reddish brown, firm silty clay; and substrata of soft, weathered, basic igneous rock (USDA Soil Conservation Service 1972).

Kalepa silty clay (KdF), the last soil type found along the project alignment, is a well drained soil generally found in the uplands at the base of slopes. It is developed in material weathered from basic igneous rock and in colluvium. The surface is generally a dark reddish brown silty clay; the subsoil is a dark red to dark reddish brown silty clay and clay; the substratum is a dark brown, dusky red, dark red silty clay and soft, highly weathered rock (USDA Soil Conservation Service 1972).

Only one wet area occurs in the project area. This is at the north end of WGC, where the alignment crosses soil type MtA, the poorly drained variant of Mokuleia clay loam. Otherwise, drainage throughout the project area is in the form of sheet flow, which is generally funneled to the drainage way parallel to Kuhio Highway.

III: HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

The following pages summarize the historical use of the project area and the general vicinity of Wailua Ahupua'a, and the previous archaeological work in the general area. The section on archaeology also discusses sand dune burials on Kaua'i and in Hawai'i in an effort to establish the context of such burials, including their location and placement in the dunes. It is a particularly relevant topic as much of the project corridor is occupied by dune land and has been designated a multiple burial site by Wendell Bennett (1931). Both the historical and archaeological sections are fairly short because the project area has largely been ignored in the oral histories and early historical accounts, few archaeological studies have been conducted within its boundaries, and prehistoric use of the area seems to have been confined to burials with no indication of occupation or other activities.

Historical Documentary Evidence

Traditional oral accounts and early post-Contact reports make no specific reference to the project area, most likely because it consists almost entirely of dune land. However, there are several references to the general Wailua area, especially the river and the *ahupua'a*. As Kawachi (1993) notes, Wailua was an important area in the cultural development of Kaua'i. It was the site of many legends; it served as the chiefly residence and birth place of the royal lineage, *kapu* to commoners; and it was a rich and productive district with many sites of cultural significance such as petroglyphs, a *heiau* complex, a series of *lo'i*, fishponds, *'auwai*, and agricultural terraces. Historically, the *ahupua'a* of Wailua was kept as Crown Lands by Kamehameha III; it was the site of early sugar companies, state of the art rail lines, bridges, and early government homesteads. In fact, the area has been occupied and cultivated for many generations with little change in the settlement pattern -- cultivation mostly inland near flowing water (springs, rivers, streams) and residences near the coast, although there is evidence of residences upriver and associated with agricultural terraces during the prehistoric or early historic era (no absolute dates are currently available).

Wailua Ahupua'a is centered on the Wailua River drainage in the district of Puna. It is 4.4 km wide along the coast, 10.8 km wide along the inland mountain ridges, and extends 17.8 km inland from the shoreline, but in the oral histories, it takes on legendary proportions. When, in tales about the Hawaiian Islands, the hero visits Kaua'i, he inevitably lands on the beach at the mouth of the Wailua River (Dickey 1916). In fact, it is here that all prehistoric voyagers have landed according to the oral accounts, including the first chief of Kaua'i, Moikeha from Kahiki (possibly Tahiti), and it is here from which all ocean voyages were initiated (Lydgate 1916). Wailua was considered the capital of Kaua'i and the residence of the principal *ali'i* (Lydgate 1916). It was also considered the birth place of the royal lineage; according to Dickey (1916), all the kings of Kaua'i were born here, from the earliest times to

King Kaumuali'i, the last king of Kaua'i, that no one was recognized as a chief unless born in the Puna district, and that all chiefs should, if possible, be born in Wailua.

The importance of Wailua in the culture history of Kaua'i is reinforced by the number of *heiau* in close proximity, with a total of seven *heiau* located along the course of the river, from its mouth to the point where it divides into the North and South Forks (Bennett 1931; Ching 1968; Kikuchi 1974). Moikeha and the *menehune* (mischievous and highly talented legendary figures, also known as black dwarfs) are credited with constructing the *heiau* (Yent 1989). Other features which have elevated the area to its high status include the presence of petroglyphs at the river mouth, unique sites such as the bell stones which announced the presence of commoners in the *kapu* area as well as the birth of a royal child, a refuge site on the banks of the Wailua River, a number of legendary sites such as the Brother-Sister Rocks, and the Kings Highway which stretches from the mouth of the Wailua River to Mount Waialeale in the heart of Kaua'i and on which annual pilgrimages took place. The traditional division of the region into two zones, too, lends support to the importance of the area. Wailua-by-the-sea, Wailua Nui or Wailua Kai was the residence of the ruling *ali'i* as well as the locale in which ceremonial observances were held (Ching 1968); great, sacred Wailua, a land *kapu* to common people (Dickey 1916). The common people resided in Wailua Uka, the inland zone above Wailua Kai. Even the general site and feature patterning sets this inland zone apart from the coastal area, since it includes many more domestic and subsistence-related types of sites such as agricultural terraces, *'auwai*, fishponds, *lo'i*, and house platforms. Wailua Kai also contains these site types, but not in the numbers observed in Wailua Uka (Ching 1968).

In 1778, on his third voyage, Captain James Cook chanced upon the Hawaiian Islands. At Kaua'i, he anchored his ships *Resolution* and *Discovery* off the coast of Waimea, on the south coast of the island, and embarked in a brisk trade of nails and iron fragments for pigs, sweet potatoes, and fresh water. At the time of his visit, the island was politically integrated into a single chiefdom (Athens 1983), organized in a conical clan structure with localized lineages and a paramount chief (Earle 1978), with the ruling *ali'i* residing in Wailua.

By 1785, more western ships passed through the Hawaiian Islands for provisions and to recruit men for whalers and merchantmen. However the first western contact at Wailua came in 1793 with the arrival of Captain George Vancouver. He noted that there was no safe anchorage, but that this was the most fertile and pleasant district on the island and that it was the principal residence of the king (Yent 1989; Kawachi 1993).

The 19th century was witness to a number of social, political, and economic changes on Kaua'i and in the rest of the Hawaiian Islands. The archipelago was unified by Kamehameha I, with Kaua'i reluctantly joining the unified Hawaiian kingdom in 1810; the Russians were driven from Oahu to Kaua'i by the agents of Kamehameha; in the 1820s, missionaries arrived and settled in Waimea, a brisk trade in sandalwood developed, and the sugar industry was just beginning to see the possibilities for expansion with the growing demands for exports; in 1848, during the Great Mahele, the project area and Wailua

Ahupua'a were claimed as Crown Lands by Kamehameha III; by 1850 sugar plantations were established on the island and the demand for labor created a great influx of immigrants from China, the Philippines, Japan, Portugal, and Korea; by 1875 a treaty was made between Hawai'i and the United States allowing sugar to enter the States duty free, and it was also about this same time that Hawaii's population reached a low point of less than 60,000, dropping from an estimated 200,000 to 300,000 persons at the time of the visit by Captain Cook (*Interior Departments* 1848; Grace 1974; Yent 1989; Kawachi 1993). The expansion of commercial agriculture prompted improvements in the island infrastructure with the development of roads, bridges, railroads, port facilities, and telephone lines. This commercialization spread to other commodities as well, including rice (on the island by 1892; Kikuchi 1992) and taro, but it was not until the first half of the 20th century that rice mills and poi factories were constructed (Ching 1968). In 1898, Hawai'i was annexed to the United States; by 1900 it was a U.S. Territory; and on 21 August 1959, it became the 50th State in the Union.

No specific mention was made of the project area in any of the early accounts or historical records. There were no Land Commission Awards nor any mention of ownership or descendants associated with the property; in fact, the area seems to have been ignored for the most part. At the time of contact, no one was living on the dunes, and in legal descriptions on government leases and surveyors' records from the first decades of the 20th century the dune land was referred to as waste land, reinforcing the notion that it was of little use commercially or otherwise. However, Erkelens and Welch (1993) make note of a passing reference to the area in a discussion of fishing rights off the coast of the general area, referenced in a letter for Abner Paki (1852; he served in the Royal Court in Honolulu, as Acting Governor of Oahu, and was the father of Bernice Pauahi Bishop; Day 1984) to "His Excellency Keoni Ana" (John Young II, the Governor of Maui and Prime Minister of the kingdom between 1848 and 1854; Day 1984). Paki states that Wailua *ahupua'a* (and by extension the project area) was part of the lands "over which I superintend" and that "the people of other lands shall not take fish, under fish reserved by the *konohiki*," noting that *kule* (*akule*) was the reserved fish in Wailua (Paki 1852; Erkelens and Welch 1993).

It was not until the 20th century that the project area became the focus of development activity. Sugarcane fields were established on the coastal plain inland from the dunes. In 1920, the route for the Ahukini Terminal and Railway Company, Ltd. was surveyed across the government land in Wailua, including the dune land on which the project area is located. The right-of-way was 40 ft wide, extending 20 ft on each side of a center line, according to the survey records; the right-of-way was deeded to the Territory of Hawai'i on 5 October 1934. In 1921, Lydgate Park was established in the dune land, with the golf course, the Wailua Golf Links, developed in 1927 within the boundaries of the park. A wetlands area on the golf course is prominently noted on a map of the course; the project corridor passes directly through this marsh land. A 1923 map of the area (Iao 1923) depicts a large wetlands or marsh to the north and inland of KCCC (formerly the Lihue Jail Site, established in 1936); this wetland/marsh area drains into the wetlands on the golf course, and ultimately drains into the sea through a series of small ponds and narrow drainages. Finally, within the last few decades, a portion of the government land was leased to Mr. Fernandes for

ranching, to fatten his cattle for market, and still other parcels of the project area were developed as resorts.

Previous Archaeological Research

Archaeological work in the project area and in the *ahupua'a* of Wailua has been characterized by Kawachi (1993) as limited in scope and area, with much of the work compliance driven. Under these circumstances, the areas of archaeological investigation have been dictated by development projects; nevertheless, the cultural materials and features identified and/or exposed lend support to the historical land use records and reinforce the traditional accounts of a twofold division of the *ahupua'a*. The site types identified include burials, habitation areas and house platforms, agricultural terraces, *'auwai*, *lo'i*, fishponds, *heiau*, activity areas, midden, an adze workshop, and unique sites in the oral histories such as the birth stones where the island's *ali'i* were presumably born and the bell stones which announced those births as well as the presence of commoners in the *kapu* area of the *ali'i*. Their distribution across the *ahupua'a* reveal a concentration of high status sites, such as the *heiau* in the coastal zone and the lower reaches of the Wailua River, identified in oral accounts as Wailua Kai, with a concentration of sites associated with daily living mostly inland and on the coastal plain north of the Wailua River.

Only one archaeological survey has included the area specific to the project area. This survey was completed by Wendell Bennett (1931) within the context of an island wide archaeological survey. He characterized the dunes on which the project area is located as a single site, Site 103, Dune burials; the State lists the site as 50-30-08-103. The full text of the accompanying site description says, "(i)n the sand dunes that run along the shore half way between Hanamaulu and Wailua River are many burials" (Bennett 1931: 125); a minimal description with no distinct boundaries defined, as might be expected from a summary work of this nature. In placing this site within the context of Kaua'i archaeology, he found that dune burials were a common feature and that almost any sand dune on the island contained burials. Further, that from time to time the shifting sands revealed these burials and that they tended to be either flexed or straight (on their back, laying face up), with a predominance of flexed burials. There were seldom burial goods associated with the interments; there were generally no crypts, although occasionally a large boulder or rock slab would be placed in the sand just above the burial as a marker of sorts; and the burial cavity could seldom be distinguished from the surrounding sand (Bennett 1931). A common belief in the local lore, according to Bennett, was that the dune burials actually represented prehistoric battlefields; however, he dismisses this notion by pointing out the presence of women, children, and flexed burials as well as the absence of weapons (Bennett 1931). In contrast, the sand could be easily excavated and thereby presented a favorable medium for a wholesale burial ground that provided a convenient location for quick or easy interment.

Two other archaeological projects were conducted in the immediate vicinity of the current project area, both of which were in the dune deposit and both of which describe the presence of multiple burials. The first and most relevant is a description of the burials

encountered during monitoring on an effluent reclamation project in the north half of the golf course (Cox 1977). Thirteen partial and complete burials were encountered and subsequently reburied over the course of this project. The burials tended to cluster in groups on the western slope or face (the lee side) of sizable dunes along the inland edge of the dune land, and they were all extended with the head oriented to the east or northeast (Cox 1977), in a pattern roughly parallel to the general axis of the dune formation. The original depth of interment remains unknown because most of the dunes have been altered by landscaping activity associated with the golf course; in fact, alterations on some dunes were so extensive that human remains are now exposed almost every time some earth removal takes place (Cox 1977). The second project was an archaeological survey with some subsurface testing for a proposed fiber optic cable landing (Folk and Hammatt 1992; Folk, Ida, Novack, and Hammatt 1993) in the south half of the golf course. Information on three burials eroding from the dune land in this half of the golf course was collected from the local golf course supervisors (past and present) and a brief surface assessment along the proposed cable route; no burials, however, were encountered during the subsequent subsurface testing phase. The findings in both of these projects -- the effluent reclamation project and the fiber optic cable landing project – seem to contradict the observation by Cox (1977) that burials in the northern, older section of the golf course tended to be no more than portions of single individuals, whereas those in the newer, flatter southern half of the golf course tended to occur in groups of multiple individuals. This distinction is further obscured by the comment in Erkelens and Welch (1993), summarizing a statement by Bobby Murata (WGC grounds staff), that "hundreds" of bones were discovered when the driving range was built in the early 1960s; the driving range is located at about the mid-point of the golf course.

The majority of archaeological work in Wailua *ahupua'a* has been concentrated in and along the banks of the Wailua River drainage, as well as the areas to the north of the river in Waipouli and Kapa'a. Within the river drainage and its tributaries, 70 percent of the archaeological work consisted of surveys, 20 percent was testing work, and 10 percent consisted of salvage/monitoring work. The sites and cultural materials identified and examined included agricultural terrace complexes, house platforms, burials, *heiau*, legendary sites, historic sites such as rice mills and poi factories, *'auwai*, *lo'i*, fishponds, relict cultigens and forest products, petroglyphs, the bell stones, the birth stones, a refuge site, cave sites, an adze workshop, shell and bone midden, activity areas that included chert, basalt, volcanic glass, and adze flakes, coral files, and perforated shells, charcoal, fire pits, and fire cracked rock (Ching 1968; Kikuchi 1973; Walton and Spilker 1974; Yent 1980, 1987, 1989, 1991; Folk, Ida and Ching 1981; Hammatt 1988; Kawachi 1993). To the north of the river, in the areas of Waipouli and Kapa'a, the majority of archaeological investigations have consisted of subsurface testing (about 72.7 percent), with the remaining studies confined to survey work (18.2 percent) and associated analyses (9.1 percent). Through this work additional information on occupational and activity areas has been added to the extant body of data established in the river surveys (Davis and Bordner 1977; Cordy 1988; Rosendahl and Kai 1990; Folk, Chiogioji, McDermott, and Hammatt 1991; Folk and Hammatt 1991; Hammatt 1991a, 1991b, 1993; Pietrusewsky 1991; Shun 1991; Hammatt and Folk 1992).

Together, the results from the Wailua River studies and those to the north of the river have at least preliminarily established the range of site types and a distribution pattern within Wailua Ahupua'a. The site or settlement pattern that emerges is one in which high status or sacred sites are confined to the banks of the lower reaches of the Wailua River, with agricultural and subsistence based sites located along the river, its tributaries, and in the associated wetlands and marsh areas; habitation sites and associated activity areas are located primarily on dry ground in the inland tributary drainages and in the near shore zone on the coastal plain; and burials are confined to the dune land and beach deposits along the coast. The distribution pattern of historic era sites is similar to the pattern established in the prehistoric era, though with some differences. Agricultural/subsistence activities are still practiced primarily in the river drainage, its tributaries, and in the inland reaches of the coastal plain, while the majority of habitations are confined to the coastal zone, concentrated in towns and villages. Among the differences, however, are abandonment of the sacred or high status sites on the banks of the river and a shift in burial location from the dune land to established cemeteries within the villages and towns.

Finally, as dune burials are an important concern in the current project work, additional information on sand dune burials was sought from previous archaeological studies conducted on Kaua'i and in Hawai'i in general. Specifically, questions centered on the location, pattern, and context of these burials; unfortunately, little information could be derived from the few available studies. On Kaua'i, three studies (Pantaleo 1989; Williams 1991; Athens 1983) at the north end of the island make note of bone fragments eroding from the beach sand deposits, but little other information is provided. At Kealia, at the northern end of the east or windward coast of the island, a number of burials were inadvertently encountered during sand mining operations (Folk and Hammatt 1991); however, no information on burial location or context is provided. Another project, a data recovery investigation at the Burial Dune Site (50-30-10-479) on the south shore of the island (Hammatt and Toenjes 1991), offered little information on the burials encountered; however, a topographic map of the dunes and burials was included in the report. According to the map, the burials appear to be clustered in the western dune deposit, in three general locations – the lee side, the crest, and in what appears to be protected hollows on the windward slope. The prevailing winds in the area, according to Hammatt and Toenjes (1991), are easterly, which continually provides a new supply of sand from the shoreline and ensure the interments remain covered. Unfortunately, sand mining has exposed and destroyed a number of burials in this dune deposit.

The other available archaeological studies on dune burials are derived from the Puu Alii Sand Dune Site (H1) in the South Point area on the big island of Hawai'i (Emory and Sinoto 1969; Underwood 1969), the Mokapu burial area at Kaneohe Bay on Oahu (Athens 1985), and the Honokahua burial site on Maui (Donham 1993). At the H1 site, the preponderance of burials was concentrated in the upper and central portion of the site (Underwood 1969), on the more protected inland slope and crest of the dune. No information on depth, orientation, or associated artifacts was provided, however. In the second area, at the Mokapu burial area, the burials tended to be concentrated in three main clusters on the lee side of sizable dunes (Athens 1985); again, no information on depth, orientation, or

associated artifacts was provided. At the Honokahua site, the distribution of burials indicated some social stratification, supported by an associated assemblage of artifacts (Donham 1993).

What little is known about sand dune burials can be summarized as follows. They will likely be concentrated on the leeward side of large dunes, but could also occur on the dune crests and in protected areas on the windward slopes. The only information on burial orientation is provided by Cox (1977), who noted a tendency for the head to be toward the east or northeast; although Cox (1977), Bennett (1931), and Underwood (1969) observed that burials can be either flexed or straight. The original depth of interment remains unknown, with determination hindered by activities such as sand mining and other development projects which have removed much of the sand cover. As for information on associated artifacts, other materials, and spatial patterning, that too remains elusive although Bennett (1931), Underwood (1969), and Donham (1993) indicate that some burial goods and other accouterment, such as an occasional stone slab marker, have been directly associated with burials, and that at least a couple of sites suggest a degree of spatial arrangement among the burials that could be reflective of an organization driven by status and/or familial ties (Underwood 1969; Donham 1993). More importantly, however, these few studies point out that much work remains to be completed on defining the full context of dune burials, on Kaua'i and elsewhere in Hawai'i.

In general, the previous archaeological work in Wailua *ahupua'a* and in the dunes and shoreline areas on Kaua'i and Hawai'i have been useful in establishing the rudiments of a prehistoric/early historic era settlement pattern and the general context of dune burials for eastern Kaua'i, and particularly the current project area. Agricultural terraces, *lo'i*, *'auwai*, fishponds, and habitation sites are located along the length of the Wailua River, its tributaries, and the wetlands and marshes on the coastal plain; many sites were observed much farther inland than had been expected (Hammatt 1988). Habitation sites and house platforms are generally located on dry land near the inland agricultural complexes and in the coastal area (Cordy 1988); burials are mostly confined to the dunes; and the high status sites such as *heiau* and the bell stones are concentrated on the lower reaches of the Wailua River, from its mouth upstream to the point where it splits into the North and South Forks.

IV: FIELDWORK METHODS, MODIFICATIONS, AND SCHEDULING

Field investigations in the proposed KCCC-WGC sewer line corridor were initiated on 15 November 1993, with over 10 percent of the deposit along the proposed alignment slated for examination. The primary purpose of these investigations was to determine the presence of significant historic sites and burials within the sewer line route, evaluate those resources, and make recommendations concerning the need for preservation, avoidance, and/or mitigation. The high level of testing planned for this project included a sufficient number of backhoe trenches in order to provide both a systematic and uniform coverage of the area as well as to present a reasonable basis for inference, and to ensure that burial clusters and concentrations of cultural material, if present, would be encountered. While it is a matter of chance that a burial would be encountered, the intensity of testing planned not only increases the likelihood that at least large concentrations of burials would be met, but it also increases the possibility for the discovery of isolated burials.

The testing proposal (see letter to Mr. Eric Nishimoto, project coordinator, dated 4 August 1993) called for up to 40 backhoe trenches to be excavated along the sewer line route. About 26 trenches would be placed at 60 m intervals along the 1500 m route, with 9 trenches along the lateral lines in the vicinity of KCCC and WGC clubhouse where extensive construction work was planned, and an additional 5 trenches placed at the discretion of the project director in areas where the nature of the sediments or presence of cultural deposits suggest the need for more intensive testing to either define site boundaries or check for additional deposits or burials. Each trench should be excavated to a length of 4 to 5 m and a depth of 1 m below the surface, unless bedrock was encountered at a shallower depth. In areas where sewer line construction and installation was planned for depths greater than 1 m, test excavations should also exceed the 1 m depth. The specific activities included in the testing prospectus are outlined below; in all, it was estimated that the work would take a crew of four archaeologists 10 days to complete.

- Over the course of excavation, one archaeologist will continually monitor the backhoe to ensure that work will be halted immediately if human skeletal remains are encountered.

- Following the excavation of a trench, the walls will be cleaned and profiles drawn of a representative sample of walls. All trench walls with cultural deposits will be drawn.

- A few trenches with cultural deposits may be expanded by hand excavation to collect samples that will assist in evaluating the significance of the deposits.

- Auger cores may be taken if they would be helpful in determining the extent of burial clusters or cultural features.

- A map must be prepared to document the location of all test units, cultural features, and burials.

- If human remains are encountered, excavation must cease immediately in the vicinity of the remains. Hand excavation will be allowed only to the extent necessary to determine if the remains are human.

- All human skeletal remains will be recorded and their locations marked. They must be left in place and covered with soil, with the disposition of the displaced remains decided in consultation with the Kaua'i Burial Council. Excavation may resume some distance away.

- On the grounds of KCCC and at the northwest end of the sewer line corridor (the northern end of WGC), there is the possibility of uncovering former marsh sediments, especially in the deeper trenches. These sediments should be sampled for pollen analysis and possibly radiocarbon dating.

- Finally, as a safety measure, all trenches will be backfilled at the end of each day owing to the high traffic flow throughout the project area.

Modifications to the Plan

It is inevitable that the best laid plans must be altered to accommodate existing conditions not anticipated or incorporated into the original plan. Such is the case with the field methods prescribed for this project. Buried utility lines – water, power, and telecommunication – cesspool leach fields, and restricted access to the Fernandes property were the three principal elements that initiated a few, mostly minor changes to the planned field methods. The first two items – utility lines and leach fields – prompted more circumspection and planning in the placement of backhoe trenches; the third item – restricted access to the Fernandes segment of the sewer line route – required a change in the method of excavation.

Three trenches were planned for that segment of the sewer line across the property of George Fernandes; in all, from excavation, profiles, and backfilling, less than one-half day of work with a backhoe. However, there was no gate large enough in the perimeter fencing around the property for passage of the backhoe onto this segment of the line. Upon

consultation with the Historic Preservation Office archaeologist for Kaua'i, it was agreed that these three trenches would be excavated by hand and that each would be excavated to a length of 2 m and a depth of 1 m – shorter than the other trenches along the sewer line, but attaining a similar depth.

Trench location relative to utility lines and leach fields required more creative solutions. The maintenance supervisor at KCCC and the manager of Kaha Lani were able to describe with reasonable accuracy the locations of utility lines and leach fields on these two segments of the sewer line; the manager of Kaha Lani even produced blueprints that contained this information. However, identification of utility lines on the grounds of WGC was a formidable task owing to the many uncharted improvements made to the golf course throughout its nearly 70 year history. The WGC maintenance supervisor stayed close at hand during fieldwork in the area of the clubhouse, where the numbers of buried lines were greatest and the possibility of hitting one or more during excavation increased. He was able to describe the general locations and types of lines buried, but not specific locations, depths, or numbers. With trench location confined to the alignment of the sewer line, the exact location of buried lines was paramount. A solution to this problem came in the form of a brass divining rod. Such rods are capable of reacting in a gross way to sources of electrical energy, including the energy produced by water movement, and will indicate the general location and path of the energy movement. The divining rod became the most useful tool in the archaeological explorations not only on the grounds of the golf course, but it was also quite useful along the remainder of the sewer line corridor.

Before any excavation took place, the backhoe operator would walk over a proposed trench location several times with the divining rod in hand. He would mark the location or path of energy movement (presumably utility lines) as indicated by the response of the rod; trench placement was then adjusted accordingly, with trenches placed as close to the original proposed locations as possible. This was quite a successful system for trench placement, but it did create some rather tight situations. Often a trench would be placed immediately adjacent to a series of vertically stacked pipes, where one stray move with the backhoe bucket to either side of the trench would mean a broken pipe. In all, there were only four mishaps – three on the golf course and one on Leho Road. On the golf course, a dead irrigation line, abandoned many years ago according to the maintenance supervisor, was ripped open; it did not register with the divining rod because there was no water running through its course. A second irrigation line was severed in the golf course parking lot; it was in an area that contained a web of utility lines that crisscrossed one another and were installed at various depths. The third line encountered on the golf course was the main irrigation line for the north half of the course; it was broken not by the backhoe bucket during excavation (the trench was located alongside and parallel to the line) but was crushed under the weight of the backhoe while the trench was being backfilled. The encounter on Leho Road was with a dead cable, which was comparable to the situation with the abandoned irrigation line on WGC in that it did not register with the divining rod.

Scheduling

Fieldwork took place from 15 to 24 November 1993 and included one day of preparations, meetings, and a preliminary inspection of the project area, and seven days of active fieldwork. The first day in the field, 15 November, was spent in part by Welch, the principal investigator, and Beardsley, the project director, in consultation with the various property representatives affected by the sewer line corridor, for the express purpose of informing all parties of the onset of fieldwork and the type of work expected to take place on each parcel of land that the sewer line crosses. They also met with the general contractor, Marvin Dye, to coordinate the mechanics (equipment and personnel needed) of pavement cutting and resurfacing for those trenches which would be excavated through the WGC parking lot, rented equipment such as barricades for public safety concerns, examined the staked sewer line corridor for the most efficacious placement of trenches, and determined the amount of effort needed to clear the vegetation from some of the prospective trench locations.

Fieldwork began in earnest on 16 November with the assistance of a team of archaeologists – Fadden, Blankfein (16 to 19 November), Coleman (22 to 24 November) – and Lemn, the backhoe operator. It lasted a total of seven days, the final day of which was spent completing the requisite hand excavations.

V: FIELDWORK RESULTS

A total of 39 trenches were excavated, with 36 completed using a backhoe and three excavated by hand (Table 1). The trenches ranged in length from 2 m (hand dug) to 6.5 m, with the depths ranging from 55 cm below surface (bs) to 3 m bs depending on the nature of the sediments encountered and the proposed sewer line construction. Trenches were placed at roughly every 60 m along the sewer alignment, with specific locations determined by existing utility lines and accessibility with the backhoe; where trench location and utility lines coincided, the trench was placed as close as possible to the intended alignment. In areas considered sensitive and likely to contain burials, trenches were placed closer together. Five backhoe trenches were located in the vicinity of KCCC, four trenches were placed in the vicinity of the WGC clubhouse, and the remainder were distributed along the rest of the alignment with the three hand excavated trenches placed within the pasturage of Mr. Fernandes.

The actual fieldwork was divided into three stages with one archaeologist accompanying the backhoe operator to monitor the excavations, to examine any questionable or anomalous deposits such as dark stains, pipes and utility lines, and possible bone encountered during excavation, to halt the excavations if and when human skeletal remains were unearthed, and to be on hand during backfilling operations for the sake of safety (for the backhoe and traffic concerns) and a final cursory examination of the backdirt as it is returned to the trench. A second archaeologist cleaned and profiled the trench walls once the excavation was completed, and took photographs of the sewer corridor prior to excavation as well as selected trench walls. Finally, the third archaeologist described the various soil layers exposed in each trench, determined if additional excavation, either by hand or backhoe, would be necessary in order to evaluate the significance of a deposit, and took samples of soil deposits, charcoal, and cultural debris. Soil descriptions were prepared in conformance with the U.S. Soil Conservation Service and the Munsell color reference system. When all work within a given trench was completed, the trench was backfilled so that no trench remained open at the end of the work day; Trench 33 was the only exception to this practice.

The trenches exposed dune sand on the grounds of KCCC, WGC, and Kaha Lani, a wetlands area at the north end of WGC, agricultural land from the north end of WGC through the Fernandes property and along Leho Road to Nehe Road, and a buried lava flow at the intersection of Leho and Nehe Roads and eastward for about 60 m along Nehe Road (Figs. 5, 6). The only cultural deposits within the profiles appeared to be of recent origin. These included the tell-tale marks of tractor tines inscribed in the stratigraphic profiles, remnant lenses of broad area burns associated with agricultural activity such as sugarcane production,

Table 1. Trenches within the KCCC-WGC Sewer Line Project Area.

Trench	Length (m)	Depth (m)	Axis (deg)	NW Corner Reference		
				Station	Dist (m)	Bearing (deg)
1	4.8	1.35	31	STA-A	1.7	220
2	5.2	1.05	357	STA SL-3	0	0
3	5.5	1.2	156	SMH 1-1	31.6	5
4	5.5	1.05	75	SMH 1-1	0.6	80
5	4.4	0.95	156	SMH 2-2	16.8	243
6	3.3	0.95	358	FM-B	9.1	354
7	4.0	1.0	8	FM 3+00	5.0	264
8	5.3	1.05	193	FM 4+00	8.2	210
9*	6.0	1.0	192	FM 6+00	3.2	27
10	5.5	0.95	11	FM 8+00	7.7	18
11	4.3	0.85	186	FM 10+00	5.3	174
12	5.5	0.85	194	FM 12+00	6.2	184
13	5.5	1.05	15	FM 14+00	0	0
14	5.5	0.75	198	FM 17+00	29.4	8
15	5.2	0.55	197	FM 18+00	0.83	43
16	4.5	0.65	194	FM 20+00	0.52	24
17*	5.2	1.0	190	FM 23+80	1.95	19
18	6.5	1.05	195	FM 26+00	7.8	188
19	3.3	1.0	193	FM-D	10.8	181
20	4.1	1.0	96	FM-H	1.4	236
21	4.4	1.25	90	FM 37+00	14.6	266
22	4.6	1.05	82	FM 39+00	5.9	88
23	5.3	1.2	88	FM-I	11.5	92
24	4.7	1.15	70	FM-J	22.3	72
25	4.9	1.25	45	SMH 4-1	6.9	42
26	4.3	0.95	129	2+00	20.0	135
27	4.5	1.0	131	2+00	1.0	357
28	4.8	1.35	135	SMH 4-3	5.5	126
29	5.2	1.4	134	SMH 4-4	6.1	127
30*	6.2	1.55	110	SMH 2-5	13.8	112
31	4.5	1.35	112	SMH 2-4	1.4	338
32	5.0	1.2	113	SMH 2-4	25.0	110
33*	3.3	3.0	75	FM-A	2.0	124
34*	5.2	1.1	62	SMH 4-4	18.0	233
35*	4.9	1.15	58	7+00	3.3	226
36	5.2	1.35	62	Exist.SMH	7.3	65
37	2.0	1.0	212	FM-G	0.8	65
38	2.2	1.0	193	FM 30+00	10.0	192
39	2.3	0.95	186	FM-E	6.0	180

* Trenches from which sample(s) were collected.
Note: All bearings were taken relative to true north.

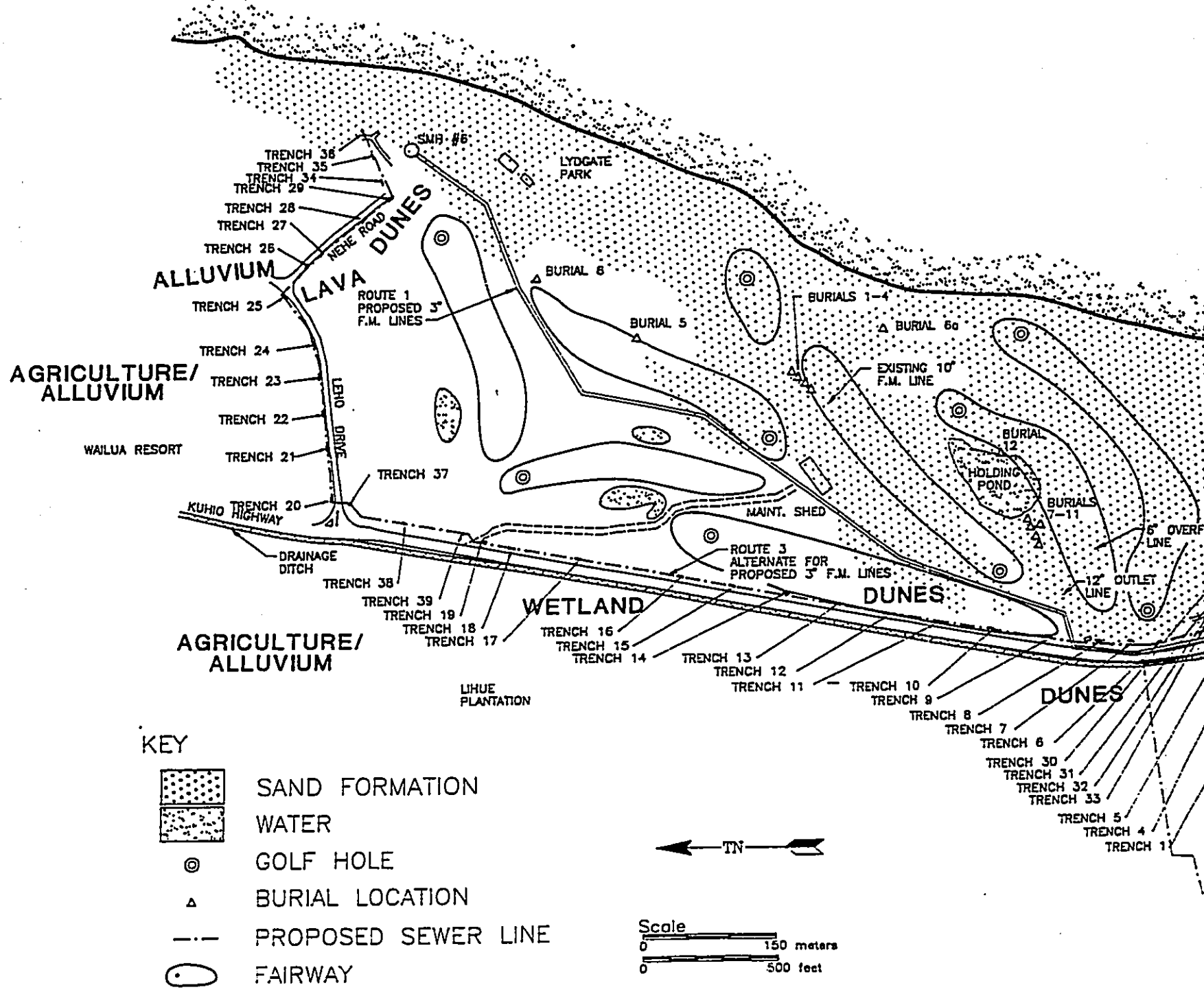
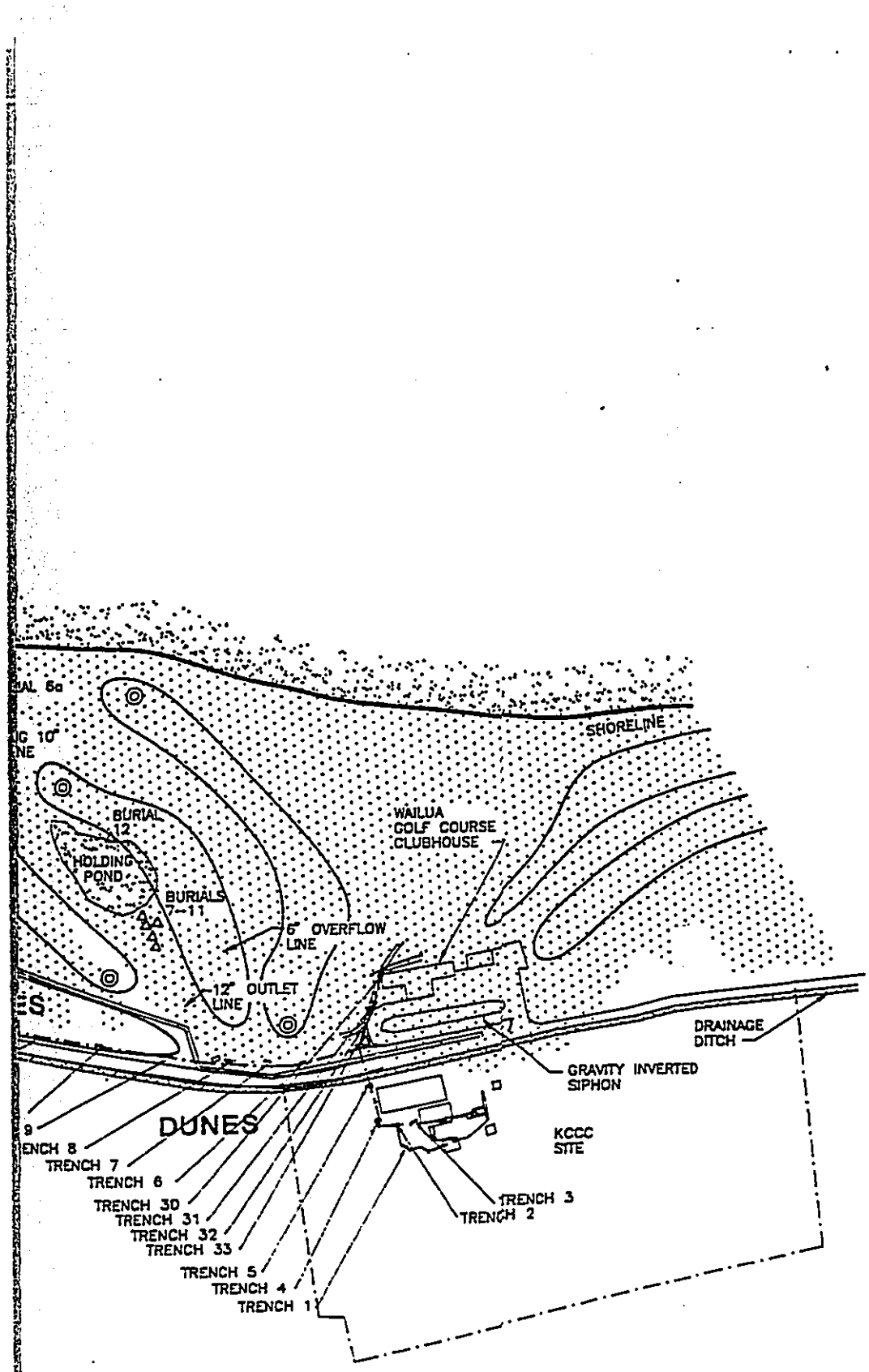


Figure 5. Overview of the KCCC-WGC Sewer Line Project Area Noting Burials. Trench Locations and Landforms.


SHORELINE
WAILUA
GOLF COURSE
CLUBHOUSE
BURIAL
12
HOLDING
POND
BURIALS
7--11
6" OVERFLOW
LINE
12" OUTLET
LINE
DRAINAGE
DITCH
GRAVITY INVERTED
SIPHON
KCCC
SITE
DUNES
TRENCH 8
TRENCH 7
TRENCH 6
TRENCH 30
TRENCH 31
TRENCH 32
TRENCH 33
TRENCH 5
TRENCH 4
TRENCH 1
TRENCH 3
TRENCH 2

Trench

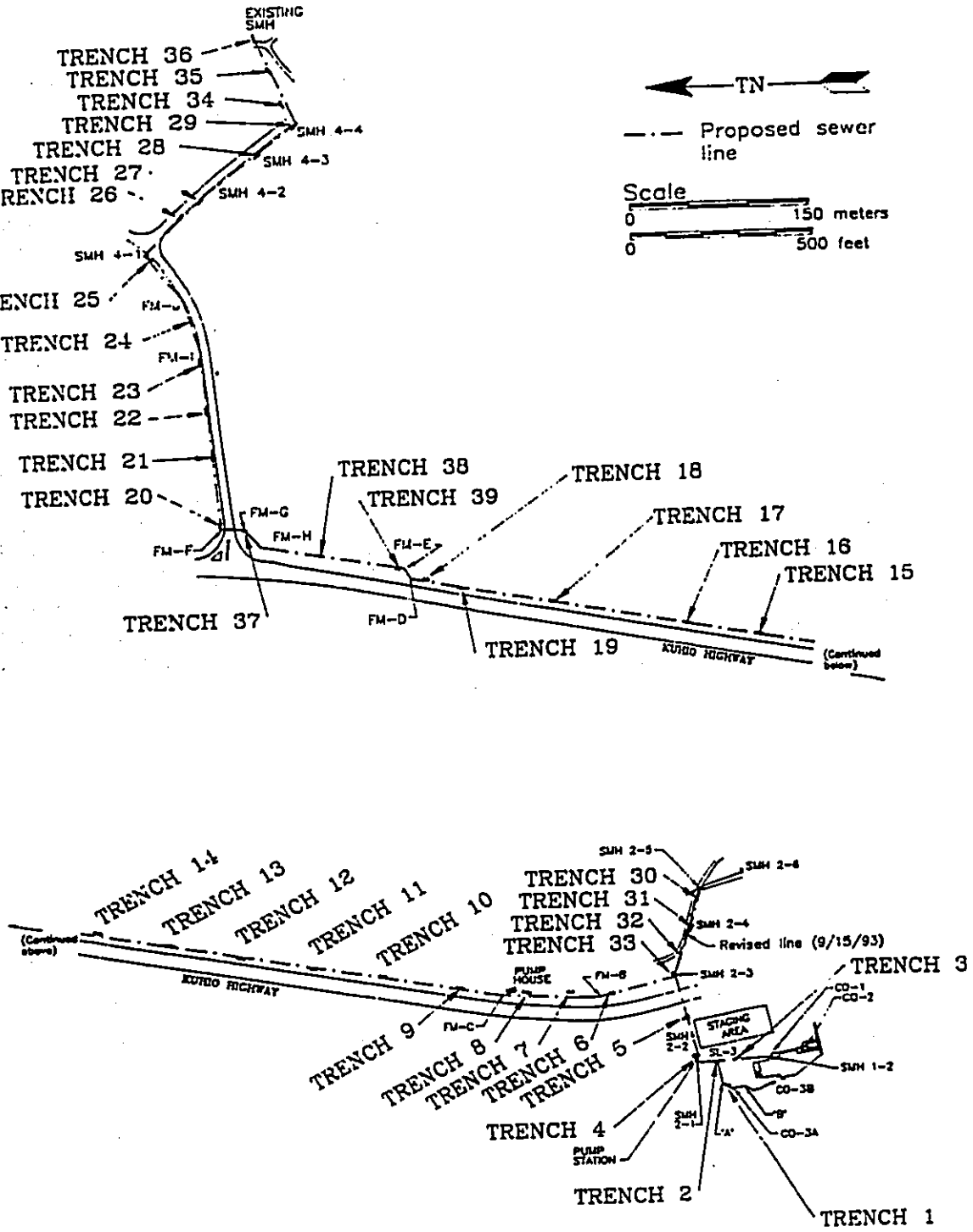


Figure 6. Base Map of KCCC-WGC Sewer Line Project Area with Trench.

CORRECTION

THE PRECEDING DOCUMENT(S) HAS BEEN REPHOTOGRAPHED TO ASSURE LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

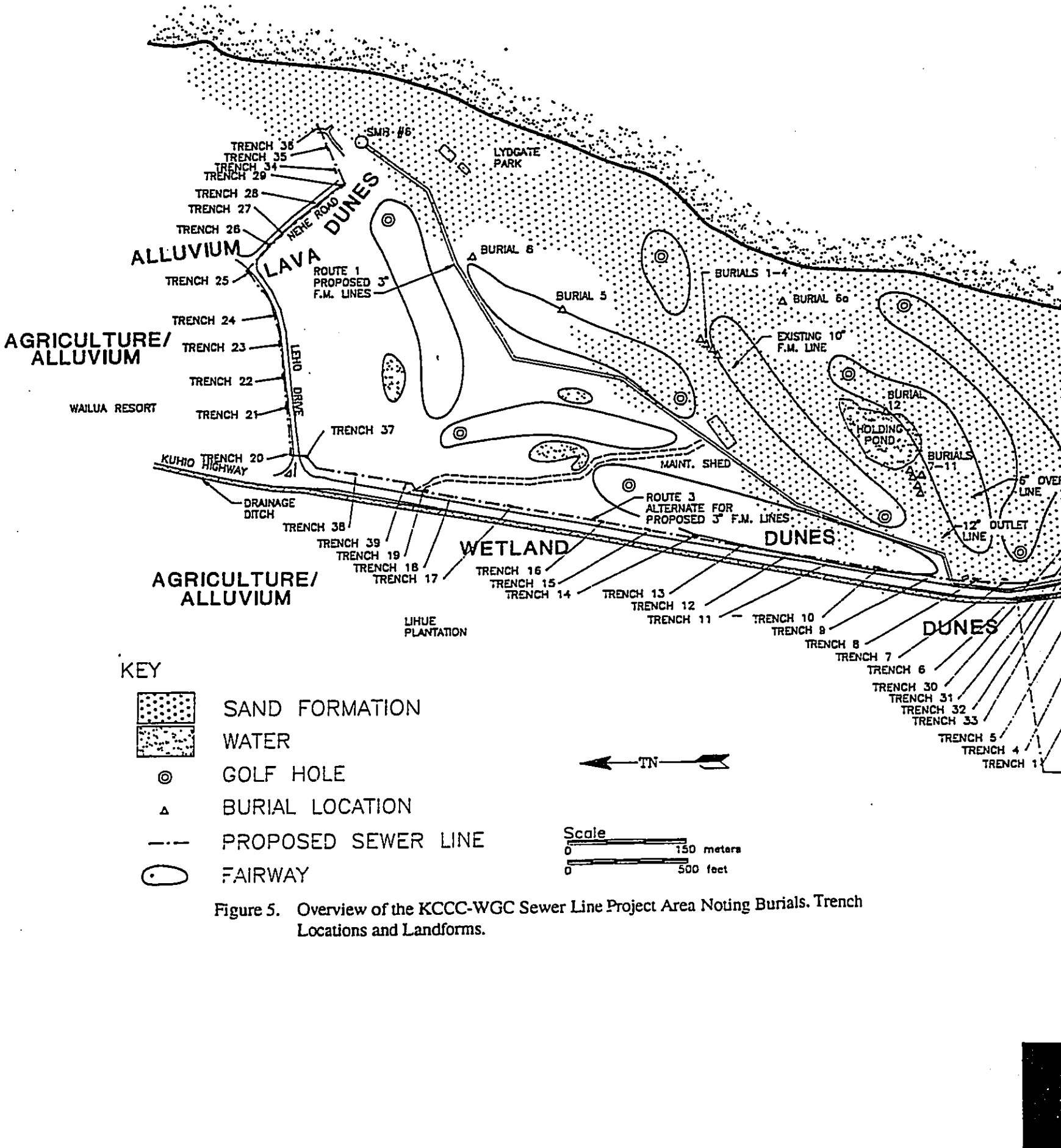
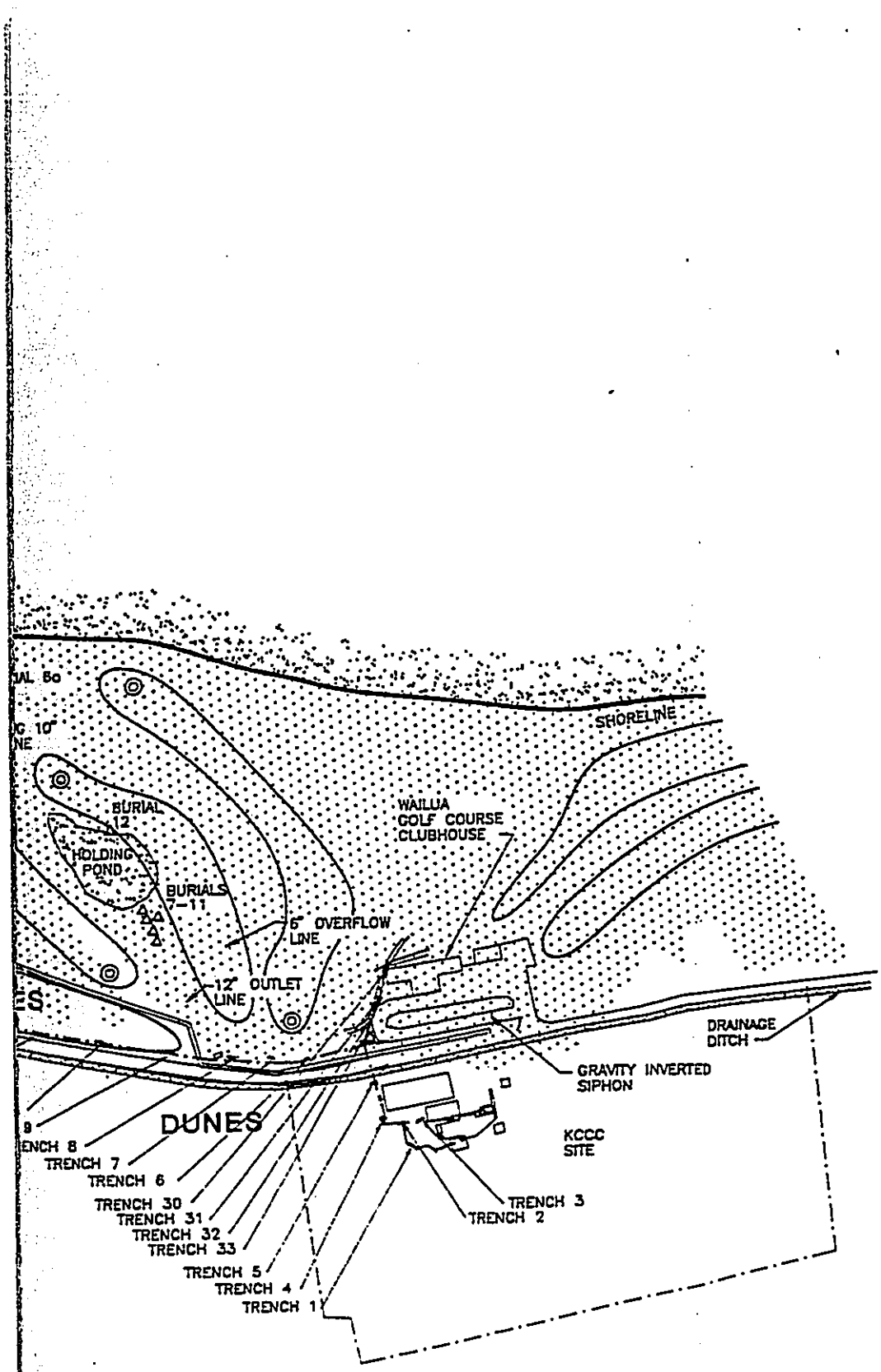


Figure 5. Overview of the KCCC-WGC Sewer Line Project Area Noting Burials. Trench Locations and Landforms.


SHORELINE
BURIAL 12
HOLDING POND
BURIALS 7–11
WAILUA GOLF COURSE CLUBHOUSE
6" OVERFLOW LINE
12" OUTLET LINE
DRAINAGE DITCH
GRAVITY INVERTED SIPHON
DUNES
KCCC SITE
TRENCH 8
TRENCH 7
TRENCH 6
TRENCH 30
TRENCH 31
TRENCH 32
TRENCH 33
TRENCH 5
TRENCH 4
TRENCH 1
TRENCH 3
TRENCH 2

Trench

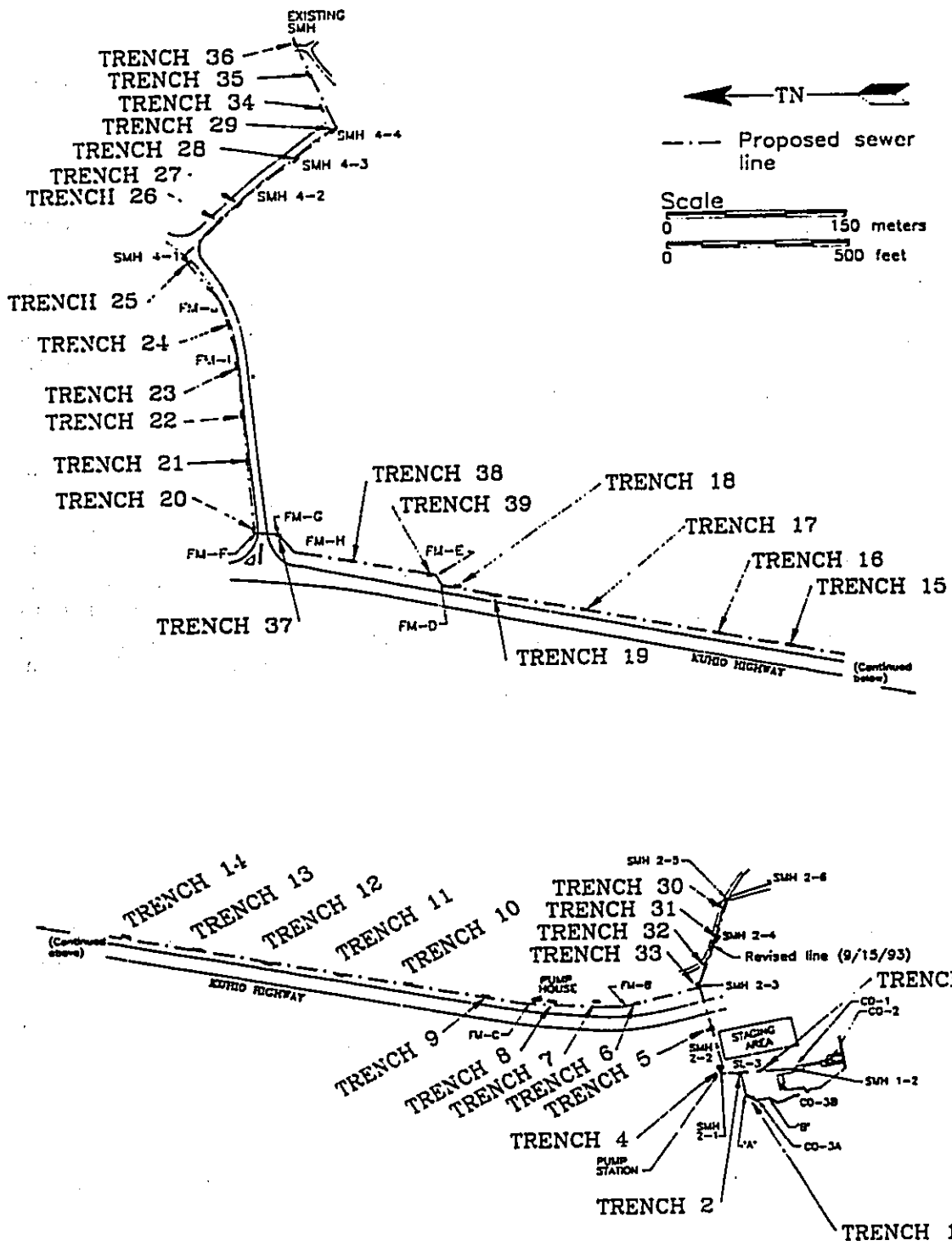


Figure 6. Base Map of KCCC-WGC Sewer Line Project Area with Trench.

and trash deposits that contained plastic, glass, milled lumber, faunal bone (toad and horse or cow), and a few small fragments of possible human bone. Outside of the profiles and just to the east of Trench 31, a single squared basalt boulder was uncovered. It has three artificial depressions ground into the surface; one still retains a portion of a metal bit.

A single burial was discovered in Trench 33, within a proposed jacking pit for the sewer line. Excavation of this trench was technically more complicated than any of the other trenches because it was within the parking lot of WGC, which required the coordination of pavement cutters, trucks to haul away the cut pavement, and the materials and labor necessary to repave the excision. Below the pavement and parking lot fill, which extended to a depth of nearly 2.75 m bs, the burial was encountered in the underlying dune sand, within 25 cm from the base of the fill. Excavation was immediately stopped, the removed sand was screened for bone fragments, and the trench was left open until completion of the consultation process with the Kaua'i Burial Council and the SHPD.

In the following discussion, the trench excavations are grouped in accordance with their similar stratigraphy and close proximity (Table 2). Naturally, there is some overlap between groups in terms of stratigraphy, but such an overlap merely points to the dynamism of landforms and the depositional history of the project area. The choice to place a trench in one group or another was based primarily on the similarities or differences in the lower strata, as upper strata appear to result from either encroachment of sediments from other landforms or mechanical alteration (mostly cultural) to the existing landform. It is the upper strata which demonstrate the changes in the landscape such as progradation of the coastal alluvium, expansion of agricultural land, or decline of a wetland.

* * * * *

Table 2. Trench Groups.

Group	Location	Trenches
I	KCCC grounds	1 to 5
II	WGC clubhouse	30 to 33
III	Dune land, WGC grounds	6 to 14
IV	wetlands	15 to 17
V	agricultural lands	18 to 24, 37 to 39
VI	lava flow and alluvium	25 to 28
VII	Dune land, Kaha Lani grounds	29, 34 to 36

Group I

This group of five trenches (1 to 5) was excavated on the grounds of KCCC (Photo 1). The stratigraphy is relatively simple with an organic layer (a humic sand) underlain by a sand layer that appears equivalent to the sand observed within the dune land immediately to the east (on the grounds of WGC). There is, of course, some variation to this sequence, such as the addition of imported fill or top soil related to construction of the prison facilities (in Trenches 1 and 3) or the presence of a second buried humic sand layer in Trench 4 (Table 3). With the exception of Trench 4, the basic sequence has remained intact and was consistently visible in at least four of the five trenches. This same sequence was also reflected in the soil profiles completed by GeoLab, whose soil engineers were conducting their own analyses at the same time the archaeological work was underway. According to their preliminary field observations, the stratigraphic sequence consisted of an organic layer underlain by a sand layer, except that their profile extended to a depth of about 10 m. It began with the organic layer, which was about 30 cm thick, under which was sand; at about 5 m the sand was characterized as a beach sand; at 6 m it turned to a coarse marine sand indicative of a high energy environment; and at 9 m, the marine sand became a fine marine sand indicative of a low energy environment. At roughly 1 m bs, they hit the water table at about the same depth the water table was encountered in the excavation trenches. No cultural material was observed or encountered in any of the trenches.

* * * * *

Table 3. Group I Stratigraphic Correlation.

TR 1	TR 2	TR 3	TR 4	TR 5	GeoLab
I		I			
II	I	II	I II	I II	Organic
III	II	III	III	III	Sand
			IV		

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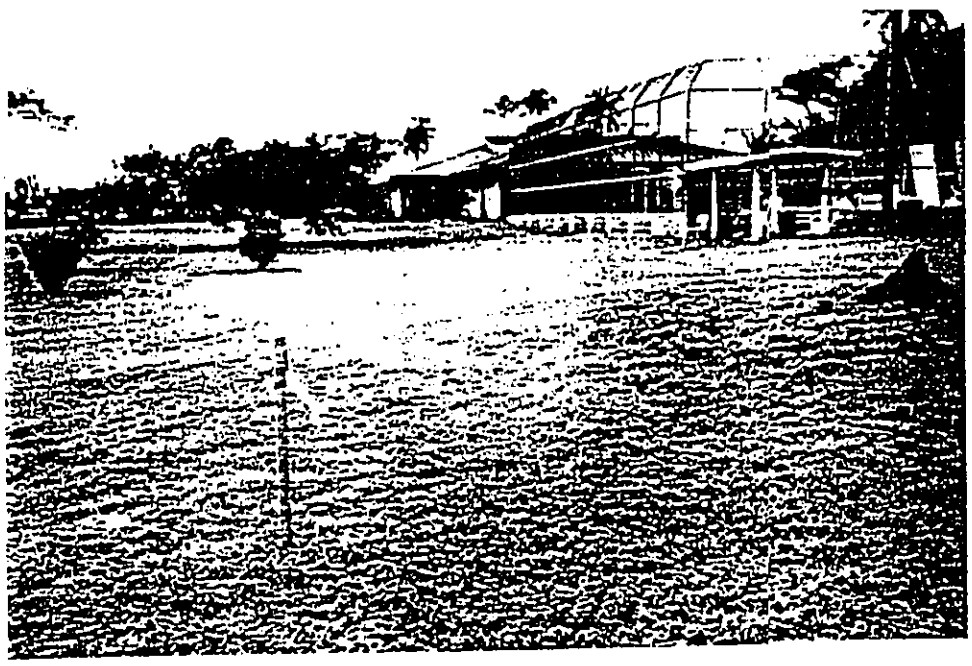

Photos 1 and 2. The Grounds of KCCC with the Main Prison Facility in the Background (above) and The Grounds of WGC. looking NW, with the Pump House in the Foreground (below)

Trench 1

This trench is 4.8 m long, 135 cm deep, and it is oriented along an axis of 31°. Its northwest corner is located on a bearing of 220° from Station A on the surveyed and staked sewer line, at a distance of 1.7 m. The long southeast wall was profiled.

The trench is located on the back side of the main prison building, within a slightly mounded area that was part of the foundation grade on which the facility was constructed. Within the soil profile, this lift appears as Layer I, a fill layer.

I. Fill or imported top soil; 0 to 33 cm bs, 20 to 33 cm thick; a dark brown (7.5YR 3/4) silty sand that is crumbly and fairly friable, with many rootlets and a few pebbles. Grass covers the surface and the lower boundary of the layer is distinct.

II. Organic, humic sand; 20 to 62 cm bs, 26 to 40 cm thick; a very dark brown (10YR 2/2), slightly friable, soft sand with many small rootlets. A couple of small sand lenses were observed in the profile, possibly an indication of some disturbance in this area. The lower boundary was distinct to diffuse owing to rootlet penetration into the underlying sand of Layer III.

III. Sand; 56 cm bs to the base of excavation, 36 to 78 cm thick; a light yellowish brown (10YR 6/4), slightly friable, soft sand. The water table was encountered at 130 cm bs, and at the base of this level and the bottom of the trench coral cobbles were observed.

Trench 2

This trench displays the general stratigraphic sequence common to this part of the project area. It is centered on Station SL-3 (0+00), and extends for a distance of 5.2 m and a depth of 105 cm. The trench is oriented along an axis of 357°. A profile of the east wall was drawn (Fig. 7).

I. Organic, humic sand; 0 to 44 cm bs, 26 to 44 cm thick; a very dark brown (10YR 2/2), soft silty sand where rootlets are quite common owing to the grass cover. A lens of light gray sand is present in the layer. The boundary with Layer II is diffuse with both root penetration and some mottling. The layer is equivalent to Layer II in Trench 1.

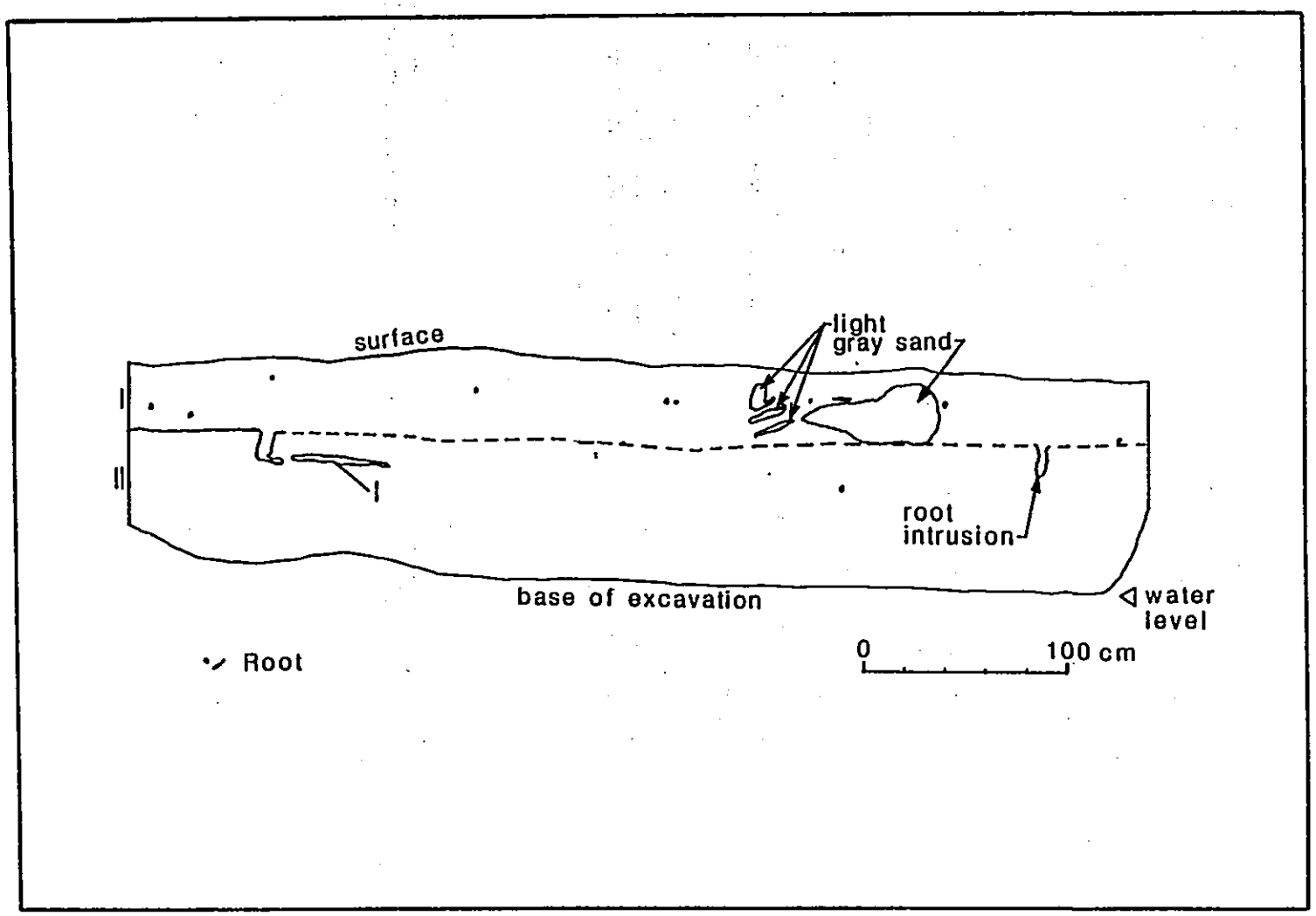

Figure 7. Stratigraphic Profile of the East Face of Trench 2.

II. Sand; 26 to 105 cm bs, 46 to 68 cm thick; a light yellowish brown (10YR 6/4) soft sand with an occasional root, especially near the upper boundary. The water table was encountered at 100 cm bs. This layer is equivalent to Layer III in Trench 1.

Trench 3

The trench is located in the front of the main prison building, on the same raised foundation grade on which Trench 1 is located. The trench is 5.5 m long and 120 cm deep, with its long axis oriented along a 156° path. The northwest corner of the trench is 31.6 m to Station SMH 1-1, on a bearing of 356°. A profile of the west wall was drawn. The stratigraphic sequence is equivalent to that in Trench 1.

I. Fill, or imported top soil; 0 to 30 cm bs, 10 to 30 cm thick; a dark reddish brown (5YR 3/3), friable silty sand with large peds and many roots and rootlets. Grass covers the surface. Its boundary with Layer II is diffuse to distinct.

II. Organic, humic sand; 10 to 55 cm bs, 6 to 25 cm thick; a very dusky red (2.5YR 2.5/2), friable silty sand with a few roots and land snail shells. The lower boundary was distinct with some mottling present.

III. Sand; 34 cm bs to the base of excavation, 30 to 80 cm thick; a light yellowish brown (10YR 6/4), somewhat friable sand with small mottles of orange colored sand (10YR 5/6, yellowish brown). The water table was encountered at 120 cm bs, at the base of the excavation.

Trench 4

This trench is located 0.6 m from Station SMH 1-1, on a bearing of 80° from the stake to the northwest corner of the trench. The trench is 5.5 m long, 105 cm deep, and has a long axis oriented along a 75° path. The north wall was profiled (Fig. 8).

The stratigraphic sequence visible in this trench is unlike that in the rest of this group of trenches. It has a second, lower organic layer. Interestingly, the GeoLab soil profile in this area failed to distinguish the various strata observed in the trench profile. Their tests revealed the upper organic layer (I), but made no distinction other than texture in the remaining layers (II, III, IV).

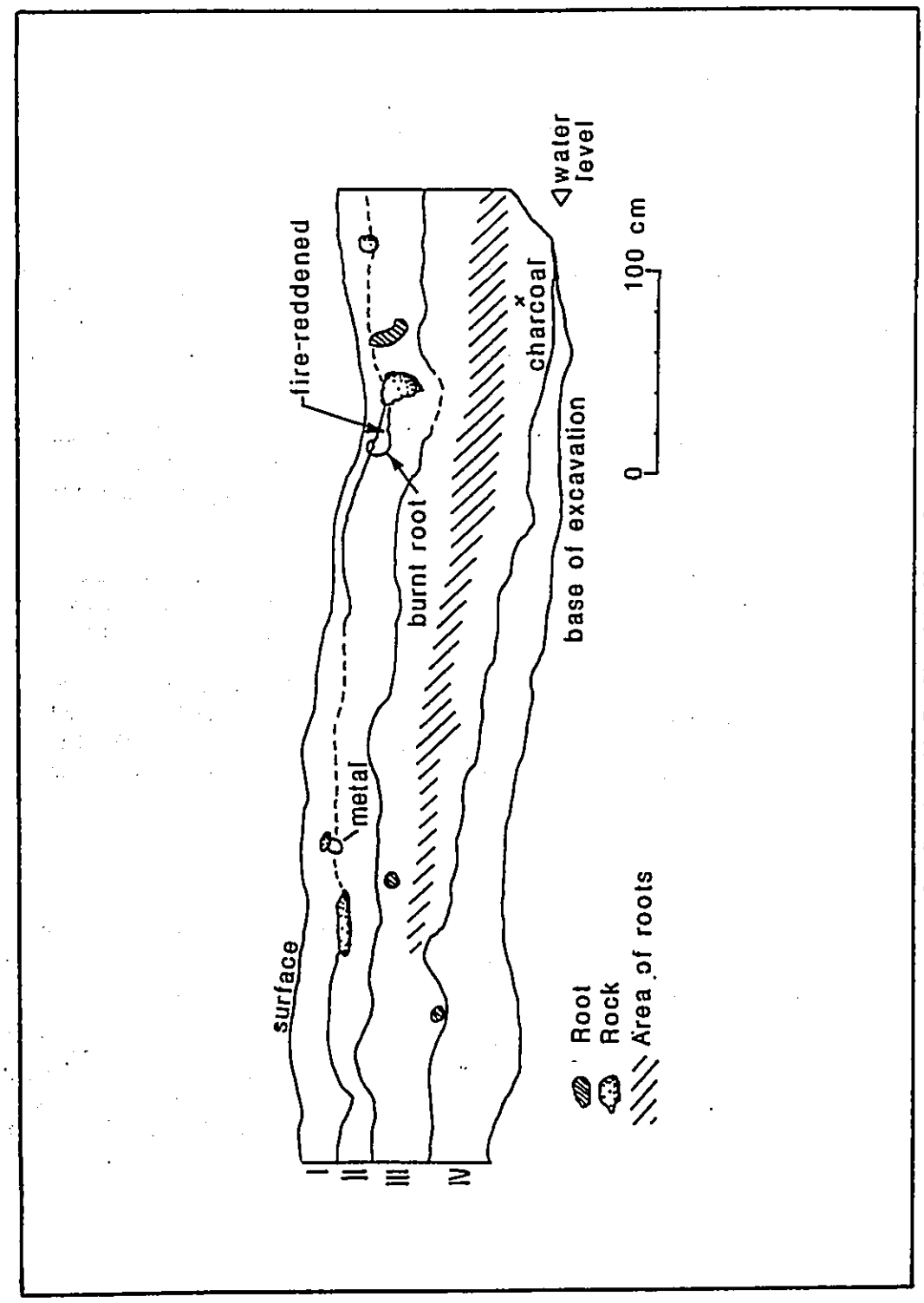

Figure 8. Stratigraphic Profile of the North Face of Trench 4.

I. Organic, humic sand; 0 to 26 cm bs, 4 to 26 cm thick: a dark yellowish brown (10YR 3/4), soft silty sand with many rootlets and large peds. Recent debris is mixed into the layer and includes iron fragments, a cement slab, and metal sheeting, as well as a couple of large rocks and the burnt roots of a stump. The lower boundary is diffuse. Grass covers the surface. Within the context of the entire profile, this layer appears to be the upper, mixed or landscaping zone of Layer II.

II. Organic, humic sand; 4 to 40 cm bs, 10 to 28 cm thick; a very dark grayish brown (2.5Y 3/2), soft silty sand with many rootlets. The boundary with Layer III is distinct.

III. Sand; 25 to 100 cm bs, 25 to 65 cm thick; a yellowish brown (10YR 5/4) soft silty sand that contains a band of roots across the length of the trench. The layer is heavily mottled, with mottles ranging in color from yellowish brown (10YR 5/6) to pale brown (10YR 6/3). A small piece of charcoal was observed in the profile face. The nature of the mottling in this layer suggests some mixing and disturbance. The boundary with Layer IV is distinct.

IV. Organic, humic sand; 55 cm bs to the base of excavation, 2 to 40 cm thick; a very dark grayish brown (10YR 3/2) soft silty sand with a few roots. This layer is equivalent in color and texture to Layer II. The water table was encountered at the base of the excavation.

The two organic/humic sand layers (II and IV) within this profile raise questions as to the localized nature of deposition in this area. Are these in fact part of the same general depositional episode interrupted by the deposit of the mottled sediments of Layer III? Such an event may have stemmed from construction of the prison facilities, whether the original facilities or the newer facilities standing today. Or are the two organic layers distinct events, each representing stabilized vegetated surfaces separated by the deposition of Layer III?

Trench 5

This trench is in the location of one of the two jacking pits planned for the sewer line corridor. It is 4.4 m long and 95 cm deep, with the long axis oriented at 156°. The northwest corner of the trench is 16.8 m from Station SMH 2-2, on a bearing of 243° to the station stake. GeoLab also drilled in this area, with the same results as described at the beginning of this section.

I. Organic, humic sand; 0 to 19 cm bs, 2 to 19 cm thick; a dark yellowish brown (10YR 3/4), somewhat friable, soft silty sand with some pebbles and many rootlets that are the likely products of the

grass cover. The lower boundary ranges from distinct to diffuse. Like Layer I in Trench 4, this layer appears to be the upper mixed zone of Layer II, rather than a separate, distinct layer.

II. Organic, humic sand; 0 to 36 cm bs. 14 to 34 cm thick; a dark brown (10YR 3/3), soft, slightly silty sand with many pebbles, a few rootlets, and some mottling. The mottles range from a light brown to light gray sand. The lower boundary is distinct.

III. Sand; 24 cm bs to the base of excavation, 20 to 70 cm thick; a light yellowish brown (10YR 6/4) soft sand with a few rootlets from the overlying layers. Two pockets of rusty orange sand were visible in this layer. Coral and the water table were encountered at the base of the excavation.

Discussion

The lowest depositional layer in four of the five trenches indicates this area was at one time an extension of the dune land immediately to the east, across Kuhio Highway. The sand in these layers is similar in color, texture, and material characteristics to the sand that is common to the dune land. Development of the overlying layer of humic sand suggests that this area was subsequently stabilized with the growth of vegetation and the contribution of organic matter to the sand. The agency of this change – from dune land, or at least the edge of the dune land, to a stabilized vegetated surface – is unknown, although several possibilities are suggested. It could have been the result of isolation from the primary dune land after the development and construction of Kuhio Highway; or perhaps the encroachment of agricultural activities, especially with the associated sedimentation; or the landscaping and construction of the prison facilities and grounds; or even some combination of the above. Further activity, such as construction of the current facilities, contributed to additional alterations in the local terrain, namely the added layer of top soil in the raised foundation grade on which the main (new) prison building was built.

Trench 4 contains an anomalous stratigraphic sequence within this group of trenches. It has a second, lower organic layer of humic sand, which was not observed in any of the other trenches; as such, its presence is somewhat enigmatic. Yet the color and composition of this layer are similar to the upper organic layer in the trench profile, which presents at least two possible explanations for its presence. The first is that the two layers (II and IV) are in fact part of the same general depositional episode interrupted by a mottled, disturbed sand. The presence of this sand layer could have been the result of ground moving construction work on the prison and its grounds prior to erection of the current facilities, or perhaps even the remnant of some natural, near catastrophic event that carried this sand inland from the dune. The second possibility is that both organic layers represent discrete events separated by the mottled sand, representing yet another discrete event. Either explanation could be accommodated easily by the geomorphological description of the gradational change in the

landscape. The former would fit directly into the proposed sequence; the latter would mean some slight adjustments to the sequence such as the presence of an isolated, stable, vegetated surface at the time of the expanded dune land, followed by expansion of the dune into this area, and finally another stabilized surface, this time associated with the current use of the grounds.

A larger picture of the geomorphology of this area is provided by GeoLab. It is one in which the image of a prograding coastline emerges and begins with submergence of the area and its characterization as a low energy environment, perhaps within a lagoonal setting. This is followed by the presence of a high energy environment, the result of the shallow, turbulent, active zone of waves. As the coastline continued to prograde, the area emerged from the ocean to become a beach, then dune land, and finally its current status as a stabilized, vegetated surface.

Group II

This group of four trenches (30 to 33) was excavated on the sewer line lateral that joins the WGC clubhouse with the main proposed line. The stratigraphy demonstrates that this is a fairly disturbed area, with disturbance related to the clubhouse, parking lot, and fairway development. The stratigraphic sequence consists mainly of a series of disturbed layers of sandy sediments, each with various added elements such as clay or mixed lenses of sediments (Table 4). Only two trenches display unaltered dune sand – Trenches 32 and 33 – but it is only a small amount at the base of each trench.

Excavation of these four trenches was painstakingly slow owing to the presence of a number of buried utility lines. Placement of trenches was difficult and required great skill and caution on the part of the backhoe operator, as the trenches had to be placed between the buried lines – close quarters in some instances. Yet in spite of all the precautionary measures, there was one mishap – a buried irrigation line was severed. The line was amid a web of buried lines and could have easily been missed in the walk-overs with the divining rod. It was quickly patched by the golf course maintenance supervisor, and work resumed with the course of excavation shifting slightly to avoid further contact with the irrigation line. Finally, at least one trench – Trench 33 – also required the logistical coordination of the archaeological work, the needs of the golf course clientele, and of course the practical needs of pavement cutters, disposal of the cut pavement, and the materials and labor necessary for repairs. This trench was placed in the WGC parking lot, within the second of two proposed jacking pits for the sewer line; a critical element in the sewer line corridor.

This group of trenches was also the most productive with regard to cultural features. A post mold and guy line anchor were exposed – both historic in nature and related to the golf course development – and a single burial was encountered. The burial was within the dune sand at the base of Trench 33; its discovery not only confirmed the suspicions regarding the presence of burials in the dune land but it also reaffirmed observations regarding predictions on the placement of such burials. However, both the date and ethnic affiliation of

Table 4. Group II Stratigraphic Correlation.

TR 30	TR 31	TR 32	TR 33
			Pavement Subgrade I
I	I	I	
II III		II III IV V	
IV V	II III	VI	II

* * * * *

the burial remain unknown at present, and must be determined before a decision on its disposition may be made.

Trench 30

This trench is located by the clubhouse near the termination point of the proposed sewer line lateral, where the line ties into the existing sewer lines to the clubhouse. The trench is 6.2 m long, 155 cm deep, and has a long axis oriented 110°. The northwest corner of the trench is 13.8 m from Station SMH 2-5, on a bearing of 112° from the trench corner to the station stake. Within the following description of the trench stratigraphy all layers exhibit some degree of disturbance. The upper three layers appear to be related to landscaping activity around the clubhouse and on the golf course; the lower two layers are also disturbed and appear related to the golf course development, but unlike the upper three layers which contain imported sediments these two layers are merely reworked dune sand.

The north face of the trench was profiled. It contains a post mold and a railroad tie used as a post (Photo 3).

I. Sod layer; 0 to 10 cm bs, 1 to 10 cm thick; a dark grayish brown (10YR 4/2), soft sand that supports the overlying cover of grass. It

contains many rootlets and caps the post and post mold. The post, made from a railroad tie, was extracted from the post mold during excavation; it was infused with small roots, along with the rest of the post mold.

The post mold extends from the base of the sod layer to a depth of 107 cm. It has a diameter of about 50 cm at the mouth or top, and is vertically oriented with tapered sides and a generally conical shape. It likely originated prior to formation of the sod layer, but after establishment of Layer II.

The boundary between Layers I and II is distinct.

II. Organic, disturbed; 1 to 28 cm bs, 10 to 25 cm thick; a yellowish brown (10YR 5/4) soft sand with a few rootlets and small pebbles. The layer contains lenses of sand ranging in color from white to brown, with the dominant color a very pale brown (10YR 7/4), and a discontinuous dark organic lens (a dark yellowish brown, 10YR 3/4, comparable to Layer I) that runs through the middle of the layer. The boundary between Layers II and III is distinct.

III. Organic, disturbed; 14 to 35 cm bs, 2 to 10 cm thick; a strong brown (7.5YR 4/6) soft sand with a few small pebbles. This layer marks the base of the planting or landscaping zone, the base of added or imported sediments. The boundary with underlying Layer IV is distinct.

IV. Sand; 22 to 130 cm bs, 75 to 100 cm thick; a light yellowish brown (10YR 6/4) soft sand with some decaying roots, specks of charcoal, and horizontal streaks of clay-like or organic sediments. Some of the charcoal (cat. no. 5) was collected, but the material could not be identified because of its small size. The lower boundary is distinct, marked by a thin, dark streak of sediment. The streaking throughout this layer suggests some degree of disturbance, likely related to the development of the golf course in concert with the action of the wind.

V. Sand; 110 cm bs to base of excavation, 5 to 30 cm thick; a yellowish brown (10YR 5/4) soft sand with a few pebbles and random specks of charcoal. The layer is darker than the overlying Layer IV, yet it also exhibits some degree of disturbance that could most likely be attributed to the golf course development.

Trench 31

This trench is located between a walkway and the WGC parking lot. It is 4.5 m long, 135 cm deep. with a long axis oriented along a path of 112°. The northwest corner of the trench is located 1.4 m from Station SMH 2-4, on a bearing of 338° from the trench corner to the station stake. The initial location of the trench was shifted southward from its northerly position when the first bucket of sediments encountered a buried utility pipe. Another pipe was encountered in this new location, so the trench was again shifted southward. Excavation resumed with the backhoe bucket skimming along the side of this second pipe. Yet another pipe – a water line – was encountered about 30 cm directly below the latter pipe, so the trench was again shifted slightly to the south. The excavation continued in this new location, with the backhoe bucket continuing to skim alongside the pipes, though with a slight buffer of sand maintained between the bucket and pipes in order to avoid any accidental rupture.

The stratigraphy in this trench, as recorded in the south wall, reflects a level of disturbance throughout the sequence. As in Layers IV and V in Trench 30, this disturbance appears to be in the form of mixed dune sands related to development of the golf course.

A squared basalt boulder with three drilled depressions was encountered immediately east of the trench (Photo 4). It was interpreted as historical in nature and likely served as a guy line anchor or some other similar function.

I. Sod layer; 0 to 15 cm bs, 2 to 15 cm thick; a dark yellowish brown (10YR 4/4) soft sand that supports the grass cover. Rootlets are quite common in the layer, and there are a few pebbles. The boundary with the underlying Layer II is distinct.

II. Sand; 2 to 100 cm bs, 85 to 95 cm thick; a brownish yellow (10YR 6/6) soft sand with a few rootlets, some pebbles, a few flecks of charcoal, some clay pellets, and a few decaying roots. In the field, this layer appeared comparable to Layer IV in Trench 30. The boundary with underlying Layer III is diffuse.

III. Sand; 85 cm bs to base of excavation, 10 to 40 cm thick; a yellowish brown (10YR 5/6) soft sand, denser and more compact than Layer II, with bands of reddish clay, similar to the type of clay observed in the clay pellets in Layer II. Charcoal flecks are present in this layer.

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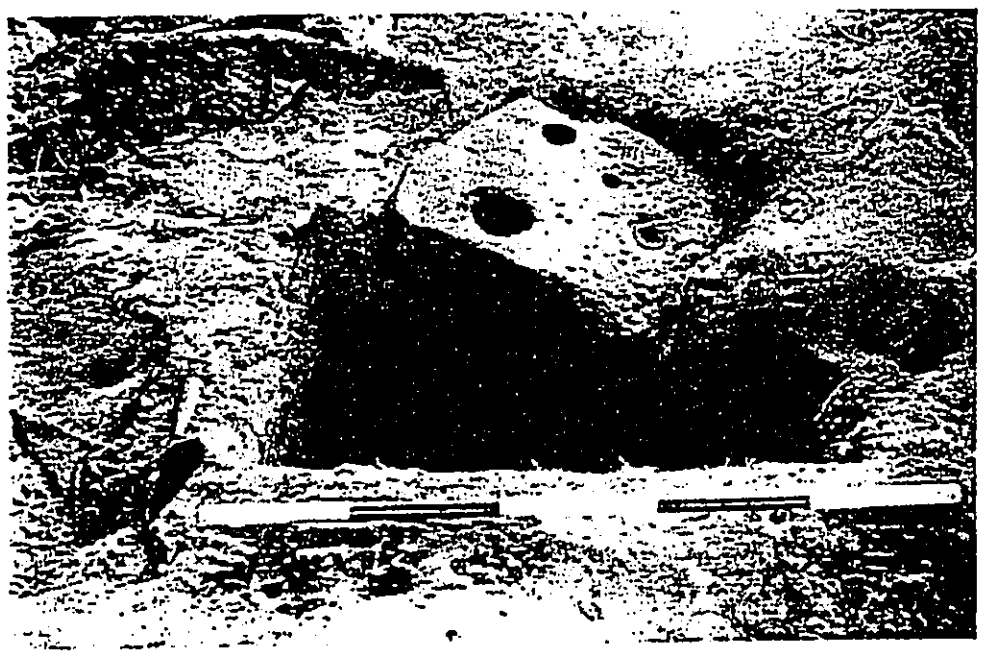

Photos 3 and 4. Post Mold in the North Face of Trench 30 with Railroad Tie Post in Backdirt (above), and Squared Basalt Boulder with Drilled Depressions, a Probable Guy Line Anchor, View to the South (below)

The basalt boulder with drilled depressions was uncovered just below the surface, at the east end of the trench. It was imbedded in Layer II. The boulder is squared, roughly 55 by 55 cm and about 25 cm thick. There are three bowl shaped drilled depressions on one face of the boulder: they range from about 9 to 14 cm in diameter and 2 to 8 cm deep. A metal bit is still present in one of the depressions. In the sand around the boulder there were fragments of clear glass, a small piece of concrete, and quite a few rootlets. The shape of the boulder and the nature of the depressions indicate a likely function as an anchor, perhaps for guy lines.

Trench 32

Like Trench 31, this trench is located between the parking lot and a walkway. It is 5 m long, 120 cm deep, and has a long axis oriented along an alignment of 113°. The northwest corner is located 25 m from Station SMH 2-4, on a bearing of 110° from the trench corner to the station stake. This trench was excavated at what was thought to be the base of a dune (the stratigraphy, however, demonstrated otherwise), on an orientation that would best accommodate the numbers of pipes crisscrossing the area. Unfortunately, in spite of all the precautions a water pipe (part of the irrigation system) was severed. The pipe crossed the trench at an angle, amid a number of other pipes. It was quickly fixed and excavations resumed.

The stratigraphy exposed in the profile of the south wall is similar to that in Trench 30, with all layers showing some degree of disturbance that can be directly traced to development of the golf course. At the base of this wall, on the end walls, and on the north wall, the original dune sand is visible. The east end wall in particular demonstrates the rather steep slope of the dune and corrected the view that this trench was placed at the base of the dune; it was instead placed roughly mid-slope on the dune, contrary to the original impression.

I. Sod layer; 0 to 5 cm bs, 2 to 5 cm thick; a dark brown (7.5YR 3/4) soft, slightly silty sand that supports the grass cover and contains many rootlets. The boundary with Layer II is diffuse, but it is in part marked by a large coral cobble that rests directly on the boundary.

II. Sand, disturbed; 3 to 35 cm bs, 10 to 28 cm thick; a yellowish brown (10YR 5/4) soft sand that is heavily mottled and contains lumps of clay and bits of coral. The mottles occur in a variety of colors, including gray, black, red, brown, yellow, and orange. The boundary with Layers III and IV is distinct.

III. Sand; 25 to 35 cm bs, 2 to 4 cm thick; a light yellowish brown (10YR 6/4) soft sand that occurs in a narrow discontinuous band across the length of the trench. Its lower boundary with Layer IV is distinct.

IV. Sand; 20 to 54 cm bs, 3 to 33 cm thick; a dark brown (7.5YR 3/3) friable, slightly plastic, slightly sticky sand with clay. There are a few rootlets present in the layer as well as a small number of roots. The lower boundary ranges from diffuse to distinct.

V. Sand; 35 to 68 cm bs, 2 to 17 cm thick; a strong brown (7.5YR 4/6) soft sand with clay pellets and a few rootlets. It appears to be the base of much of the landscaping or imported and mixed sediments. The boundary with layer VI is distinct.

VI. Sand; 45 cm bs to base of excavation, 28 to 72 cm thick; a yellowish brown (10YR 5/6) soft sand with a few rootlets, a small number of roots, some horizontal banding of white and tan sediments, and some mottling with sediments varying in color from red to black to gray. This disturbed dune sand is the lowest layer visible in the profile, yet it rests on a base of apparently unadulterated dune sand which is visible in the other three trench walls and the floor of the excavation.

Trench 33

This trench is located in the WGC parking lot, and as noted at the beginning of this section, required the cooperation of many in order to successfully meet the logistics of cutting and patching the pavement. The trench is 3.3 m long, 3 m deep, and is oriented along an axis of 75°. The northwest corner is 2 m from Station FM-A, on a bearing of 124° from the trench corner to the station. The stratigraphy is simple, consisting of nearly 2.75 m of fill, including the pavement, on top of the dune sand. Yet, this was the most complicated of all the trenches in the project area because of the logistics of excavation and the presence of a burial in the dune sand. The south wall was profiled (Fig. 9).

Pavement; 0 to 8 cm bs, 5 to 8 cm thick; a bituminous surface with gravel mixed into it.

Subgrade; 5 to 20 cm bs, 5 to 15 cm thick; gravel.

I. Fill; 12 to 275 cm bs, 255 to 270 cm thick; a series of fill layers, all of which were imported to build up the parking lot to its present grade. The primary component of the fill is sand; other additions include coral cobbles, clay balls and pellets, and mottled sediments that are brown, red, gray, white, black, and yellow in color. The fill was quite compact throughout, which formed a very distinct and sharp boundary with the underlying dune sand.

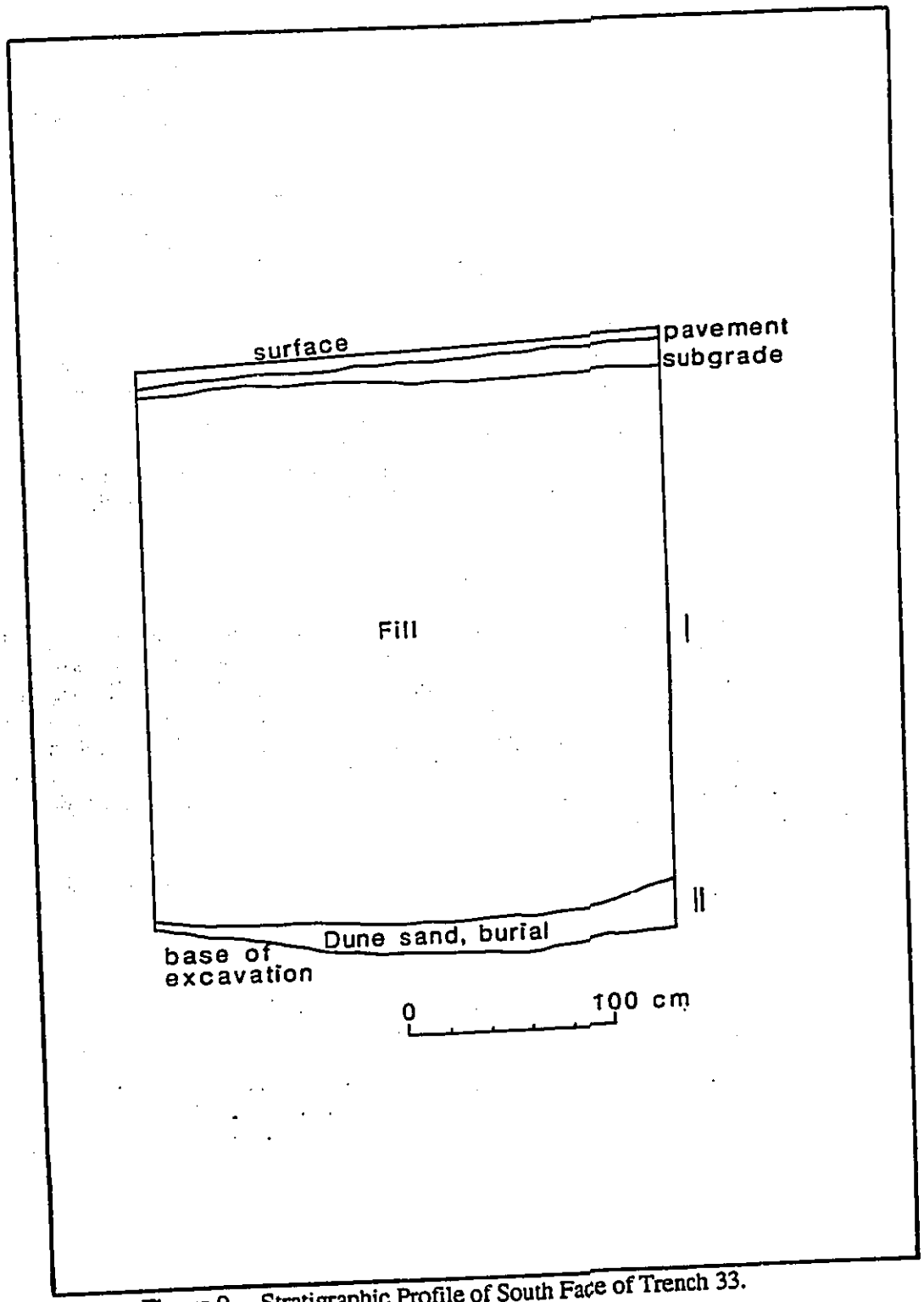

Figure 9. Stratigraphic Profile of South Face of Trench 33.

II. Sand; 275 cm bs to base of excavation. 25 cm thick: a light yellowish brown (10YR 6/4) soft sand. A burial was encountered within 25 cm from the top of the layer.

Discovery of the burial at the base of the trench, nearly 3 m bs, initiated a series of actions set by the protocols established in Section 6E of the Hawai'i Revised Statutes (1990) and the Kaua'i Burial Council regarding the disposition of human remains. The excavation was immediately halted. The sand that had been removed during excavation and after the fill material had been removed was sifted through 1/8 inch wire mesh screens in order to recover whatever skeletal elements may have inadvertently been removed from the burial (the sand had been deposited in a pile separate from the fill) during excavation. Cranial fragments, part of the jaw, and teeth were recovered from the sand; all remains were placed in a clean white cloth bag until such time as their disposition could be determined.

The Kaua'i Burial Council and SHPD were notified of the burial, its context, and the collection of loose skeletal elements from the excavated sand. It was their decision to return the bone fragments to the trench and fill it in, closing up the excavation without further exploration. The base of the trench was lined with black plastic to prevent further disturbance to the rest of the burial, then a member of the archaeological team rode the backhoe bucket down to the base of the trench, placed the collected remains in a hollow of the plastic, and covered them with sand. A second sheet of black plastic was then used to line the trench covering the newly placed set of remains, sand and the finer grained parking lot fill was placed on top of this layer of plastic until a reasonable buffer of material had been reached (about 1 m), after which the remaining fill was returned to the trench and the area was repaved.

Until further analysis is undertaken, it is uncertain whether the burial is part of the dune burial site identified by Bennett (1931), Site 50-30-08-103. Before any direct association can be made, both the date of the remains and its ethnic affiliation must be determined in order to establish the full context of the burial and clarify its relationship to the site.

Discussion

The stratigraphy exposed in this group of trenches reflected mostly disturbed ground related to the development of the golf course, from the alterations of the terrain (shaving and reshaping the dunes) to construction of the clubhouse and associated facilities like the parking lot. Two recent features were revealed -- a post mold from which a post (a railroad tie) was extracted during excavation and a basalt boulder interpreted as an anchor for guy lines or other similar type of support.

A single burial of unknown date and ethnic affinity was encountered at the base of Trench 33. Though it could be part of Site 50-30-08-103, originally identified by Bennett (1931), further investigations will be needed to make such a determination. The burial was

within the dune sand. on the lee side of what at one time had been quite a large dune. According to the golf course personnel and older patrons, the dune had been cut down in size with a fairway placed in a hollow created at the top of it. Discovery of the burial confirmed expectations expressed in planning meetings prior to the initiation of the fieldwork.

Group III

This group of trenches (6 to 14) was excavated along the proposed sewer force main corridor within the grounds of WGC and parallel to Kuhio Highway (Photo 2). The stratigraphy across this trench group is simple with disturbed sandy sediments overlying dune sand; in effect. the stratigraphy has confirmed that all trenches are located within the dune land (Table 5). Disturbance relative to landscaping and development of the golf course facilities as well as construction of Kuhio Highway is visible in the upper layer(s) of these trenches. Agricultural activity, too, makes a brief appearance in at least one trench with the wind blown residues of field burning (sugarcane?) incorporated into the layer sediments. The base layers of all but one trench consist of unaltered dune sand.

Two mishaps with buried utility lines occurred during the excavations. The first was an encounter with an irrigation line, which turned out to be an abandoned line. With no water running through it and hence no electrical energy emission, the line did not register with the divining rod. The second mishap occurred in the same vicinity as the dead irrigation line. In this instance the main pressure line for the irrigation system at the north end of the golf course was crushed under the weight of the backhoe during backfilling operations. This

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Table 5. Group III Stratigraphic Correlation.

TR 6	TR 7	TR 8	TR 9	TR 10	TR 11	TR 12	TR 13	TR 14
								I II III
I	O I	I II	I II III	I	I	I	I	
II III	II	III	IV	II	II	II	II	

section of pipe was quickly fixed by the maintenance supervisor for the golf course; however, this incident served to demonstrate the prevalence of hidden, undocumented, buried utility lines.

Trench 6

This trench is located along Kuhio Highway, within the vegetation screen between the highway and the golf course. It is 3.3 m long, 95 cm deep, and has a long axis oriented 358°. The northwest corner is 9.1 m from Station FM-B, on a bearing of 354° from the trench corner to the station stake. The presence of buried utility lines at both ends of the trench was the cause for a shortened trench; it was excavated between the utility lines. The stratigraphy is simple with an upper disturbed layer within the root zone, underlain by dune sand that is somewhat disturbed and seems to represent a zone of transition to the basal sand layer.

I. Sand; 0 to 20 cm bs, 10 to 20 cm thick; a dark yellowish brown (10YR 3/4) soft, slightly silty sand with an abundant amount of rootlets. The boundary with Layer II is distinct.

II. Sand; 10 to 64 cm bs. 10 to 48 cm thick; a yellowish brown (10YR 5/6) soft sand with many rootlets and a large number of roots. Some of the roots have a whitish pallor to them, which at a glance made them look like bone. This layer appears to be a transition layer between the overlying vegetation zone and the underlying dune sand. The boundary with Layer III, the dune sane, is fairly diffuse.

III. Sand; 25 cm bs to the base of excavation, 25 to 53 cm thick; a brownish yellow (10YR 6/6) soft sand with a few rootlets from the overlying layers.

Trench 7

This trench was located just inside the vegetated highway screen, on the grounds of WGC. It was the most problematic of the trenches in this group owing to the presence of buried utility lines. In response to the number of pipes in the general vicinity, the trench had to be shifted eastward of the sewer alignment until a relatively clear area, free of buried lines, could be located. This was within the bounds of a golf course service road, nearly 5 m from the original sewer alignment. The coordinator of the sewer line project, Eric Nishimoto, was on-site during the excavation of this trench and was noticeably concerned that the trench was not directly on the sewer alignment. His demeanor was somewhat tempered when the first pipe (the abandoned irrigation line) was severed by the backhoe; contact with the pipe, however, prompted another slight shift eastward in order to avoid another such encounter. The excavation work thereafter proceeded without any mishaps, until the final stage of

work – filling in the trench. At that time, the weight of the backhoe crushed and severed the main pressure line for the irrigation system on this end of the golf course. The line, 1/2 inch copper tubing, is buried less than 30 cm below the surface.

The trench is 4 m long and 1 m deep, excavated on an orientation of 8°. The northwest corner of the trench is 5 m from Station FM 3+00, on a bearing of 264° from the trench corner to the station. A profile was drawn of the east wall.

O. Organic horizon; 0 to 10 cm bs, 2 to 10 cm thick; includes grasses and a thick mat of needles from the surrounding ironwood trees.

I. Sand; 2 to 33 cm bs, 15 to 31 cm thick; a dark brown (10YR 3/3) soft, slightly silty sand with a number of rootlets. The lower boundary is distinct.

II. Sand; 20 cm bs to the base of excavation, 20 to 80 cm thick; a yellowish brown (10YR 5/6) soft sand.

Trench 8

This trench is about 6 to 7 m south of the pump house. There are several valves visible on the surface of the area and, as exhibited in the stratigraphic profile, the ground surrounding the pump house has been selectively cut and filled in order to accommodate the various water and power lines going to and from the building. The trench is 5.3 m long, 105 cm deep, and has a long axis oriented 193°. The northwest corner of the trench is 8.2 m from Station FM 4+00, on a bearing of 210° from the trench corner to the station.

I. Sand; 0 to 22 cm bs, 10 to 22 cm thick; a yellowish brown (10YR 5/4), very friable sand with a number of rootlets. The boundary with Layer II is diffuse owing to root penetration.

II. Sand; 0 to 35 cm bs, 3 to 28 cm thick; a very dark grayish brown (10YR 3/2) soft silty sand with many roots and rootlets. The layer is relatively compact, at least more so than Layer I. The lower boundary is distinct.

III. Sand; 0 cm or surface to base of excavation, 57 to 85 cm thick; a brownish yellow (10YR 6/6) soft sand with a few rootlets from the overlying layers. There is some mottling in this layer, with the mottling concentrated around the rootlets.

Trench 9

This trench is located within the golf course fairway, north of the pump house. It is slightly east of the sewer alignment owing to the presence of a buried pipe line on the alignment. The trench is 6 m long, 1 m deep, and has a long axis oriented 192°. Its northwest corner is 3.2 m from Station 6+00, on a bearing of 27° from the station stake to the trench corner. The stratigraphy is much like the other trenches in this group except that it also contains the windblown evidence of a broadcast burn, likely from agricultural field burning. The samples (cat. nos. 1, 2, 3) recovered from this deposit indicated that the charcoal imbedded in the sediment was actually sugarcane slag, a by-product of burning cane fields. One sample (cat. no. 2) was of snail shell; it was collected to determine with reasonable satisfaction that the snails were land based. The west face of the trench was profiled (Fig. 10).

I. Sand; 0 to 36 cm bs. 10 to 36 cm thick; a strong brown (7.5YR 4/6) soft silty sand with many roots and an occasional piece of cane slag. The lower boundary is mostly distinct, although it is mottled in places.

II. Sand; 10 to 35 cm bs, 5 to 20 cm thick; a dark yellowish brown (10YR 4/4) friable sand with an occasional root. A long discontinuous lens of charcoal and cane slag, as well as scattered fragments of cane slag, are present in the layer. The lower boundary is distinct, marked in part by the charcoal lens.

III. Sand; 15 to 68 cm bs, 5 to 35 cm thick; a dark yellowish brown (10YR 4/4) soft silty sand with a few roots, a small scattered amount of cane slag, and land snails. The lower boundary is distinct.

IV. Sand; 35 cm bs to base of excavation, 10 to 55 cm thick; a light yellowish brown (10YR 6/4) friable sand with a few roots and an occasional land snail.

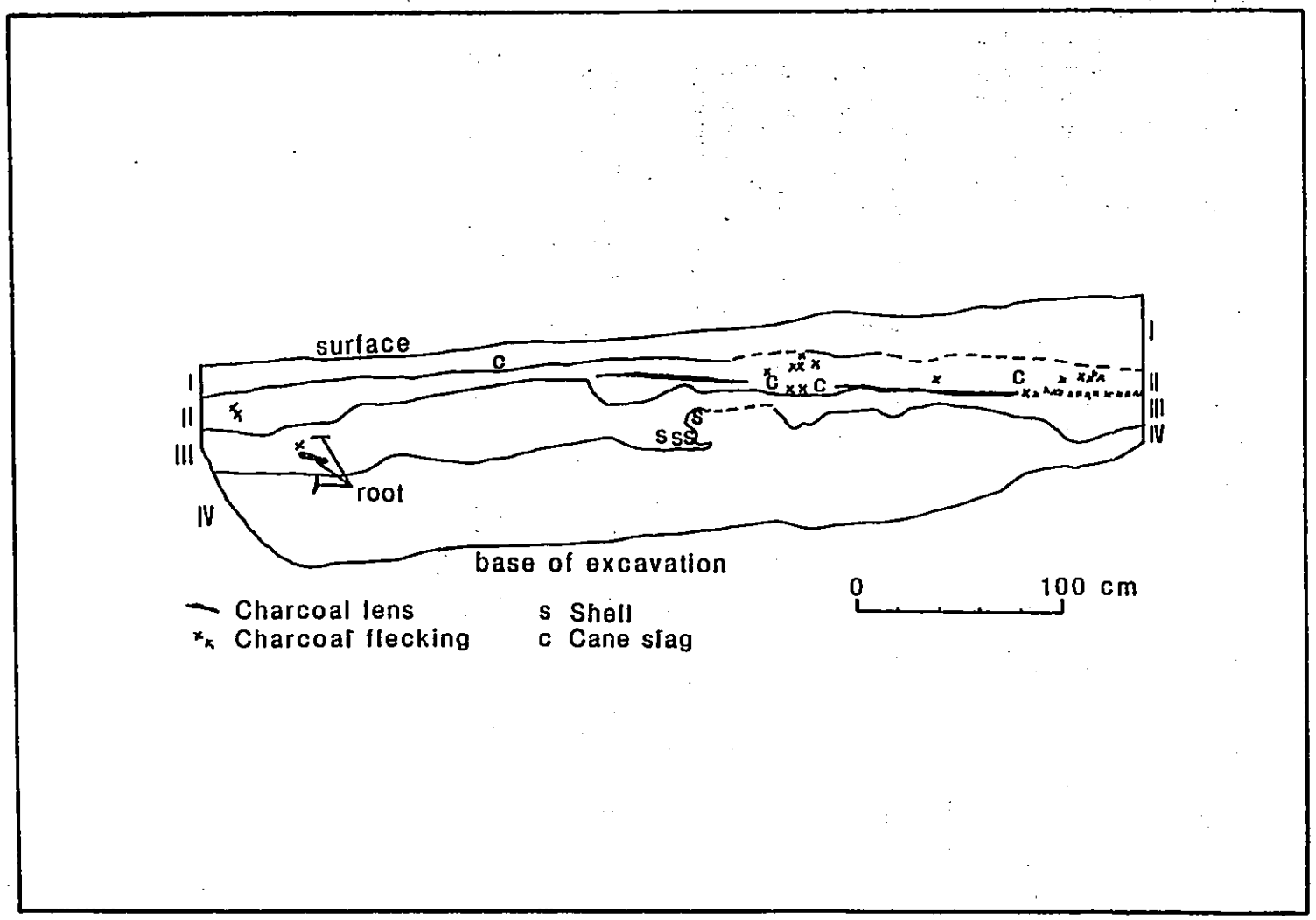

Figure 10. Stratigraphic Profile of the West Face of Trench 9.

Trench 10

The trench is within the fairway of WGC. It is 5.5 m long, 95 cm deep, and has a long axis oriented 11°. The northwest corner is 7.7 m from Station FM 8+00, on a bearing of 18° from the station stake to the trench corner. The stratigraphy is simple with a disturbed vegetated layer overlying the dune sand. Pockets of decomposed coral are visible in the lower layer. The west face of the trench was profiled.

I. Sand; 0 to 23 cm bs. 5 to 23 cm thick; a dark yellowish brown (10YR 4/4) soft silty sand with an abundant amount of roots. The lower boundary is distinct with some leaching of Layer I sediments into Layer II.

II. Sand; 5 cm bs to base of excavation. 60 to 82 cm thick; a brownish yellow (10YR 6/6) soft sand with a number of roots from the overlying Layer I. Toward the north end of the trench, pockets of white decomposed coral are visible in the layer.

Trench 11

This trench is 4.3 m long, 85 cm deep, and is oriented on a bearing of 186°. The northwest corner is 5.3 m from Station 10+00, on a bearing of 174° from the trench corner to the station stake. The stratigraphy of this trench, recorded in the profile of the west wall, is typical of this trench group (Fig. 11). As in any group of similar entities (in this case, the trenches) there is going to be some variation, but the variation is still in keeping with the general stratigraphic trends of the area with disturbed sand layer(s) overlying dune sand.

I. Sand; 0 to 35 cm bs, 18 to 35 cm thick; a dark brown (10YR 3/3) soft silty sand with many pebbles and land snails, especially in the lower 2 to 4 cm. The lower boundary is distinct.

II. Sand; 18 cm bs to the base of excavation, 20 to 63 cm thick; a brownish yellow (10YR 6/6) soft sand with an occasional land snail shell and a few roots from Layer I. Some decomposed coral is visible at the base of the trench.

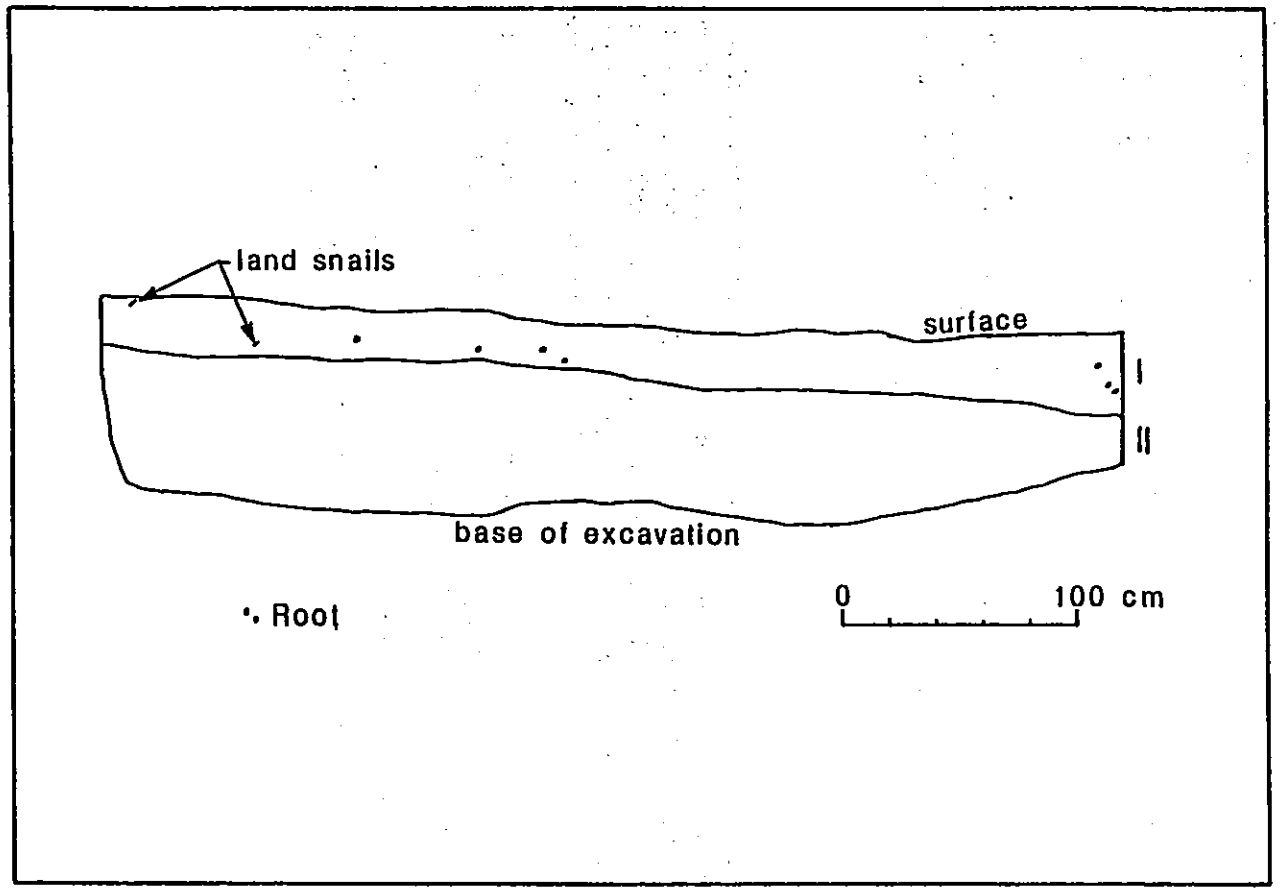

Figure 11. Stratigraphic Profile of the West Face of Trench 11.

Trench 12

This trench is 5.5 m long, 85 cm deep, and has a long axis oriented 194°. The northwest corner is 6.1 m from Station FM 12+00, on a bearing of 184° from the trench corner to the station. A profile of the west face was drawn.

O. Organic horizon; 0 to 2 cm bs. 1 to 2 cm thick; a very thin layer of organic litter covering the area.

I. Sand; 0 to 23 cm bs. 13 to 23 cm thick; a very dark grayish brown (10YR 3/2), friable to soft, slightly silty sand with an abundant amount of roots and larger peds than in Layer II. The lower boundary is distinct, although a small amount of mottling involving Layer II sediments occur along the boundary toward the north end of the trench.

II. Sand; 13 cm bs to base of excavation, 33 to 71 cm thick; a very pale brown (10YR 7/4) soft sand with a few roots present, as well as some mottling with Layer I sediments.

Trench 13

This trench is 5.5 m long, 105 cm deep, and excavated on an axis of 15°. The trench is centered on Station FM 14+00, within the vegetation screen separating the highway from the golf course. The upper stratigraphic layer, as recorded in a profile of the west trench face, incorporates debris from the highway, which is just about 6 m to the west of the trench.

I. Organic layer, or top soil; 0 to 25 cm bs, 10 to 25 cm thick; a brown to dark brown (10YR 4/3) soft silty sand with many roots and rootlets, metal and highway debris, patches of fire reddened (5YR 3/3, dark reddish brown) sediments, and a series of sediment bands at the north end of the trench. The sediment bands range in color from dark yellowish brown (10YR 3/4) and yellowish brown (10YR 5/4) to another dark yellowish brown (10YR 4/4) that has a slightly reddish tint to it. The boundary between Layers I and II is distinct to diffuse.

II. Sand; 10 cm bs to the base of excavation, 50 to 95 cm thick; a very pale brown (10YR 7/4) soft sand with a few rootlets penetrating from the upper layer.

Trench 14

This is the last trench in this series. It is 5.5 m long, 75 cm deep, and has a long axis oriented 198°. The northwest corner is 29.4 m from Station FM 17+00, on a bearing of 8° from the trench corner to the station. The entire profile appears to be fill, with a base of boulders likely related to preparation of the subgrade of Kuhio Highway and used to create a leveled surface. The surface contour on this part of the sewer alignment dips northward toward the wetland; the boulder fill was most likely a compensatory measure to maintain or at least minimize the shift in the grade along this part of the highway.

I. Organic layer, or top soil; 0 to 25 cm bs, 10 to 25 cm thick; a brownish yellow (10YR 6/6) soft silty sand with many roots and a great amount of mottling. The lower boundary is distinct with mottling in some places, banding in others.

II. Fill; 10 to 58 cm bs, 18 to 40 cm thick; a strong brown (7.5YR 4/6) soft silty sand with a number of roots, and small pockets of reddish sediments and gray clayey mottles. The gray mottles are a gritty clay that forms a ball and holds its shape; it can also be formed into a somewhat friable wire that breaks apart at a diameter of about 5 mm. The lower boundary is distinct.

III. Fill; 28 cm to the boulders at the base of the excavation, 5 to 20 cm thick; a light yellowish brown (10YR 6/4) soft sand with a few roots and mottles of Layer II sediments appearing throughout the layer.

Discussion

The stratigraphy in this series of nine trenches is simple in that it is primarily dune land with some disturbance from the golf course and highway development visible in the upper layer(s). All the trenches were excavated on an alignment that runs parallel with Kuhio Highway; they were placed on either side of or within the vegetation screen separating the highway from the golf course. Buried utility lines presented problems in locating many of the trenches directly on the staked sewer line, but those trenches which had to be offset were placed as close to the alignment as was practical. Only two buried lines were severed – an abandoned irrigation line and the main pressure line for the entire irrigation system at the north end of the golf course.

Although no cultural materials were observed or recovered from this series of trenches, indications of historic era (likely within the last few decades) agricultural activity were present. These were mainly in the form of aeolian deposited lenses of charcoal, scattered fragments of cane slag, and land snails. The character of the charcoal lenses and cane slag deposits suggest a derivation from broadcast burns in the nearby cane fields, which surround both the prison and golf course.

Group IV

This small group of three trenches (15, 16, 17) is within a limited wetlands area that has in part been incorporated into the agricultural landscape and which today is part of the WGC and is now being used to store the large woody debris from Hurricane Iniki (Photo 5). As the trenches proceed northward, the stratigraphy changes from a wetlands deposit on top of dune sand and underlain by decomposed coral to the remnants of agricultural activity with *long thin lenses* of charcoal (likely from broadcast burns) and the tell-tale red soil of agricultural fields overlying the wetlands and dune deposits (Table 6).

No cultural materials were observed or recovered, nor were there any mishaps with buried utility lines. All three trenches were mostly on-line; this, naturally depended on access by the backhoe as all these trenches were within the vegetation screen between Kuhio Highway and WGC. One sediment sample was retrieved from the buried wetland deposit; it revealed only recent, historic era pollen.

Trench 15

This trench is located inside the wetlands area. It is 5.2 m long, 55 cm deep, and was excavated on an axis of 197°. The northwest corner is 83 cm from Station FM 18+00, on a bearing of 43° from the trench corner to the station. A profile of the west face was drawn (Fig. 12). The excavation stopped when water began cascading into the trench; however, once the profile was drawn, the trench was taken down another meter to see what kind of sediments (if there was any change) lay below the sand layer.

I. Organic, wetlands; 0 to 40 cm bs, 20 to 40 cm thick; a very dark grayish brown (2.5Y 3/2) soft clayey silt with some sand mixed into the layer matrix. The sediment is wet, plastic, and sticky, rootlets and roots are common, and it forms a wire and retains the shape of whatever one fashions with it. The boundary with the underlying sand layer is distinct.

II. Sand; 20 cm bs to base of excavation, 10 to 30 cm thick; a light yellowish brown (10YR 6/4) soft sand that seems to be coarser grained than the dune sands observed in the trenches to the south. This sand deposit is reminiscent of a beach sand. The water table stands at 32 cm bs. Excavation continued once the profile was completed. It revealed that this deposit continued for at least another meter, below which was a layer of white, decomposed, comminuted coral.

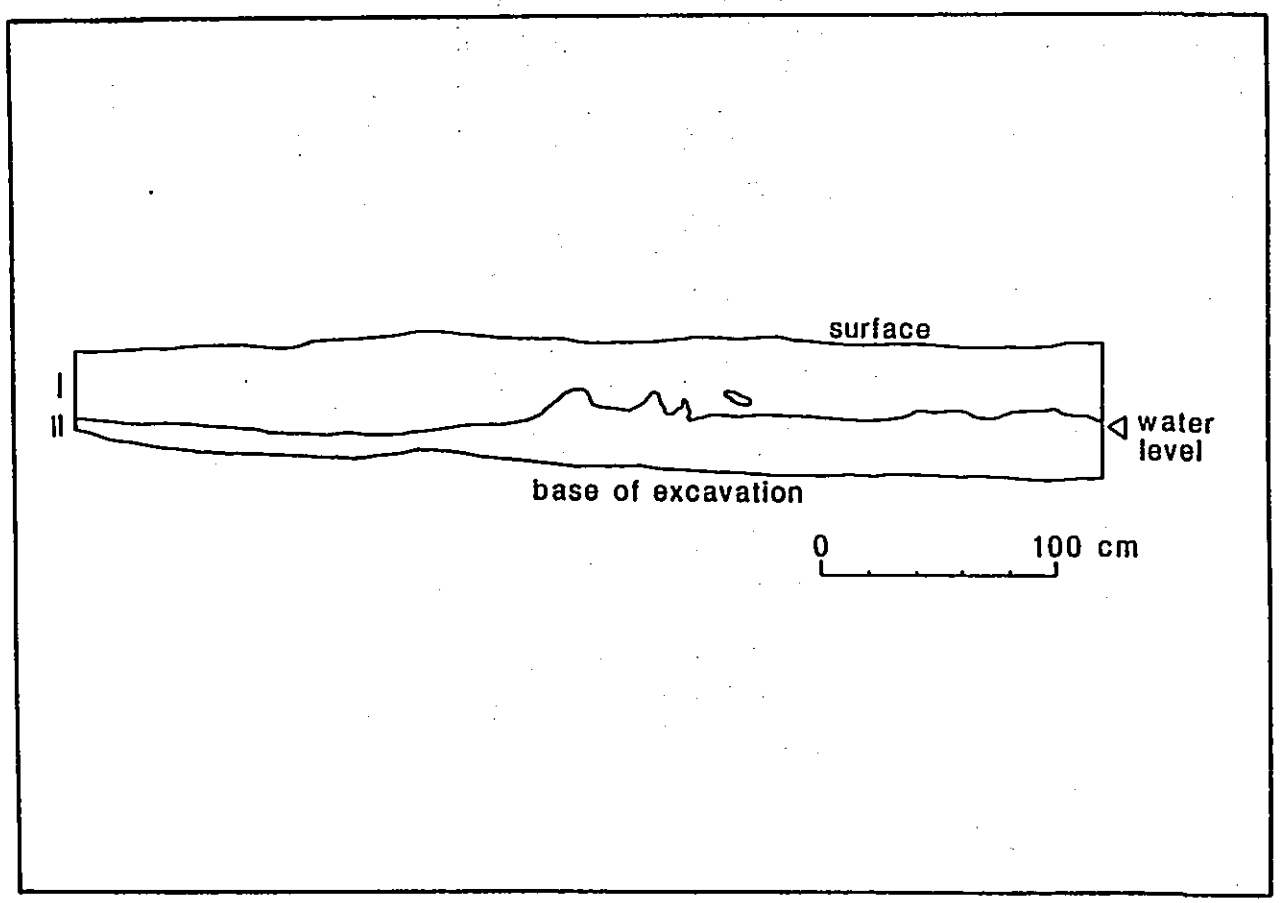

Figure 12. Stratigraphic Profile of the West Face of Trench 15.

Table 6. Group IV Stratigraphic Correlation.

TR 15	TR 16	TR 17
		I II
I	I	III
II	II	IV

* * * * *

Trench 16

This trench is on the south edge of the hurricane debris. in the wetlands area. It is 4.5 m long, 65 cm deep, and has a long axis oriented 194°. The northwest corner is 52 cm from Stations FM 20+00, on a bearing of 24° from the trench corner to the station. A profile was drawn of the west wall; it is comparable to the profile in Trench 15.

I. Organic, wetlands; 0 to 48 cm bs, 30 to 48 cm thick; a very dark grayish brown (10YR 3/2) soft clayey silt with some sand and a few roots. The sediment is very plastic and very sticky; it can be formed into a wire that breaks apart at just under 5 mm in diameter, and it can hold the shape of whatever form is fashioned from it. This is the same type of sediment as Layer I in Trench 15. The lower boundary is quite distinct.

II. Sand; 30 cm bs to base of excavation, 10 to 23 cm thick; a light yellowish brown (10YR 6/4) soft sand with some bits of clay from Layer I mixed into it. This mix has made the layer sediments seem plastic and sticky. Like Layer II in Trench 15, the sand in this deposit is coarser than the dune sand encountered in the trenches to the south. The water table stands at 32 cm bs; as soon as this layer of sand was penetrated by the backhoe, water began rushing into the trench. No additional excavation was completed.

Trench 17

This trench is amid the hurricane debris, near the approximate mid-point of its extent. The trench is 5.2 m long, 1 m deep, and has a long axis oriented 190°. Its northwest corner is

1.95 m from Station FM 23+80, on a bearing of 19° from the trench corner to the station. The stratigraphy, as recorded in the west wall, is more complicated than the previous two trenches because the upper layers consist of remnant agricultural activity – long thin lenses of charcoal and burned soil from broadcast burns, as well as the ubiquitous red soil indicative of agricultural field systems (Fig. 13). The lower layers consist of the wetlands and sand deposits exposed in Trenches 15 and 16. In effect, this trench marks a transition point from the wetlands to agricultural land and the alluvial deposits from the coastal plain.

A sediment sample was taken from the buried wetlands deposit on the basis that it might represent an unaltered pollen profile of the surrounding vegetation prior to the onset of agricultural activity. The analysis indicated a late historic, 20th century context with a dominance of sedge along with grass and *Commelina* pollen, all of which are suggestive of a marsh environment. It is always possible that the sediment was mixed with the overlying, younger agricultural sediments, which would, naturally, give the appearance of younger, historic era sediment rather than an older sedimentary environment that could potentially be extended into the 19th century or possibly earlier.

I. Agricultural layer; 0 to 25 cm bs, 4 to 25 cm thick; a dark red (2.5YR 3/6) friable clayey silt with some sand and a number of roots. The sediment breaks into small clods and appears to be the uppermost portion of Layer II rather than a discrete layer. The lower boundary is diffuse, blending with the underlying sediments of Layer II.

II. Agricultural layer; 4 to 70 cm bs, 19 to 55 cm thick; a dark red (2.5YR 3/6) hard, crumbly, granular clayey silt with a small amount of sand included in the mix, a few roots, and an occasional land snail. The sediment is non-plastic and non-sticky. The boundary with Layer III is distinct and it is also marked in several places by very fine charcoal lenses, and atop one charcoal lens a pocket of sandy ashy soil that also included some burned, decomposing pieces of branch coral.

III. Organic, wetlands; 25 to 100 cm bs, 30 to 65 cm thick; a dark reddish brown (5YR 3/2) hard clayey silt that is both plastic and sticky. It looks very much like the Layer I sediments in Trenches 15 and 16. The sediment forms a ball and holds its shape; it can also be formed into a wire that breaks apart with a diameter of about 5 mm. A sample of this sediment was retrieved for a pollen analysis (see preceding discussion). The boundary with the underlying sand layer is distinct.

IV. Sand; 82 cm bs to base of excavation, 3 to 10 cm thick; a light yellowish brown (10YR 6/4) soft sand. Water started to fill the base of the trench as soon as the sand was penetrated.

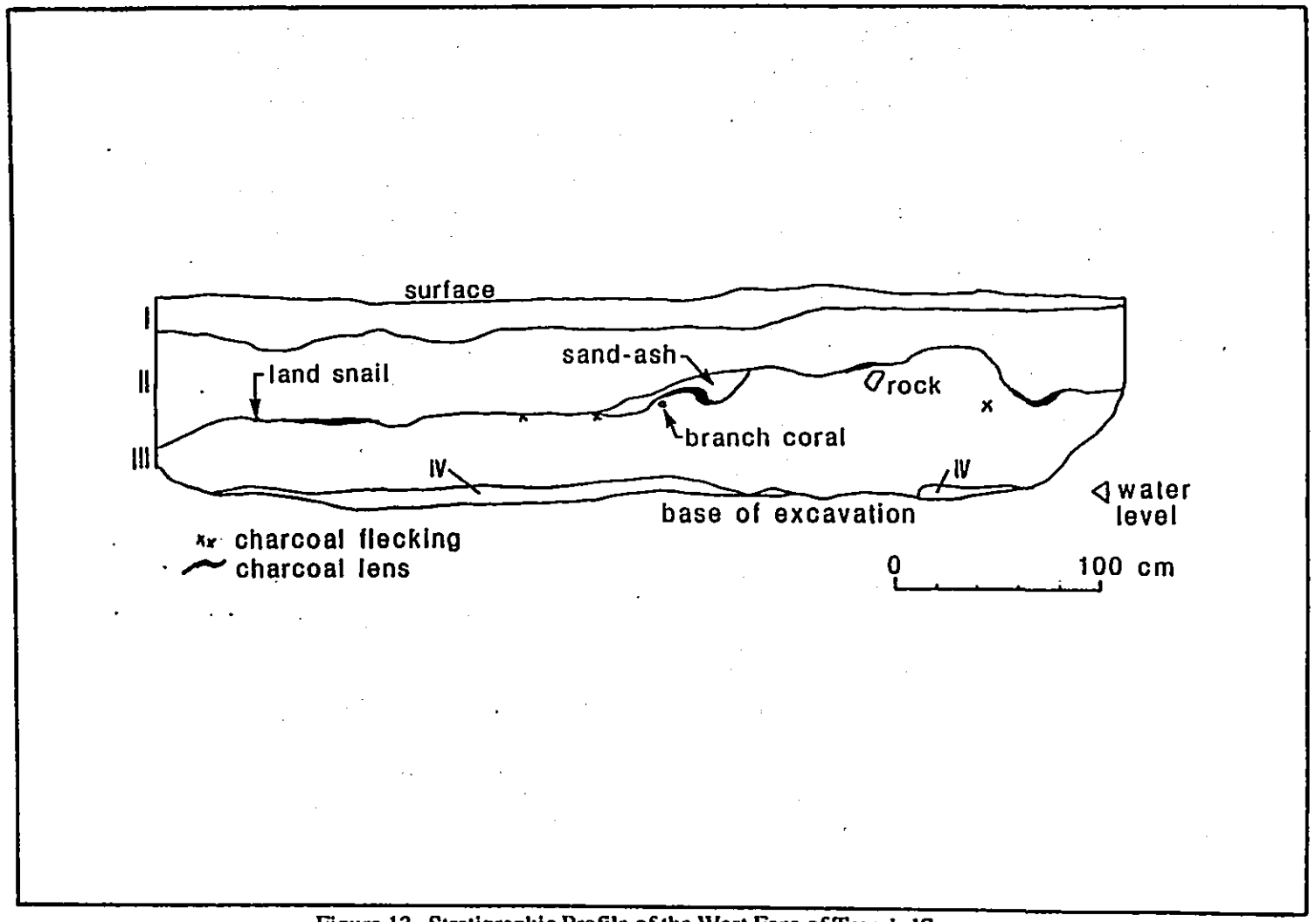

Figure 13. Stratigraphic Profile of the West Face of Trench 17.

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Photos 5 and 6. The Wetlands Area in the Vicinity of Station FM 20+00 by Trench 16. View to the West (above). and The Fernandes Property at Station FM-E. View to the South (below).

Discussion

The stratigraphy in these three trenches reveals a wetlands area that has gradually been consumed by agricultural activity toward the northern end of the alignment. All three trenches are still within the WGC, excavated parallel to Kuhio Highway in the vegetation screen separating the highway from the golf course. Large woody debris from Hurricane Iniki was stored within the wetlands area and extended to the north end of the golf course. This debris caused some access problems relative to trench location and excavation, especially with Trench 17. However, these problems were not wholly insurmountable, although some interruption in the trench spacing resulted, with Trench 16 placed at Station 20+00 and Trench 17 at 23+80, a separation of 380 feet between trench locations.

No cultural materials were observed or collected; however, a sediment sample from a buried wetlands deposit was collected. The pollen analysis from this sediment suggested that the layer had at one time been part of a marsh environment likely formed within a late, historic era context, probably within the 20th century.

Group V

This group of trenches (18 to 24, 37 to 39) was excavated on the grounds of WGC and the George Fernandes property, on an alignment parallel to Kuhio Highway, and along the northern side of Leho Road, from its intersection with Kuhio Highway to its intersection with Nehe Road (Photos 6, 7). The stratigraphy is quite simple, primarily representing agricultural soils that have been worked over and churned by plows, with cane slag, charcoal, pebbles, cobbles, boulders, a small amount of coral, a few land snails, and a bit of mottling incorporated into the sediments (Table 7). The lower layers reveal a shift from the wetlands area to the alluvium of the coastal plain. Three of the trenches, those on the Fernandes property, were excavated by hand owing to the lack of access for the backhoe. The hand excavations were completed in a day in order to limit the amount of time spent on the property, a concern of Mr. Fernandes. It was a difficult task owing to the nature of the soil, and required the use of picks to break up the soil a few centimeters at a time. As a result, the sediments were removed from the excavation in large clods. No cultural materials were observed or collected from any of the trenches in this group.

Trench 18

This trench is at the northern end of the hurricane debris, at the northern end of WGC. The stratigraphy consists of agricultural soil, a fragment of the wetlands sediment mixed with agricultural sediments, and the basal sand layer. In effect, this trench appears to be within a transition zone, between the wetlands and coastal alluvium. A number of centipedes had to be dispatched during excavation.

Table 7. Group V Stratigraphic Correlation.

TR 18	TR 19	TR 39	TR 38	TR 37	TR 20	TR 21	TR 22	TR 23	TR 24
					I II				
I II	I II	I II	I II	I II		I II	I II	I II	I II
		III	III	III	III	III			
III	III								
IV									

* * * * *

The trench is 6.5 m long, 105 cm deep, and has a long axis oriented 195°. The northwest corner is 7.8 m from Station FM 26+00, on a bearing of 188° from the trench corner to the station. A profile was drawn of the west face (Fig. 14).

I. Agricultural layer; 0 to 18 cm bs, 5 to 18 cm thick; a yellowish red (5YR 4/6), friable, silty clay with sand, many rootlets, scattered flecks of charcoal, and land snails. The layer appears to be the uppermost portion of Layer II rather than a discrete layer, comparable to Layer I in Trench 17. The lower boundary is diffuse.

II. Agricultural layer; 5 to 55 cm bs, 30 to 47 cm thick; a dark red (10R 3/6), friable, silty clay with sand, a few flecks of charcoal, and a few rootlets. The sediments are neither plastic nor sticky, and are reminiscent of Layer II in Trench 17. The lower boundary is diffuse with a thin lens of charcoal occupying the boundary at the north end of trench.

III. Organic, wetlands layer; 37 to 90 cm bs, 12 to 45 cm thick; a dark reddish brown (5YR 3/4) friable, slightly plastic, slightly sticky clayey silt with some sand, a few rootlets, an occasional land snail, and a small number of charcoal flecks. The layer appears similar to the wetlands layer (III) in Trench 17, although more mixing related to agricultural activity is evident. The impression of plow tines forms

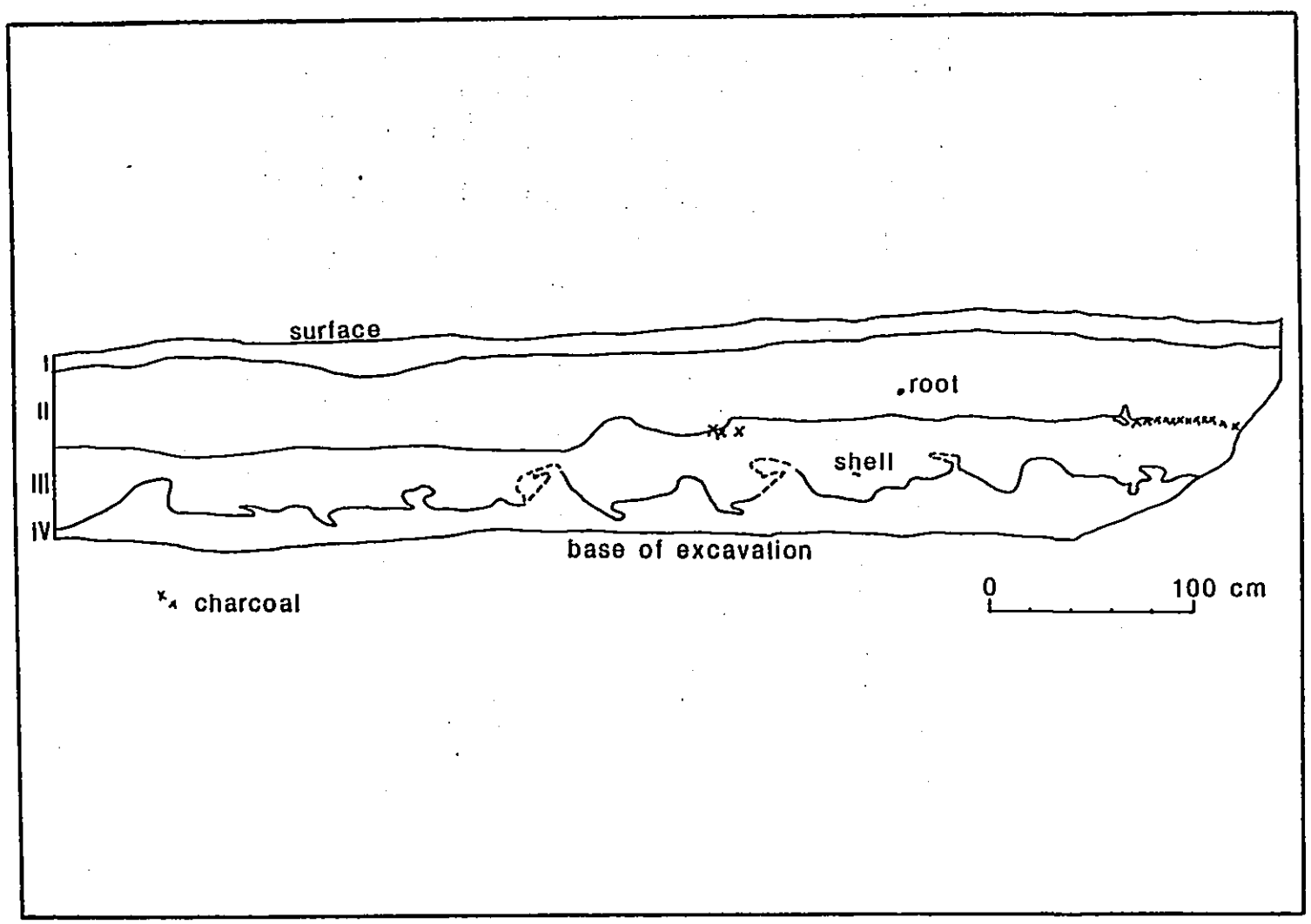

Figure 14. Stratigraphic Profile of the West Face of Trench 18.

the lower boundary of the layer, creating a very distinct boundary in the underlying sand.

IV. Sand; 60 cm bs to base of excavation, 5 to 35 cm thick; a brownish yellow (10YR 6/6) soft sand with a very few rootlets from the overlying layers. The layer is comparable to Layer IV in Trench 17, although no water percolated to the surface; the sand, however, was quite wet.

Trench 19

This trench is the northernmost trench on the grounds of WGC. The stratigraphy is virtually the same as that in Trench 18, with agricultural sediments overlying a transition layer that mixes wetland sediments with the coastal alluvium. The trench is 3.3 m long, 1 m deep and has a long axis oriented 193°. The northwest corner is 10.8 m from Station FM-D, on a bearing of 181° from the station to the trench corner. The west face of the trench was profiled.

I. Agricultural layer; 0 to 25 cm bs, 10 to 25 cm thick; a dark reddish brown (5YR 5/5), friable, clayey silt with some sand and a number of rootlets. The soil is slightly plastic and slightly sticky, and comparable to Layer I in Trenches 17 and 18. It appears to be the uppermost portion of Layer II rather than a discrete layer. The lower boundary is diffuse.

II. Agricultural layer; 10 to 80 cm bs, 48 to 70 cm thick; a dark red (2.5YR 3/6), friable, clayey silt that is slightly plastic and slightly sticky, with a few rootlets, charcoal flecks, and a discontinuous charcoal lens. The layer contains some sand and appears similar to Layer II in Trenches 17 and 18. The lower boundary is distinct.

III. Organic, wetlands/alluvium layer; 66 cm bs to base of excavation, 20 to 30 cm thick; a dark reddish brown (2.5YR 2.5/4), friable, plastic, sticky clayey silt with a few rootlets. Charcoal flecks and a cobble were observed near the upper boundary of the layer. Field observations suggest this layer is similar to Layer III in Trenches 17 and 18, although with more alluvium mixed into it.

Trench 39

This trench is on the Fernandes property, at the south end of the Kuhio Highway side. It was hand excavated to a length of 2.3 m, 95 cm deep, and along an axis of 186°. The northwest corner is 6 m from Station FM-E, on a bearing of 180° from the trench corner to

the station. The east face was profiled. The stratigraphic sequence exposed was comparable to that in Trench 19, with upper layers attributable to agricultural activity and a lower layer likely part of the alluvium deposit from the coastal plain. Cane slag was observed in the backdirt.

Immediately to the north of the trench is an old road, most likely related to the agricultural activity. The center of the road is about 1.4 m from the trench, its width is about 1.7 m, and it consists of a bituminous surface over a thin bed of crushed gravel.

I. Agricultural layer; 0 to 15 cm bs, 7 to 15 cm thick; a yellowish red (5YR 4/6), friable to hard, clayey silt with some sand, pebbles, a small amount of road gravel, and an abundant amount of roots especially from the grassy cover that dominates the surface. The lower boundary is distinct, yet field observations indicated this layer was actually the vegetated, root zone of underlying Layer II rather than a discrete layer, similar to Layer I in Trenches 17 to 19.

II. Agricultural layer, alluvium; 7 to 80 cm bs, 56 to 68 cm thick; a dark red (2.5YR 3/6), friable, slightly sticky, slightly plastic, friable clayey silt with a few roots and a small amount of clay pellets. The lower boundary is diffuse.

III. Alluvium; 58 cm bs to base of excavation, 8 to 40 cm thick; a dusky red (10R 3/3), friable, slightly plastic, slightly sticky clayey silt with a few roots and a number of clay pellets. The soil breaks down to a fine powder when crushed.

Trench 38

Like Trench 39, this trench was hand excavated on the Fernandes property. It is 2.2 m long, 1 m deep, and has an axis oriented 193°. The northwest corner is 10 m from Station FM 30+00, on a bearing of 192° from the trench corner to the station. The stratigraphic profile, as recorded in the west face, is similar to Trench 39 with agricultural layers overlying alluvium.

I. Agricultural layer; 0 to 35 cm bs, 17 to 35 cm thick; a dark red (2.5YR 3/6), friable, slightly plastic, slightly sticky clayey silt with an abundant amount of roots from the grass cover, and a number of pebbles, cobbles, and boulders. This layer appears to be the upper few centimeters of Layer II rather than a discrete layer; the lower boundary is diffuse.

II. Agricultural layer, alluvium; 17 to 60 cm bs, 10 to 38 cm thick; a yellowish red (5YR 4.6), friable, clayey silt with a few roots,

boulders, and mottles of tan and black. The soil breaks into a powder when crushed. The lower boundary is distinct and marked with a line of boulders

III. Alluvium; 37 cm bs to base of excavation, 28 to 50 cm thick; a dark reddish brown (5YR 3/3), friable, sticky, slightly plastic clayey silt with a few roots and a number of mottles varying in color from gray to black to red. The mottles are a common occurrence in this soil type, Lihue silt clay (USDA Soil Conservation Service 1972).

Trench 37

This is the last hand excavated trench on the Fernandes property. It is at the north end of the Kuhio Highway side, near the intersection with Leho Road. The trench is 2 m long, 1 m deep, and was excavated on an alignment of 212°. The northwest corner is 80 cm from Station FM-G, on a bearing of 65° from the trench corner to the station. The stratigraphic profile was recorded from the south face. It is essentially similar to that in the preceding trenches, Trenches 38 and 39, with agricultural layers overlying alluvium.

I. Agricultural layer; 0 to 20 cm bs, 7 to 20 cm thick; a dark reddish brown (2.5YR 2.5/4), friable, slightly plastic, slightly sticky clayey silt with roots. The layer appears to be the root zone, the upper few centimeters of Layer II rather than a discrete layer. The lower boundary is distinct.

II. Agricultural layer, alluvium; 7 to 85 cm bs, 58 to 71 cm thick; a dark red (2.5YR 3/6), friable, clayey silt with a few roots. The sediment breaks into a powder once crushed. The lower boundary is diffuse.

III. Alluvium; 67 cm bs to base of excavation, 15 to 23 cm thick; a dark reddish brown (2.5YR 3/4), friable, clayey silt with a few roots. The layer is slightly sticky and slightly plastic, distinguished from Layer II by both its texture and degree of moistness.

Trench 20

This trench is located along the north side of Leho Road, on the corner of Leho Road and Kuhio Highway. The trench is 4.1 m long, 1 m deep, and has a long axis oriented 96°. The northwest corner is 1.4 m from Station FM-H, on a bearing of 236° from the trench corner to the station. The stratigraphic profile, recorded in the south face, consists almost entirely of fill, or at least churned sediments related to the road construction as well as construction of the electrical transformer immediately north of the trench. Only a small section of alluvium is visible at the base of the trench.

I. Fill; 0 to 8 cm bs, 5 to 8 cm thick; a dark brown (7.5YR 3/4) sandy silt with rootlets, and some clay and road gravel. The sediment is friable and appears to be the top few centimeters of Layer II, with a bit of sand included in the mix. The lower boundary is diffuse.

II. Fill; 5 to 90 cm bs, 70 to 85 cm thick; a strong brown (7.5YR 4/6), hard, compact silt with a few rootlets and a substantial amount of mottling. The mottling includes a variety of colors such as gray, yellow, black, white, and red. The layer was so hard that the backhoe operator commented on the difficulties he was having in removing the sediments. The lower boundary is distinct.

III. Alluvium; 78 cm bs to base of excavation, 5 to 10 cm thick; a dark red (2.5YR 3/6), friable, clayey silt with some sand. It is somewhat sticky and somewhat plastic, and is comparable to the reddish soil layers observed in the trenches to the south. In other words, this layer is not a fill layer but part of the natural deposits in the area.

Trench 21

This trench is located along Leho Road, on the north side of the road between the pavement and the cane fields. It is 4.4 m long, 125 cm deep, and has a long axis oriented 90°. The northwest corner is 14.6 m from Station FM 37+00, on a bearing of 266° from the trench corner to the station. The stratigraphy was recorded in a profile of the south face; it is similar in every respect to the stratigraphic profiles recorded in the trenches on the Fernandes property.

I. Agricultural layer; 0 to 24 cm bs, 2 to 24 cm thick; a dark brown (7.5YR 3/4), slightly plastic, slightly sticky, friable clayey silt with some sand and a number of rootlets. The layer appears to be the upper few centimeters of Layer II rather than a distinct layer. Its use now as the road shoulder appears to have influenced the constituents in the layer, especially the addition of sand. The lower boundary is distinct.

II. Agricultural, alluvium; 2 to 110 cm bs, 80 to 108 cm thick; a dark brown (7.5YR 3/4), hard, plastic, sticky clayey silt with a few rootlets and some sand. Mottles of gray, yellow, orange, and black appear throughout the layer; inspection of some of the black mottles indicate they are fragments of cane slag. The lower boundary is quite distinct.

III. Alluvium; 94 cm bs to base of excavation, 2 to 10 cm thick; a strong brown (7.5YR 4/6), hard, plastic, sticky clayey silt. The sediment

holds the shape of whatever is fashioned from it, and it can form a relatively thin wire that breaks apart at about 2 mm in diameter.

Trench 22

This trench is in the same relative location as Trench 21, on the north shoulder of Leho Road between the road and cane fields. It is 4.6 m long, 105 cm deep, with a long axis oriented 82°. The northwest corner is 5.9 m from Station FM 39+00, on a bearing of 88° from the trench corner to the station. The stratigraphic profile, *as recorded in the south face*, is comparable to that in Trench 21.

I. Agricultural layer; 0 to 28 cm bs, 10 to 28 cm thick; a dark brown (7.5YR 3/3), slightly plastic, slightly sticky, friable clayey silt with a number of roots and a few grains of sand. The layer appears to be the upper few centimeters of Layer II rather than a discrete layer. Its lower boundary is diffuse.

II. Agriculture, alluvium; 0 cm bs or the ground surface to base of excavation, 75 to 105 cm thick; a dark yellowish brown (10YR 3/4), friable, sticky, plastic, clayey silt with a few rootlets. Mottles of red, gray, orange, white, and black occur throughout the layer; many of the black mottles are actually fragments of cane slag. The layer appears similar in virtually all respects to Layer II in Trench 21.

Trench 23

This trench is comparable in most every respect to the preceding trenches, trenches 21 and 22. It is located on the north road shoulder, between Leho Road and the cane fields. It is 5.3 m long, 120 cm deep, and has an axis oriented 88°. The northwest corner is 11.5 m from Station FM-I, on a bearing of 92° from the trench corner to the station. The north wall was profiled; the resulting stratigraphic profile is quite similar to that in the two trenches to the west. About 40 cm bs, the backhoe encountered a PVC pipe on an alignment parallel to the road. The pipe was not damaged and the backhoe simply shifted the excavations slightly to the north in order to avoid any further contact with the pipe.

I. Agricultural layer; 0 to 21 cm bs, 2 to 21 cm thick; a dark brown (7.5YR 3/3), friable, slightly plastic, slightly sticky clayey silt with an abundant amount of rootlets from the grass cover. The layer appears to be the upper few centimeters of Layer II rather than a discrete layer. Its lower boundary is diffuse.

II. Agricultural, alluvium; 2 cm bs to base of excavation, 88 to 105 cm thick; a dark brown (7.5YR 3/4), friable, plastic, sticky, clayey silt

with a few rootlets and a couple of fragments of coral. The layer is heavily mottled with sediments of gray, red, orange, white, and black; some of the black mottles are in fact fragments of charcoal and cane slag. The layer is comparable to Layer II in Trench 22.

Trench 24

This trench is located on the north shoulder of Leho Road, between the road and the cane fields, just like Trenches 20 to 23. It is 4.7 m long, 115 cm deep, and oriented along an axis of 70°. The northwest corner is 22.3 m from Station FM-J, on a bearing of 72° from the trench corner to the station. A profile was drawn of the south face; the exposed stratigraphy is very similar to that documented in the trenches to the west.

I. Agricultural layer; 0 to 26 cm bs, 10 to 26 cm thick; a dark brown (7.5YR 3/3), friable, very slightly sticky, very slightly plastic clayey silt with a number of rootlets from the grass cover and some road gravel. The layer appears to be the upper few centimeters of Layer II rather than a distinct layer. Its lower boundary is diffuse.

II. Agricultural, alluvium; 10 cm bs to base of excavation, 80 to 98 cm thick; a dark brown (7.5YR 3/4), friable, sticky, plastic, clayey silt with a few rootlets. The layer is heavily mottled with sediments of red, orange, gray, white, and black; some of the black mottles are actually cane slag. A few cobbles and even a boulder were observed in the layer. The cobbles are somewhat friable, rapidly decaying in an environment with increased moisture. The source of the cobbles and boulders appears to be the buried lava flow encountered in the next trench, Trench 25, to the northeast; it is discussed in the next group of trenches.

Discussion

This group of ten trenches illustrates the transition from the wetlands at the northern end of the golf course to the alluvium along Leho Road. One feature common to all the trenches is that each displays the residue of agricultural activity – tilled soil – in their upper stratigraphic layers. Charcoal, land snails, cane slag, and a small number of coral fragments have been incorporated into the agricultural based layers. Long thin discontinuous charcoal and ash lenses are visible in the two trenches on the grounds of WGC; they are not present in the other eight trenches (on the Fernandes property and along Leho Road), however, the constituents of these lenses are present as isolated elements in thoroughly mixed matrices. The character of the remnant charcoal lenses and scattered charcoal and cane slag in the two WGC trenches are reminiscent of broadcast field burns; that these lenses are still present in the agricultural layers rather than mixed into the sediment indicates a cessation of use

(possibly a period of fallow) or even abandonment of this area in the overall field system and the probable encroachment of run-off or rapid siltation of the area from the surrounding fields.

Three of the trenches were hand excavated – Trenches 37 to 39 on the Fernandes property – owing to the lack of access for a backhoe. The stratigraphy in these trenches was much like that observed in the trenches on Leho Road – agricultural layers mottled with cane slag, charcoal, sediments in a variety of colors, and other constituents overlying alluvial deposits from the coastal plain.

No cultural material was observed or collected from any of the ten trenches. A buried PVC pipe was encountered in Trench 23, but it was not damaged. No other mishaps or unexpected encounters occurred during the excavation.

Group VI

This group of trenches (25 to 28) was excavated along Nehe Road, from its intersection with Leho Road (Photos 7, 8). The stratigraphy consists of alluvium atop a lava flow at the west end of the line to alluvium overlying dune sand at the east end (Table 8). Some reworking of the sediments has occurred, with the upper few centimeters incorporated into the roadside landscaping. Only Trench 28 displays evidence of disturbance and reworked sediments to some depth. Excavation work in those trenches on the neatly manicured grass cover along Nehe Road involved removing the grass in sheets and setting these aside before the remainder of the trench was excavated. The sod was returned to the upper few centimeters of soil when the trench was backfilled, in order to reseed and revegetate the trench area. No cultural materials were observed or collected in any of the trenches.

* * * * *

Table 8. Group VI Stratigraphic Correlation.

TR 25	TR 26	TR 27	TR 28
I II	I II	I II III	I II
III	III		
IV			
			III

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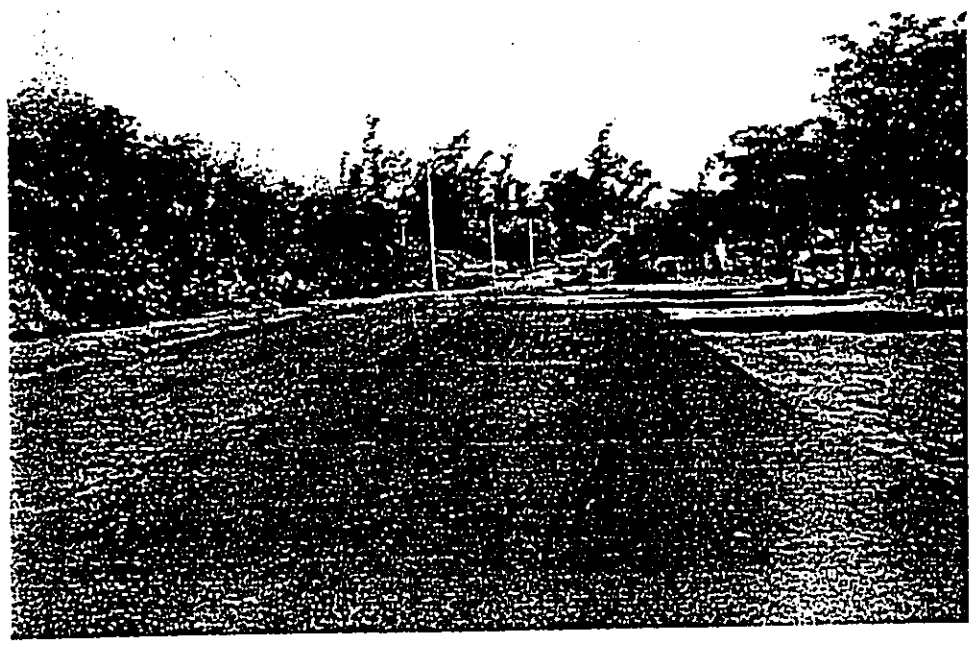

Photos 7 and 8. Looking West down Leho Road from the Intersection of Leho and Nehe Roads (above), and Looking East on Nehe Road (below).

Trench 25

This trench is located at the intersection of Leho and Nehe Roads. It is actually on the shoulder of Leho Road, at the base of a road cut; a cane field, noted in the discussion of the Group V trenches, is located at the top of the road cut. The stratigraphy is quite simple with alluvium resting on a lava flow, which in turn is overlaying a layer of hardened, baked silt. The trench is 4.9 m long, 125 cm deep, and has a long axis oriented 45° The northwest corner is 6.9 m from Station SMH 4-1, on a bearing of 42° from the trench corner to the station. The south wall was profiled (Fig. 15).

The first backhoe bucket of sediment encountered a cement slab covering a cement box with some old wires, many of which were corroded and broken. The trench was shifted to avoid any further contact with the cement box. In addition, a number of buried pipes in the immediate area prompted some shifting and maneuvering with the backhoe until a fairly free and unencumbered piece of ground was located.

I. Organic, alluvium; 0 to 26 cm bs, 5 to 26 cm thick; a dark brown (7.5YR 3/3), friable, very slightly plastic, very slightly sticky clayey silt with a number of rootlets from the grass cover, and some road gravel. The layer appears to be the upper few centimeters of Layer II rather than a discrete layer. The lower boundary is diffuse.

II. Alluvium; 8 to 58 cm bs, 5 to 36 cm thick; a dark reddish brown (5YR 3/3), friable, clayey silt with a few rootlets and a small amount of road gravel. Sand used in the fill of a pipe trench is visible in the layer profile; it appears at the base of the layer on the east end of the trench. The sand is brownish yellow (10YR 6/6) in color, similar to the sand observed in the dune formation. The boundary with Layer III, the lava flow, is very distinct.

III. Lava flow; 5 cm bs to base of excavation, 25 to 106 cm thick; a lava flow with rounded, vesicular basalt boulders and cobbles. A few rootlets from the overlying layers are present. As expected, the boundary with the underlying Layer IV is distinct.

IV. Alluvium; 112 cm bs to base of excavation, 3 to 12 cm thick; a very dark grayish brown (10YR 3/2) soft silt. The sediment is quite hard and compact in the profile, but once a small amount is removed, it can be easily crushed and breaks into a fine powder. The soil feels as though it has been baked in place.

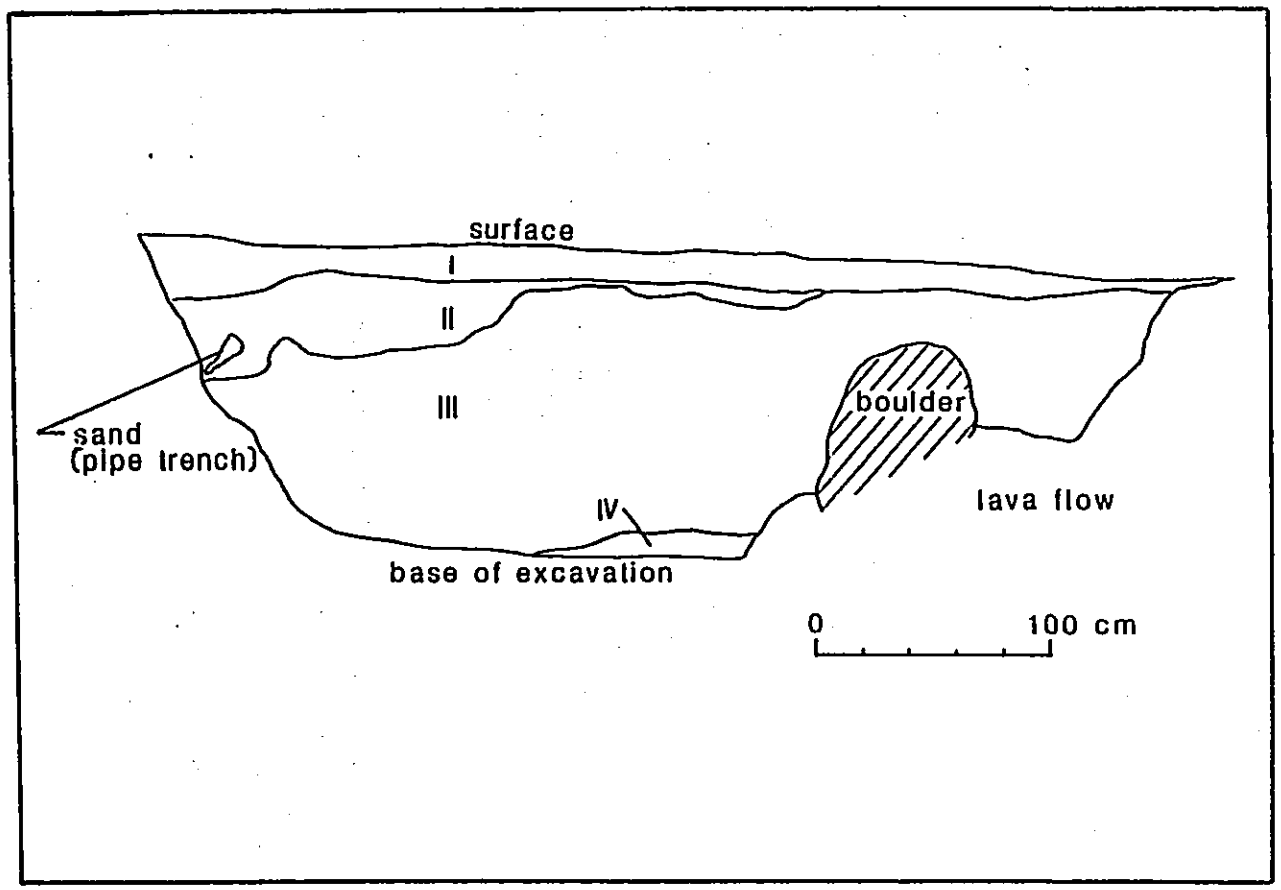

Figure 15. Stratigraphic Profile of the South Face of Trench 25.

Trench 26

The trench is situated on the south shoulder of Nehe Road. It is 4.3 m long, 95 cm deep, and has a long axis oriented 129°. The northwest corner is 20 m from Station 2+00 on Nehe Road, on a bearing of 135° from the trench corner to the station. A metal pipe line was encountered about 75 cm bs in the east wall. The backhoe bucket was shifted slightly to the west to avoid any further contact with the pipe. A profile was drawn of the west face of the trench.

I. Organic, alluvium; 0 to 20 cm bs, 5 to 20 cm thick; a dark brown (7.5YR 3/4), friable, very slightly plastic, very slightly sticky, clayey silt with a number of roots from the grass cover. Some plastic and glass fragments are present in the matrix. The layer appears to be the upper few centimeters of Layer II rather than a discrete layer; an arrangement comparable to that observed in Trench 25. The lower boundary is diffuse.

II. Alluvium; surface to base of excavation, 25 to 85 cm thick; a dark brown (7.5YR 3/4), plastic, sticky clayey silt with a few rootlets. An occasional cobble and boulder from Layer III are mixed into the sediments. The boundary with Layer III is distinct.

III. Lava flow; 36 cm bs to base of excavation, 2 to 55 cm thick; a lava flow with rounded, vesicular basalt cobbles and boulders, with a few rootlets from the overlying layers present. On the whole, the boulders and cobbles visible in this trench are smaller than those in Trench 25.

Trench 27

The trench is located on the south shoulder of Nehe Road. It is 4.5 m long, 1 m wide, and has a long axis oriented 131°. The northwest corner is 1 m from the Nehe Road Station 2+00, on a bearing of 357° from the trench corner to the station. The stratigraphy recorded on the east face consists entirely of alluvium; it is beyond the edge of the lava flow.

I. Organic, alluvium; 0 to 24 cm bs, 9 to 24 cm thick; a dark brown (7.5YR 3/4), friable, slightly plastic, slightly sticky clayey silt with an abundant amount of roots from the grass cover. The layer appears to be the upper few centimeters of Layer II rather than a discrete layer. It has been incorporated into the landscaping on this part of the road shoulder, with a discontinuous layer of yellowish brown (10YR 5/6) sand laid at the base of the layer (or on top of the underlying Layer II) and the layer sediments redeposited over this sand (the sand is visible only in the east face of the trench; it does not appear on the west face).

The boundary with the sand lens is distinct, but with Layer II it is diffuse.

II. Alluvium; 10 to 39 cm bs. 5 to 20 cm thick; a dark reddish brown (5YR 3/3), friable to hard, clayey silt with a few rootlets. The sediment breaks into angular, platy clods. Its boundary with the underlying Layer III is distinct.

III. Alluvium; 9 cm bs to base of excavation, 65 to 80 cm thick; a dark reddish brown (2.5YR 2.5/3), friable, plastic, slightly sticky clayey silt with a few rootlets.

Trench 28

This trench is located on the south shoulder of Nehe Road. It is 4.8 m long, 135 cm deep, and has a long axis oriented 135°. The northwest corner is 5.5 m from Station SMH 4-3, on a bearing of 126° from the trench corner to the station. The stratigraphy, recorded in the west face, consists of alluvium over sand, an indication that the sewer alignment is moving into the dune land once again. The entire Layer II sediment is disturbed, with recent debris incorporated into the matrix. The base of the layer appears as though it consists of at least two rounded pits cut into the basal sand layer; however, that may simply be an artifact of the disturbance.

I. Organic, alluvium; 0 to 16 cm bs, 4 to 16 cm thick; a dark yellowish brown (10YR 3/4), friable to hard, clayey silt with a number of roots from the grass and brush that dominates the area. Some sand and road gravel is mixed into the layer, and a small stockpile of gravel from the road paving rests on the surface within the general area of the trench. The layer appears to be the upper few centimeters of Layer II rather than a discrete layer. The lower boundary is diffuse.

II. Alluvium; 4 cm bs to base of excavation, 50 to 105 cm thick; a dark brown (7.5YR 3/4), friable, slightly plastic, non-sticky clayey silt with a few rootlets, pebbles, patches of sand, cobbles, and mottles of red, orange, yellow, and white. The entire layer appears to be disturbed, with tin foil observed in the profile about 70 cm bs. The lower boundary appears as though it exhibits the remnants of at least two rounded pits cut into the underlying sand; however, this configuration may actually be an artifact of the disturbance. The lower boundary is distinct.

III. Sand; 65 cm bs to base of excavation, 5 to 65 cm thick; a yellowish brown (10YR 5/4) soft sand with a few rootlets. An occasional piece

of charcoal, a few pebbles, and some cobbles are present in the sand matrix.

Discussion

This small group of four trenches was excavated along Nehe Road, from its intersection with Leho Road. The trenches extend from a lava flow at the western end of this alignment through alluvium near the mid-point to dune sand at the eastern end. The upper layers of all trenches consist of alluvium, with the first few centimeters incorporated into the landscaping along the road shoulder.

No cultural materials were collected in any of the four trenches; the only cultural materials observed were of recent origin, e.g., the tine foil. Two encounters occurred with buried utilities, however – a cement box with a number of dead wires (corroded, frayed, and broken) and a number of pipelines in Trench 25, and a buried pipe line in Trench 26. No pipes or wires were ruptured or severed by the backhoe.

Group VII

This is the final group of trenches (29, 34 to 36), excavated along the last segment of the proposed sewer line where it joins the existing sewer line to the Wailua Sewage Treatment Plant (Photo 9). Three of the four trenches are on the grounds of the Kaha Lani condominium complex; the fourth is directly across Nehe Road from Kaha Lani, on a service road into WGC. The trenches share a base of dune sand, with disturbed layers of alluvium, sand, or imported fill overlying the dune sand (Table 9). Plow tines have left their mark in the sediments of one trench; large pits cut through several layers are visible in at least two of the trenches. Deposits of recent food debris or midden and other discarded materials, including plastic, milled lumber, and even fragments of possible human bone, are present in the disturbed sand of two trenches. Like the trenches along Nehe Road (discussed in Group VI above), the trenches on the Kaha Lani grounds were excavated in similar fashion, with the sod removed separately in sheets so that it could be replanted in the surface layers of the backfill once the trenches were filled at the close of the work day.

Three samples of cultural material were retrieved from the disturbed sand layer in Trenches 34 and 35. The major component of the samples was bone, collected for examination to determine if it was natural, midden, or human bone. The identifications, made in the laboratory upon completion of the fieldwork, included toad, horse or cow, and possible human bone.

Table 9. Group VII Stratigraphic Correlation.

TR 29	TR 34	TR 35	TR 36
I II V VI			
III			
	I II	I II	
	III	III	I II
IV	IV	IV	III

* * * * *

Trench 29

This trench is located at a turning point in the proposed sewer alignment, where it turns from Nehe Road onto the Kaha Lani property. The trench is situated on the shoulder of Nehe Road across from the condominium property. It is 5.2 m long, 140 cm deep, and has a long axis oriented 134°. The northwest corner is 6.1 m from Station SMH 4-4, on a bearing of 127° from the trench corner to the station. The stratigraphy, as recorded in the east face of the trench, consists of the road pavement and its subgrade, a disturbed sediment with the indelible marks of plow tines at the base of the layer, and a base of sand. A large pit was cut into the south end of the trench, and two pipes were encountered in the excavations. One pipe was located at about 70 cm bs on the west face, the second was at the base of the trench (Photo 10).

I. Pavement; 0 to 25 cm bs, 6 to 15 cm thick; a bituminous surface.

II. Road subgrade; 6 to 23 cm bs, 8 to 15 cm thick; a gravel base for the road pavement.

III. Alluvium; 11 to 110 cm bs, 62 to 93 cm thick; a dark reddish brown (2.5YR 3/4), friable, sticky, plastic, clayey silt with cobbles and an

occasional boulder. a few mottles of orange, black. yellow, and white. and an occasional pocket of sand. The layer is disturbed both as a result of a pipe running the length of the west face of the trench at a depth of about 70 cm bs and also from plowing, the impression of which is evident in the lower boundary where the indelible mark of plow tines has been left. The boundary with the underlying Layer IV is distinct; with Layers V and VI, the pit layers, the boundaries are also distinct.

A large pit at the south end of the trench terminates the horizontal extent of this layer. The pit appears to have been excavated prior to construction of the road but after the full development of Layer III. The pit consists of two layers. The upper layer, Layer V in the overall context of the trench profile, is a dark reddish brown (5YR 3/4) soft sandy silt that extends from the base of the road to 75 cm bs. The lower layer in this pit, Layer VI, is a yellowish brown (10YR 5/6) soft silty sand with a large boulder and mottles of Layer III sediments mixed throughout. It extends from 50 cm bs to the base of excavation.

IV. Sand; 80 cm bs to base of excavation, 10 to 45 cm thick; a yellow (10YR 7/6) soft sand. A pipe at the base of the trench indicates some degree of disturbance with this layer. The pipe is surrounded by a slightly darker sand.

Trench 34

This is the first trench on the Kaha Lani property. It is 5.2 m long, 110 cm deep, with a long axis oriented 62°. The northwest corner is 18 m from Station SMH 4-4, on a bearing of 233° from the trench corner to the station. The stratigraphy was recorded on the south face. It consists of imported fill for the landscaping work that overlies the dune sand. The sand just below the imported fill has been disturbed, likely in preparation for the landscape work, and included some bone and other debris. Samples (cat. nos. 8, 9) were taken of the bone and debris. In addition, the south face of the trench was expanded to the south in a 1 by 1.35 m unit and excavated to Layer III, the disturbed sand layer in which the bones were located. This extension was intended to address the context of the bones and to determine their specific layer association. A couple of railroad spikes were observed in the backdirt, but their association with a specific stratigraphic layer remains unknown.

The only real buried hazard on the Kaha Lani property is the irrigation system. This system appears on the blueprints of the Kaha Lani grounds, but the area was still traversed with the divining rod to ensure that 1) the irrigation system rendered on the blueprints was actually in place on the ground and that 2) there were no other buried lines in the immediate area of the trenches.

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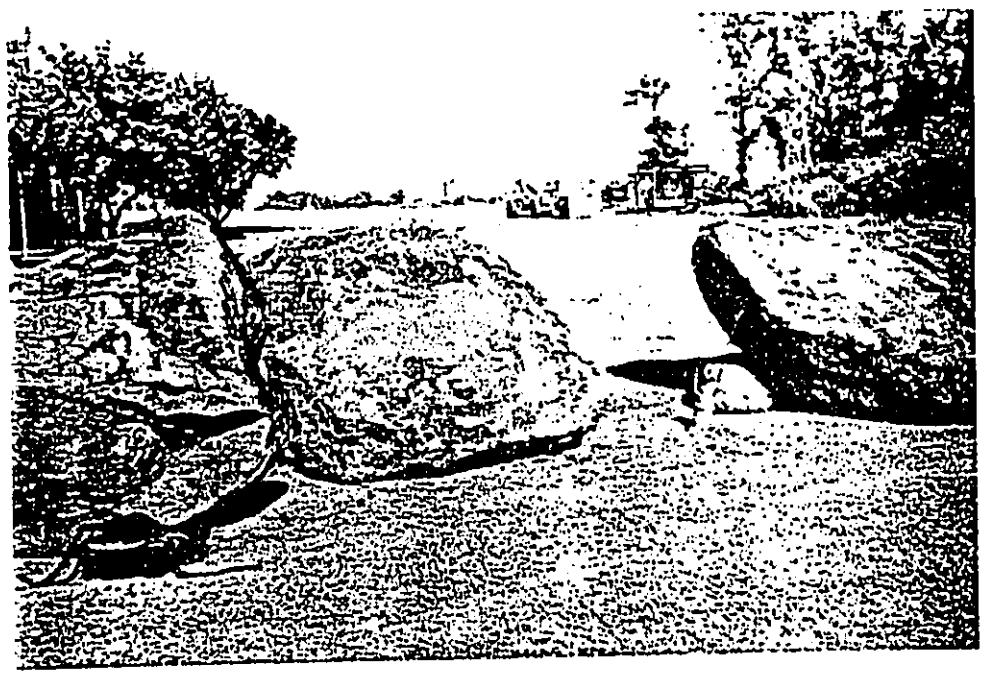


Photos 9 and 10. The Last Segment of the Sewer Alignment on the Grounds of Kaha Lani. View to the NE (above), and West Face of Trench 29 Showing the Buried Pipe Line (below).

I. Fill, imported top soil; 0 to 16 cm bs, 12 to 16 cm thick; a dark reddish brown (5YR 3/4), friable, plastic, sticky clayey silt with a number of rootlets from the grass cover. The layer appears to be the upper few centimeters of Layer II rather than a distinct layer. Its lower boundary is diffuse.

II. Fill, imported top soil; 12 to 33 cm bs, 10 to 17 cm thick; a dark brown (7.5YR 3/2), friable, plastic, sticky clayey silt with a few rootlets, coral, cobbles, pebbles, a little sand, and mottles of reds, yellows, grays, whites, and blacks. The boundary with Layer III is distinct.

III. Sand; 25 to 43 cm bs, 3 to 16 cm thick; a yellowish red (5YR 4/6) friable, slightly plastic, slightly sticky, sand with some clay, a few rootlets, an occasional rock and some bone. The bone (cat. no. 9) in the face of the trench was in an area of smeared sediments, at the base of Layer III. In an effort to further examine the bone and its association with the layer, a 1 m wide area centered on the bone was expanded 135 cm to the south. The expanded area was excavated to the top of Layer III with the backhoe. The layer was then excavated by hand. Additional samples of bone and other debris (cat. no. 8) were collected. No additional segments of the original bone (cat. no. 9) were observed.

Sample 8 included toad bones, coral, crab pincers, land snail, a sea urchin spine, and a couple of shells. Sample 9, the original bone, was identified as either horse or cow. Both samples were definitely associated with Layer III; other materials observed within the layer included paper and other bits of recent, historic era trash. The lower boundary was distinct but smeared.

IV. Sand; 30 cm bs to base of excavation, 53 to 75 cm thick; a yellowish brown (10YR 5/6) soft sand with a few rootlets. Pellets and balls of clay, some mottling of gray, red, and black sediments, bands of reddish sand, and charcoal flecking were mixed throughout the layer; an indication that it too was disturbed.

Trench 35

This trench is located on the Kaha Lani grounds. It is 4.9 m long, 115 cm deep, and has a long axis oriented 58°. The northwest corner is 3.3 m from Station 7+00, on a bearing of 226° from the trench corner to the station. The stratigraphy is recorded on the south face of the trench (Fig. 16). It is much like the stratigraphy in Trench 34 with imported top soil

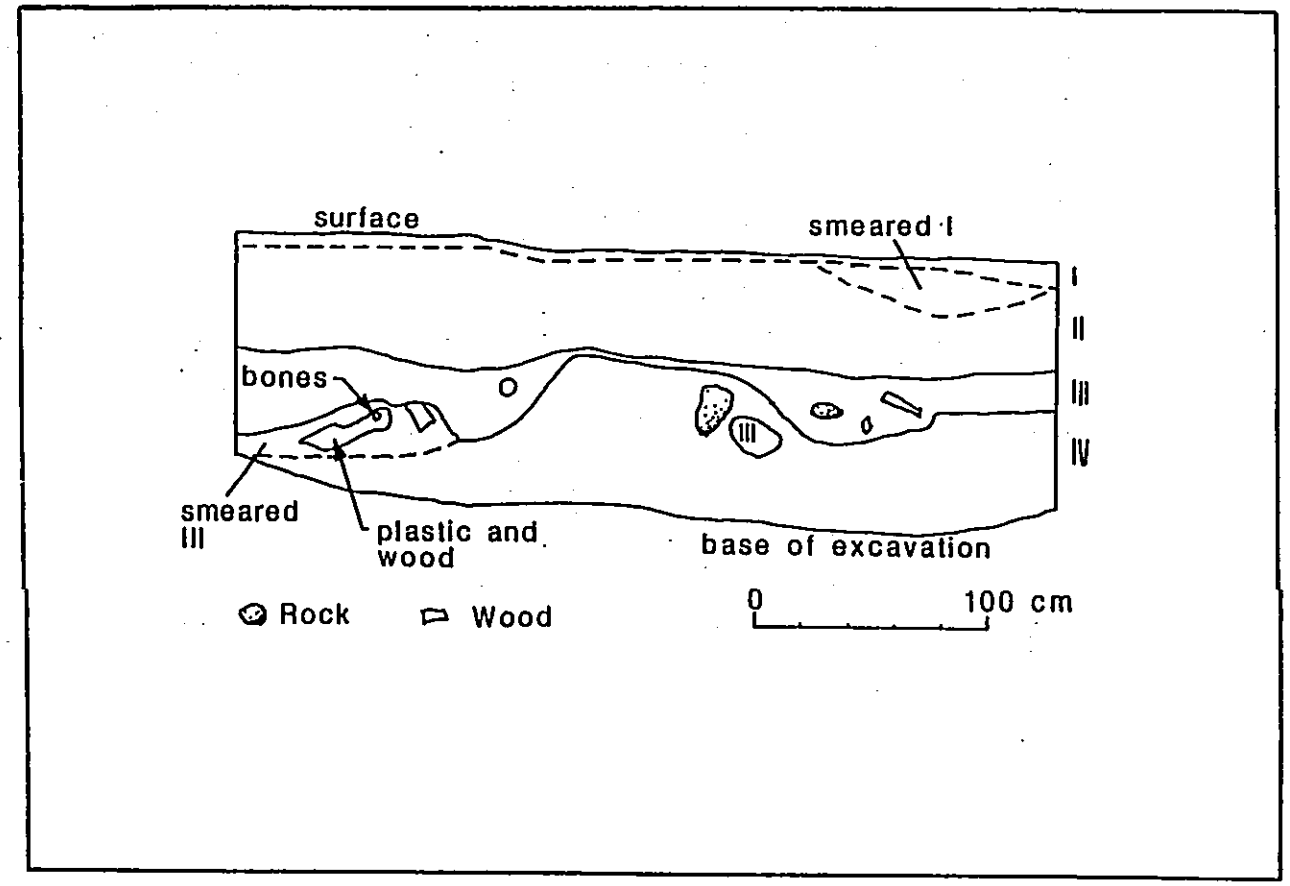


Figure 16. Stratigraphic Profile of the South Face of Trench 35.

associated with the landscaping atop a base of dune sand. A small number of possible human bone fragments (cat. no. 7) were recovered from the disturbed sand layer below the imported top soil. The bones were in direct association with other debris such as plastic wrap and milled lumber fragments.

I. Fill, imported top soil; 0 to 10 cm bs. 4 to 10 cm thick: a dark reddish brown (5YR 3/4), friable, slightly sticky, slightly plastic clayey silt with a number of rootlets from the grass cover and some sand. The layer appears to be the upper few centimeters of Layer II rather than a discrete layer. Its lower boundary is diffuse.

II. Fill, imported top soil; 4 to 55 cm bs, 35 to 50 cm thick; a dark reddish brown (2.5YR 3/4), friable, slightly plastic, slightly sticky, clayey silt with sand, a few rootlets, rocks, cobbles, pebbles, and mottles of gray, red, orange, yellow, and black. The boundary with Layer III is distinct.

III. Sand; 40 to 82 cm bs, 3 to 35 cm thick; a strong brown (7.5YR 4/6) soft sand with a few rootlets, clay pellets, and some cobbles and boulders. The layer also contains fragments of milled lumber, plastic wrap, and small bone fragments. The bones were collected as Sample 7 and were subsequently identified in the laboratory as possibly human; they were amid plastic and wood. The boundary with Layer IV is distinct, with some smearing and blending.

IV. Sand; 42 cm bs to base of excavation, 34 to 58 cm thick; a brownish yellow (10YR 6/6) soft sand with a few rootlets. The layer contains a couple of pockets of Layer III sediments near the top of the layer, comminuted shell, small flecks of charcoal, and bands of brown and gray sandy sediments.

Trench 36

This is the final trench in the sewer alignment. It is 5.2 m long, 135 cm deep, and has a long axis oriented 62°. The northwest corner is 7.3 m from the existing sewer man hole, Station Exist.SMH, on a bearing of 65° from the trench corner to the station. The stratigraphy, as recorded on the north face, consists mostly of sand. Some disturbance is indicated in the form of a large pit cut into the layers at the east end of the trench.

I. Sand; 0 to 20 cm bs, 13 to 20 cm thick; a yellowish brown (10YR 5/6) soft sand with some pebbles and a number of roots from the grass cover. The boundary with the underlying Layer III is diffuse. A large pit, excavated sometime before the development of Layer I but after

the formation of Layer III, appears at the east end of the trench. It is probably associated with the existing sewer line. The pit fill has been designated Layer II, in keeping with the overall context of the stratigraphic profile. Like Layer I, it is a yellowish brown (10YR 5/6) soft sand with a number of roots, a few metal fragments, some banding of lighter colored sands, shell, pebbles, cobbles, boulders, charcoal flecks, and clay pellets. Its boundary with Layers I and III is distinct, but visible only when the sediments are dry.

III. Sand; 15 cm bs to base of excavation, 80 to 95 cm thick; a yellowish brown (10YR 6/4) soft sand with a few roots. The layer also contains some banding (designated Layers IIIa and IIIb), charcoal flecks and streaks, clay pellets, small shell fragments, coral, and an occasional cobble. The Layer IIIa bands consist of strong brown (7.5YR 5/6) soft sandy sediments with an occasional clay pellet. The Layer IIIb bands consist of a dark reddish brown (2.5YR 3/3) sticky, plastic, friable clayey sediment.

Discussion

These four trenches are the final trenches in the proposed sewer line corridor. They were excavated on the grounds of Kaha Lani and on Nehe Road within a service road onto WGC. All four trenches share a common base of dune sand, with upper layers of disturbed sediments. Three samples of bone – identified as toad, horse or cow, and possibly human – were recovered from the disturbed layers of Trenches 34 and 35. Of all the trenches on the entire sewer alignment, these two trenches contained the most cultural material. Unfortunately, it was all within disturbed sediments and consisted of a mix of materials including plastic, metal, milled lumber, bones, snails, and a variety of unidentifiable remains.

VI: ANALYSIS OF CULTURAL MATERIALS AND STRATIGRAPHY

Cultural Materials

A dearth of cultural materials was collected from the trench excavations. In all, a total of eight samples representing five categories of material were retrieved from 5 of 39 trenches (Table 10). The material categories include charcoal, shell (terrestrial and marine), marine fauna. bone, and sediment (for pollen analysis); no true artifacts are represented in any of these categories, only the residues of human activity, most of which is quite recent.

Note: Field No. 6 was assigned to the human skeletal fragments recovered from the burial in TR 33, Layer II. The skeletal material was reburied with the burial from which it was originally derived.

All the samples were taken to the laboratory facilities of IARII, where they were brushed clean of adhering sediments, counted, weighed, and identified. The bone was sent to

* * * * *

Table 10. Cultural Materials recovered from the KCCC-WGC Sewer Line Project Area.

Fld./Cat. No.	TR/Layer	Description
1	9-II	11 pieces of charcoal, cane slag
2	9-III	land snail shells
3	9-II	2 pieces of cane slag
4	17-III	sediment sample for pollen analysis
5	30-IV	charcoal
7	35-III	3 bone fragments (possibly human)
8	34-III	2 small bone fragments (toad)
		2 pieces of coral
		crab pincer
		sea urchin spine
		land snail shell
		2 marine shells
9	34-III	3 bone fragments (cow or horse)

Dr. Alan Ziegler for identification. those fragments identified as possibly human were subsequently examined by Ms. Rona Ikehara. IARII osteologist: the sediment sample was sent to Dr. Jerome Ward for a pollen analysis; and the charcoal was given to Ms. Gail Murakami. who directs the charcoal identification laboratory at IARII. Each of their comments are recorded below. along with descriptive comments made by the author on each category of material. Once analysis has been completed. the samples will be temporarily housed at IARII until a designated curation facility has been approved by the State.

Charcoal

Three samples of charcoal were collected, two of which were identified as fragments of sugarcane slag with the third remaining unidentified owing to the small size of the charcoal fragments. Gail Murakami was responsible for the identifications, correcting most of the preliminary identifications made in the field.

Sample 1 is from the charcoal lens in Trench 9, Layer II. It consists of 11 fragments of sugarcane slag and weighs a total of 7.87 g.

Sample 3 is also from Trench 9, Layer II, and specifically 38 cm bs. It consists of two fragments of sugarcane slag and weighs a total of 16.49 g. The initial field observations suggested the possibility that these were fragments of basaltic glass; however, their relative density and weight, as well as their morphology, suggested they should be reclassified as cane slag. Murakami confirmed the identification as slag.

Sample 5 is from Trench 30, Layer IV. It consists of randomly picked flecks of charcoal that were scattered throughout the stratigraphic layer. Murakami could not identify the fragments owing to their small size; however, she did state that they were most likely from a woody plant, perhaps a shrub, and that they were not derived from sugarcane.

Shell

Two samples of shell, both marine and terrestrial, were recovered from the excavations. Sample 2 is from Trench 9, Layer III, 54 cm bs. It consists of land snails and weighs a total of 0.51 g. No count could be made as the shells would crumble when touched.

Sample 8 is from Trench 34, Layer III, 58 to 65 cm bs. It consists of one land snail shell weighing 2.76 g, one *Periglypta puerpera* shell weighing 7.63 g, and one unidentified marine shell weighing 1.33 g.

Marine Fauna

Only one sample of miscellaneous marine faunal materials was collected, primarily because it was initially thought to represent food remains or midden. Sample 8, noted above,

contained a crab pincer weighing 0.31 g, a sea urchin spine weighing 0.04 g, and two pieces of coral weighing a total of 0.79 g. The coral and the sea urchin spine appeared while cleaning the *Periglypta* and land snail shell from this sample (discussed above). They were imbedded in the sediments within the shell cavities. Neither the coral nor the sea urchin spine show any signs of modification as might be expected if they had been used as implements of some sort. Identification of the crab as food remains cannot be ruled out; however, it is just as likely that deposition of the pincer fragment was the result of natural agencies, similar to the depositional processes responsible for the presence of the coral, sea urchin spine, and marine shell.

Bone

Three samples of bone were collected from two trenches. The bone fragments were cleaned and weighed, then sent to Dr. Alan Ziegler for identification. At the time of collection all the bone fragments were considered probable food remains owing to their context – all were recovered from disturbed sediments, in direct association with recent materials such as milled lumber and plastic bags.

The bones were identified to the lowest taxonomic level possible and include a couple of toad bones, possible human bone fragments, and bone fragments from a horse or cow (or close ally). Other then noting that the toad and horse/cow bones were historic in age, Ziegler could provide no further analysis of these bones.

Sample 7 is from Trench 35, Layer III, 76 cm bs. It consists of three bone fragments weighing a total of 2.20 g. They were identified by Ziegler as possibly *Homo sapiens*, as "all . . . seem to have the general appearance and lightweight construction of certain human bones." Rona Ikehara, IARII osteologist, also reviewed these bone fragments subsequent to Ziegler's identification. She confirmed his analysis and noted that there are no distinctive features on the bones to allow a positive identification.

Sample 8 is from Trench 34, Layer III, 58 to 65 cm bs. It consists of two bone fragments identified by Ziegler as *Bufo marinus*. One of the fragments was identified as part of the cranium, the other was identified as part of an ilium. They weigh a total of 0.14 g.

Sample 9 is also from Trench 34, Layer III, 50 cm bs. It consists of three bone fragments and weighs a total of 136.73 g. Ziegler identified the bone as *Equus caballus* and/or *Bos taurus*, or a close ally of either. He noted that the bones represented individuals at least one year old. The bone fragments identified include a tibia (in two fragments) and a limb or extremity bone fragment.

Pollen

One sediment sample, Sample 4, was retrieved from the buried wetlands layer in Trench 17, Layer III, at 72 cm bs. It weighed 563.6 g. The sample was sent to Dr. Jerome Ward for a pollen analysis. His comments are quoted in full.

> This sample contained abundant organic debris, including cuticle, unidentified algal spores and cells of unknown origin, and fungal spores. Charcoal derived from wood was common, however, none attributable to grass cuticle was seen. Palynomorphs were common but in general were poorly preserved. Of these sedge pollen proved to be dominant at 75 percent followed by grass pollen at 7 percent. Pollen of other types were recorded at levels of 1 to 3 percent and include *Erythrina*, *Euphorbia*, *Casuarina*, and *Commelina*. Since *Casuarina* and *Commelina* are considered 20th century introductions, this sample likely derives from a late historic context or was mixed with younger sediments. The dominance of sedge along with grass and *Commelina* pollen suggests deposition in a marsh environment. A few specimens of *Pseudoschizaea* were seen in the pollen slides which are associated with wetlands and sometimes abundant in Quaternary samples.

Stratigraphy

The proposed sewer line corridor spans five different landforms, including dune land, wetlands, agricultural land, alluvium, and a lava flow. Four of these landforms, all but the agricultural land, are visible in the lower layers of the backhoe trenches, which not only provide an approximation of their extent but also create a baseline from which subsequent landscape changes can be observed and documented. This baseline overlays, in part, an earlier sequence of land formation derived from the soils analysis conducted by GeoLab. In effect, the GeoLab sequence documents the relative progradation of the shoreline at the south end of the project corridor in the vicinity of KCCC and the WGC clubhouse. No such sequence has been established for the north end of the project corridor, although the GeoLab sequence could be extended in general to this area with the understanding that the initial shoreline location remains unknown. There is no time frame attached to the GeoLab sequence, but it begins at about 9 m bs with a fine grained marine sand indicative of a low energy environment, perhaps a lagoon or a deep water environment. This is overlain by a coarser grained marine sand, extending to at least the 6 m bs mark and suggestive of a high energy environment, perhaps one in the wave zone or at least in shallow water. A beach sand to about 5 m bs replaces the coarse marine sand. As the shoreline continues to prograde, the beach sand is replaced by dune land, which in turn is stabilized (the final 30 cm of the sequence) with the establishment of a vegetation cover, including grasses, shrubs, and trees.

The landscape changes observed over the length of the project corridor relate primarily to the establishment and growth of agricultural activity across the northern half of the area, as well as the facilities development for KCCC, WGC, and the Kaha Lani condominium complex at the northern and southern ends of the project corridor. Much of the area stratigraphy has been discussed in the Chapter V above; however, the new element in this summary is the addition of the sample analyses, which indicate that nearly all the landscape changes visible in the trench profiles occurred during the historic era and, according to both the pollen analysis and faunal analysis, most likely within this century. Figure 17 charts the stratigraphic correlation across the project area. For descriptions of specific strata, refer to Chapter V above.

Most of the stratigraphic changes seem to have been precipitated by agricultural activity. Evidence for this overriding force occurs in the form of wind blown deposits of charcoal fragments and sugarcane slag, the residues of broadcast field burning. These deposits are visible in the dune sand layers on the grounds of WGC and appear in the form of long, thin, discontinuous lenses of charcoal and cane slag, as well as randomly scattered flecks of both charcoal and slag. The continually moving and shifting sand has partially mixed the deposits, but it has also served to preserve some of the charcoal and slag lenses. With the development of WGC and stabilization of the dunes, these deposits were effectively sealed, capturing the onset or at least early period of sugarcane agriculture in the area. To the north of WGC, on the Fernandes property and along Leho Road, no charcoal and/or slag deposits are visible in the form of lenses, rather they occur as random elements in a thoroughly mixed sediment matrix; an indication of the continuity of agricultural activity in this part of the project corridor and testimony to the cessation of such activity within the bounds of WGC.

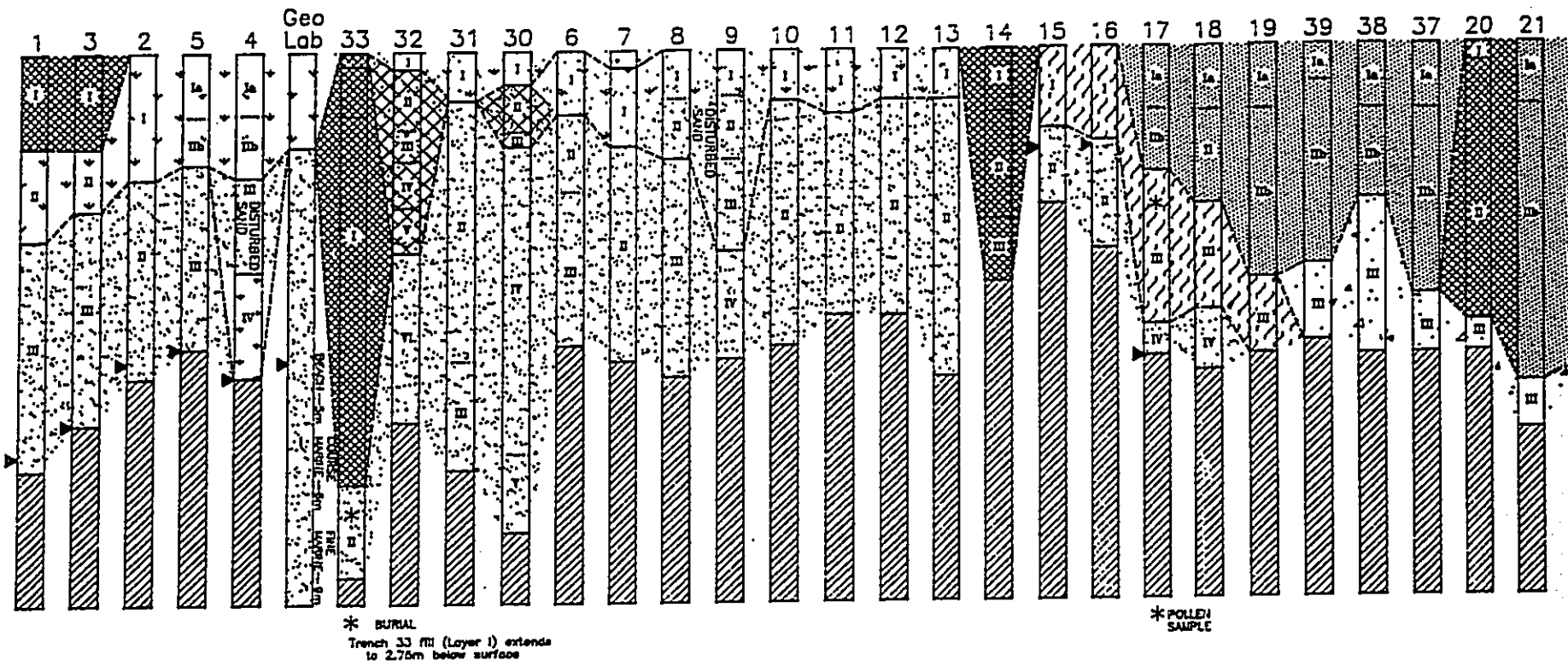
The wetlands, too, succumbed at least in part to the agricultural activity, with the northern end plowed under and ultimately mixed with the overlying sediments. The occurrence of charcoal and cane slag lenses in the agricultural layers within the wetland trenches suggest a termination of agricultural activity in the immediate area. Whether this was a result of abandonment of agricultural activity, fields laying fallow, or development of the golf course is unknown. However, the red agricultural soil overlying intact charcoal lenses does suggest a period of rapid siltation from the surrounding fields, with the newly deposited soil remaining untouched and therefore unmixed by the plow. Development of the golf course, as the final phase in the stratigraphic profiles within this segment of the proposed sewer line, insured the conservation of these deposits.

The landform changes in the immediate vicinities of KCCC and the WGC clubhouse, both at the south end of the project corridor, appear to have been stimulated primarily from development of the facilities rather than agricultural activity. The development included stabilization of the dune surface through landscaping, such as the importation of top soil, and the planting of grass, shrubs, and trees. On the grounds of the golf course, changes in the landform also included cutting and shaping the dunes to create fairways, landscaping work, and deposition of fill material during construction of the parking lots.

At the north end of the project corridor, along Nehe Road and onto the grounds of Kaha Lani, the landform baseline includes a lava flow at the intersection of Leho and Nehe Roads, an alluvial deposit to the east, and finally, at the end of the line, dune land. The lava flow is covered by more alluvium, which extends eastward and slightly overlaps the dune land. This alluvium served as the base for the agricultural activity to the south and west. In the area of Nehe Road and Kaha Lani, facilities development and landscaping work rather than agricultural activity has affected the upper few centimeters of the sediments. The dune land at this end of the project corridor also exhibits a number of other disturbances related to construction of the existing sewer line to the Wailua Sewage Treatment Plant, possibly construction and dismantling of the railroad (indicated by the appearance of railroad spikes in the backdirt from the trenches on the grounds of Kaha Lani), and development of the grounds of Kaha Lani including the import of top soil as well as the requisite grading of the top few centimeters of the dune sand.

In sum, then, changes in the landforms across the project corridor as revealed in the stratigraphic profiles of the testing trenches indicate a shift from a baseline of dunes, wetlands, lava flow, and alluvium to the current arrangement of landforms. The four baseline landforms continue to be present; however, the addition of agriculturally modified land has engulfed a portion of the wetlands and incorporated some of the alluvium, completing the current landscape pattern.

Excavation Trenches.

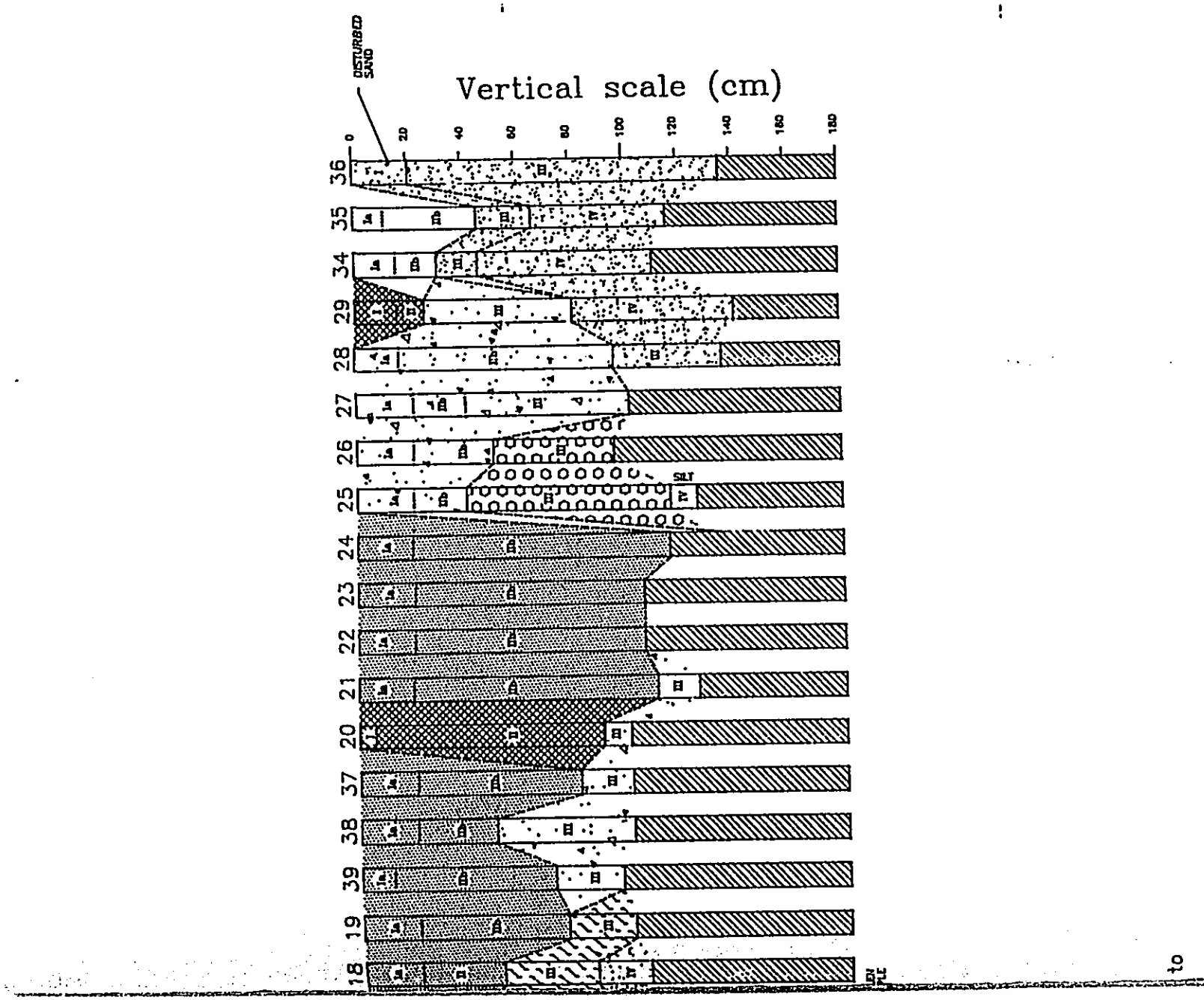


Key

- Fill
- Sand
- Sandy fill
- Organic
- Sandy organic
- Organic wetland
- Agricultural
- Alluvium
- Lava flow
- Unexcavated area
- ▶ Water level
- * Specific feature or sample

Vertical scale does not pertain to GeoLabs core and trench 33.

Figure 17. Stratigraphic Correlation Across the KCCC-WGC Sewer Line Project Area.


DISTURBED SAND
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40
60
80
100
120
140
160
180
36
35
34
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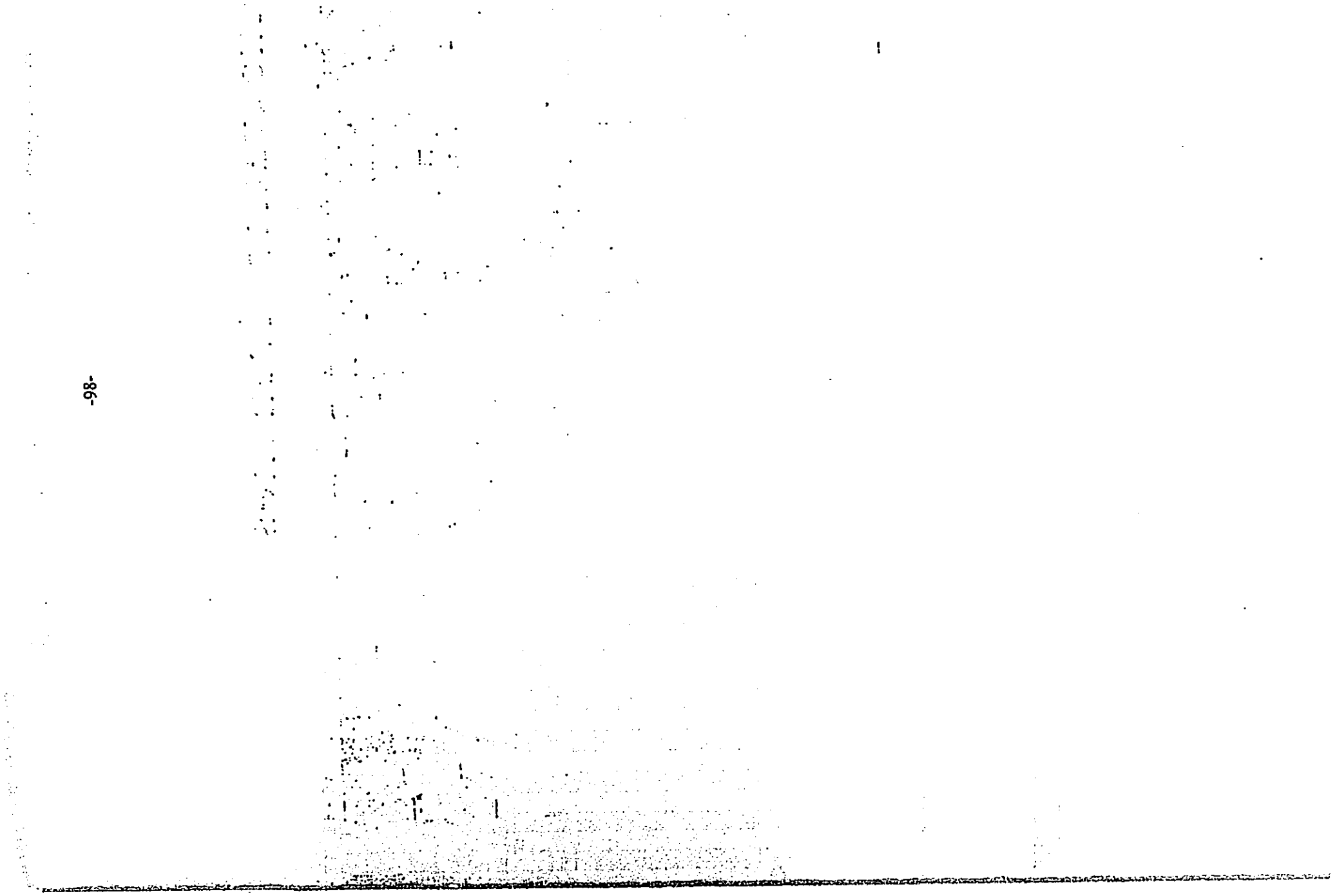

VII: SUMMARY, SIGNIFICANCE ASSESSMENT, AND RECOMMENDATIONS

One burial and a scattering of recent, historic era cultural materials were encountered over the course of subsurface testing for the proposed KCCC-WGC sewer line. The burial lies within the planned jacking pit on the grounds of WGC; the cultural materials were observed in disturbed contexts in 5 of the 39 test trenches. No other cultural sites or features were unearthed in the remainder of the alignment. With the exception of the burial, no potentially significant archaeological sites were identified along the proposed sewer line corridor during the inventory survey.

The discovery of the burial, together with information on other burials encountered within the grounds of WGC (Bennett 1931; Cox 1977; Folk and Hammatt 1992; Folk, Ida, Novack, and Hammatt 1993), prompted a reexamination of sand dune burials on Kaua'i and in Hawai'i in general, with the focus of inquiry directed toward the context, location, and placement of such burials, as well as the dates of use and the ethnic identities of those interred. Few studies are available across the archipelago, and those that have been completed offer little substantive information on questions such as dates of use and ethnic affiliation(s). Nearly all inquiries assume that dune burials are confined to the prehistoric era, but use of the dune lands as burial grounds may well have continued into the historic era. Were immigrants such as the Chinese or Portuguese buried in these grounds or were they solely occupied by indigenous Hawaiians? And what about the unexpected dead among the early European visitors to the islands; could they too have been interred in the dune land?

Burial location was the one element in this inquiry which was most adequately addressed in the work of Bennett (1931), Underwood (1969), Cox (1977), Athens (1985), Hammatt and Toenjes (1991), and Donham (1993). In all the reports, one pattern kept recurring – burials were invariably located on the leeward side of large dunes, although some burials were also placed on dune crests and in other protected areas on the windward slopes. Additionally, Bennett (1931), Underwood (1969), and Cox (1977) note that burials were either flexed or straight. Orientation and depth of interment, however, remains unknown. As for associated burial goods, other accouterment directly related to the burials, and even the arrangement of the burials within a dune formation, little information is available, although at least three sources (Bennett 1931; Underwood 1969; Donham 1993) provide some insights. At best, one can say that more work needs to be undertaken to clarify the full context of dune burials in Hawai'i.

Within the context of east Kaua'i archaeology, discovery of the burial in the project corridor is consistent with the general interment pattern outlined above, but questions on date, ethnicity, and context remain to be resolved. A review of previous archaeological work in the area has at least established the basic framework of the overall site distribution on this

part of Kaua'i. The emergent settlement pattern included burials confined mostly to the dune land and beach deposits along the coast: agricultural and subsistence based sites located along the Wailua River, its tributaries, and in associated wetlands and marsh areas: habitation sites and associated activity areas located primarily on dry ground in the inland tributary drainages and in the near shore zones on the coastal plain; and high status or sacred sites confined to the banks of the lower reaches of the Wailua River, with the appropriate landmarks (both physical and cultural) denoting the immediate area *kapu* to the general population. As this part of Kaua'i, the *ahupua'a* of Wailua, is considered the traditional residence of the island's *ali'i*, it is not known if the dune burials are associated solely with the *ali'i* or with the general population in the *ahupua'a*. It is also not known if the date of use was historic or prehistoric or both: and if any historical period populations using the burial ground were solely Hawaiian or included members of other ethnic affiliations.

The majority of information recovered from the trench excavations on this project is related to geomorphology and landscape change rather than the cultural presence in the project area. Of particular note are the changes precipitated by the introduction and expansion of agricultural activity, as well as the development of KCCC, WGC, and Kaha Lani during this century. These changes include the gradual disappearance and contraction of a marsh or wetlands, stabilization and alteration of the dune land, rapid sedimentation associated with the preparation, burning, and plowing of agricultural (sugarcane) fields, and development of humic sediments where once shifting dune sands predominated. The overall changes to the general area include progradation of the shoreline, at least in the southern part of the project area, from a point well inland of the KCCC facilities to its present location, and the gradational contact between the alluvium of the coastal plain, a lava flow, and the dune land at the northern end of the project corridor.

Significance of the Burial

Discovery of the burial in the dune land within the project corridor raises questions regarding its relationship to Site 50-30-08-103, Dune Burials, identified by Bennett (1931) in this general area. Neither the site boundaries nor the number of burials, or for that matter the full contexts of the burials (e.g., date, ethnicity, associated burial goods, arrangements within the dune formation), have ever been thoroughly defined. Therefore an assessment of significance with respect to the burial identified in the current testing work, the burials encountered in the previous archaeological work, and Site 50-30-08-103 in terms of the criteria of eligibility for inclusion on the National and State Registers of Historic Places cannot be made. However, this burial and the Dune Burial site in general, which appears to encompass the entire dune formation, are potentially significant under National and State Register Criterion D and State Register Criterion E. Sites are significant under Criterion D if they have yielded or are likely to yield information important in prehistory or history; sites which retain important traditional cultural value are significant under Criterion E.

In general, Bennett's Site 50-30-08-103 has already contributed to the development and enrichment of our knowledge of the site distribution and settlement pattern on this part of

the island. However association of the burials with the *ali'i* or general population in the *ahupua'a*. as well as date of use still must be clarified. and can only be resolved in a systematic examination of the burials. their context. and any associated burial goods. This is difficult to accomplish through the piecemeal employment of scattered. compliance driven projects such as the current KCCC-WGC sewer line; yet the practicality of a large scale. thorough examination of the Dune Burial Site and the burials that have continued to appear over the course of recent development projects is also limited because of funding as well as the disruption it would cause to the routine business of WGC. Under these circumstances. the only recourse currently available is to avoid burials during construction work, or if inadvertently disturbed, to fully document the remains and their location.

If a burial(s) must be removed to accommodate the route of the sewer line or some future unspecified development project. then the burial(s) must be documented in full and reburied in a suitable location agreed upon by the SHPD and any living descendants, the Kaua'i Burial Council, or other appropriate organization representing the ethnic group of the deceased. Documentation should include detailed recording of the burial and associated materials *in situ* and osteological analyses following disinternment. The process of documentation is fundamental to the definition and understanding of dune burials on Kaua'i and Hawai'i generally, and specifically it is consistent with compliance of Section 6E of the Hawai'i Revised Statutes (1990), which requires that ethnicity be determined before any decisions on reburial and/or additional treatment can be made. Such documentation will also aid in clarifying the nature of mortuary practices in Hawaiian culture, and whether there are distinctions between the treatment of individuals based on their status or ethnicity.

Recommendations

The following recommendations are presented as a guideline for the treatment of archaeological resources within the project corridor. One burial and a few recent, historic era cultural remains have been identified over the course of the archaeological testing; however, only a small sample of the project corridor has actually been investigated. It is always possible that additional cultural remains will be encountered in those areas of the project corridor that were not examined.

1. The present location of the proposed sewer line alignment and its coincidence with existing utility lines along some stretches of the route suggests that some modifications in the location of the line will occur, especially with shifts to either side of the current proposed alignment. And, as burials could potentially be encountered anywhere in the dune land, any changes in the sewer line alignment increase the likelihood of such an encounter. Therefore, it is recommended that an archaeological monitor be present on-site throughout the construction in order to ensure that all work stops should human remains be unearthed.

If human remains are encountered, the construction work may continue on another, distant segment of the sewer alignment, while the procedures and protocols established for the treatment of human remains are completed on the discovered remains. This means contacting and consulting with the SHPD and initiating the processes described in Section 6E in the Hawai'i Revised Statutes (1990), which outline the way in which human remains are handled. Treatment can range from realignment of the sewer line to avoid the burial to disinternment and reburial of the remains. In any event, the burial, its location, and its context must be fully documented by a qualified archaeologist and osteologist, and the information reported in full to the SHPD.

2. Any proposed shift in the location of the jacking pit in the immediate location of the burial encountered in the current testing work should be preceded by an expanded archaeological exploration of the area. This means removing the parking lot pavement over a broader area than was removed during the testing work and removing the parking lot fill to its boundary with the dune sand in order to create a reasonable working space for the archaeologists. The objective of the archaeological work would be to determine the presence or absence of additional burials and to gather sufficient information to be used in subsequent planning efforts for the disposition of such remains as are identified and the placement of the sewer line jacking pit and alignment.

Because one burial has already been identified in this area, it is very likely that additional burials are present in the immediate vicinity, which would be consistent with the pattern of previous burials reported and mapped in the northern half of WGC (see Cox 1977). The burial discovered in the current project appears to fall within the general location pattern observed by Bennett (1931), Underwood (1969), Cox (1977), Athens (1985), Hammatt and Toenjes (1991), and Donham (1993) for dune burials in Hawai'i; that is, a propensity for burials to be located in groups on the western or leeward side of sizable dunes. The dune on which the discovered burial is located had at one time been much larger, according to WGC personnel, but substantial alterations associated with construction of a WGC fairway have greatly diminished its size and expanse.

If there are no plans to move the jacking pit, then approval must be sought from SHPD and any living descendants for disinternment of the remains already identified and any other remains within the area to be affected and their reburial in a suitable location.

3. Full analysis should be completed on the discovered burial remains and any other remains encountered over the course of the project work. This is necessary to determine significance for historic preservation compliance purposes, as well as ethnicity as required by State law.

4. Should another of the proposed sewer line routes be selected as an alternative to this one, archaeological testing should precede the planned construction work. This testing would be similar to that already completed. It must be pointed out, however, that the absence of burials and other cultural materials along the currently tested route, with the exception of the jacking pit on the WGC grounds. suggests that this route should be retained.

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—Burial Treatment Plan—

Kaua'i Community Correctional Center and Wailua Golf Course Sewage Force Main Project, Wailua, Kaua'i

by

Felicia Rounds Beardsley

David J. Welch

INTERNATIONAL ARCHAEOLOGICAL RESEARCH INSTITUTE, INC.

June 1994

EXHIBIT B

—Burial Treatment Plan—

KAUA'I COMMUNITY CORRECTIONAL CENTER AND WAILUA GOLF COURSE SEWAGE FORCE MAIN PROJECT, WAILUA, KAUA'I

by

Felicia Rounds Beardsley
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prepared on behalf of:
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Public Works Division
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Submitted to:
State of Hawaii Historic Preservation Division
and
Kaua'i Island Burial Council

International Archaeological Research Institute, Inc.
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July 1994

Introduction

This burial treatment plan has been prepared by International Archaeological Research Institute, Inc. (IARII) on behalf of the State of Hawaii Department of Accounting and General Services (DAGS) Division of Public Works. The discovery of a human burial by IARII archaeologists during archaeological testing of the proposed route for a new sewage force main to be installed by DAGS in Wailua, Kaua'i has prompted development of this plan. This new sewer line will connect the Kaua'i Community Correctional Center (KCCC) and Wailua Golf Course (WGC) Clubhouse with the main Kaua'i County sewer line. The purpose of the plan is to set forth procedures which will be followed in the treatment of the human burial which was found during the testing. The procedures set forth in this plan will also be followed if additional burials are found during construction of the new sewer line. This plan has been prepared in accordance with Section 6E Hawaii Revised Statutes (HRS) and the National Historic Preservation Act.

The KCCC-WGC project area consists of a narrow, 2 km (1.2 mile) long corridor that connects KCCC and WGC to the Kaua'i County sewer system and Wailua Sewage Treatment Plant. It is located on the windward side of Kaua'i, roughly 2 km south of the Wailua River (Figs. 1, 2, 3), in the Puna district of the traditional land unit comprising Wailua *ahupua'a*. The land on which the sewer line will be built is part of the property designated in the tax map keys as TMK 3-9-02, owned by the State of Hawaii. The State retains ownership, but has conveyed the Wailua Golf Course property on which the burial was found to the County of Kaua'i for its use under terms of an executive order.

Background: Archeological Inventory Survey

An archaeological inventory survey, including the excavation of trenches along the proposed route of the KCCC-WGC sewage force main, was conducted by IARII in November 1993 under the direction of Dr. F. R. Beardsley. The results were presented in the final project report (Beardsley 1994), which has been submitted to and accepted by the State Historic Preservation Division (SHPD) (Appendix A). In all, 39 test trenches were excavated—36 with a backhoe, 3 by hand. The trenches ranged in length from 2 to 6.5 meters and in depth from 55 cm below surface (bs) to 3 m bs, with roughly 10 percent of the entire proposed project alignment examined during these excavations.

A single burial of undetermined ethnicity and age (historic or prehistoric) was identified during the excavations. It was located in the dune sand at the base of Test Trench 33, in the WGC parking lot. The burial is situated at a critical link in the proposed sewage force main system—a jacking pit that connects the planned sewer lines from the WGC clubhouse and the KCCC facility to the proposed force main.

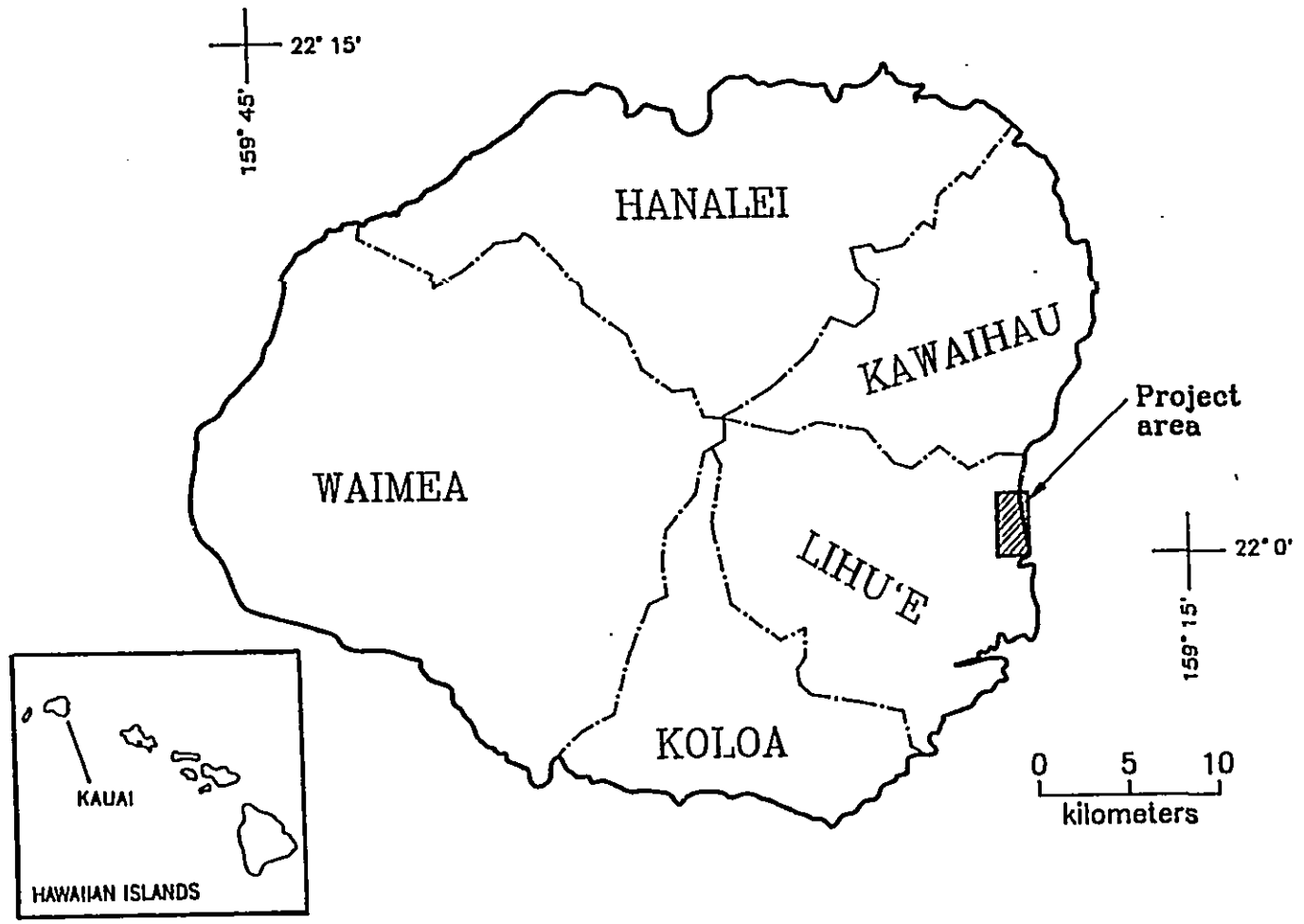


Figure 1. Location of the KCCC-WGC Sewer Line Project Area on the Island of Kaua'i.

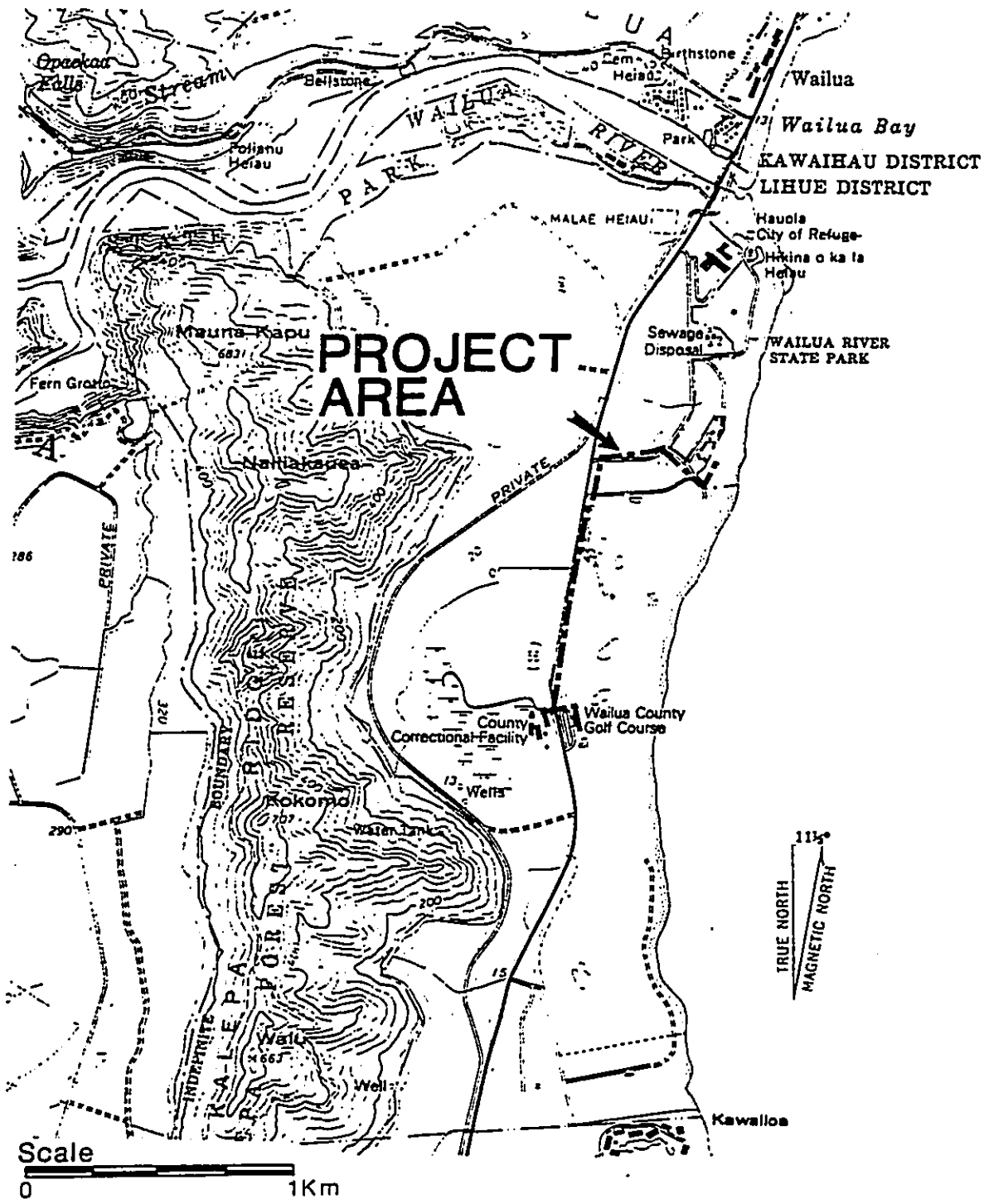


Figure 2. Location of the KCCC-WGC Sewer Line Project Area on USGS Map.

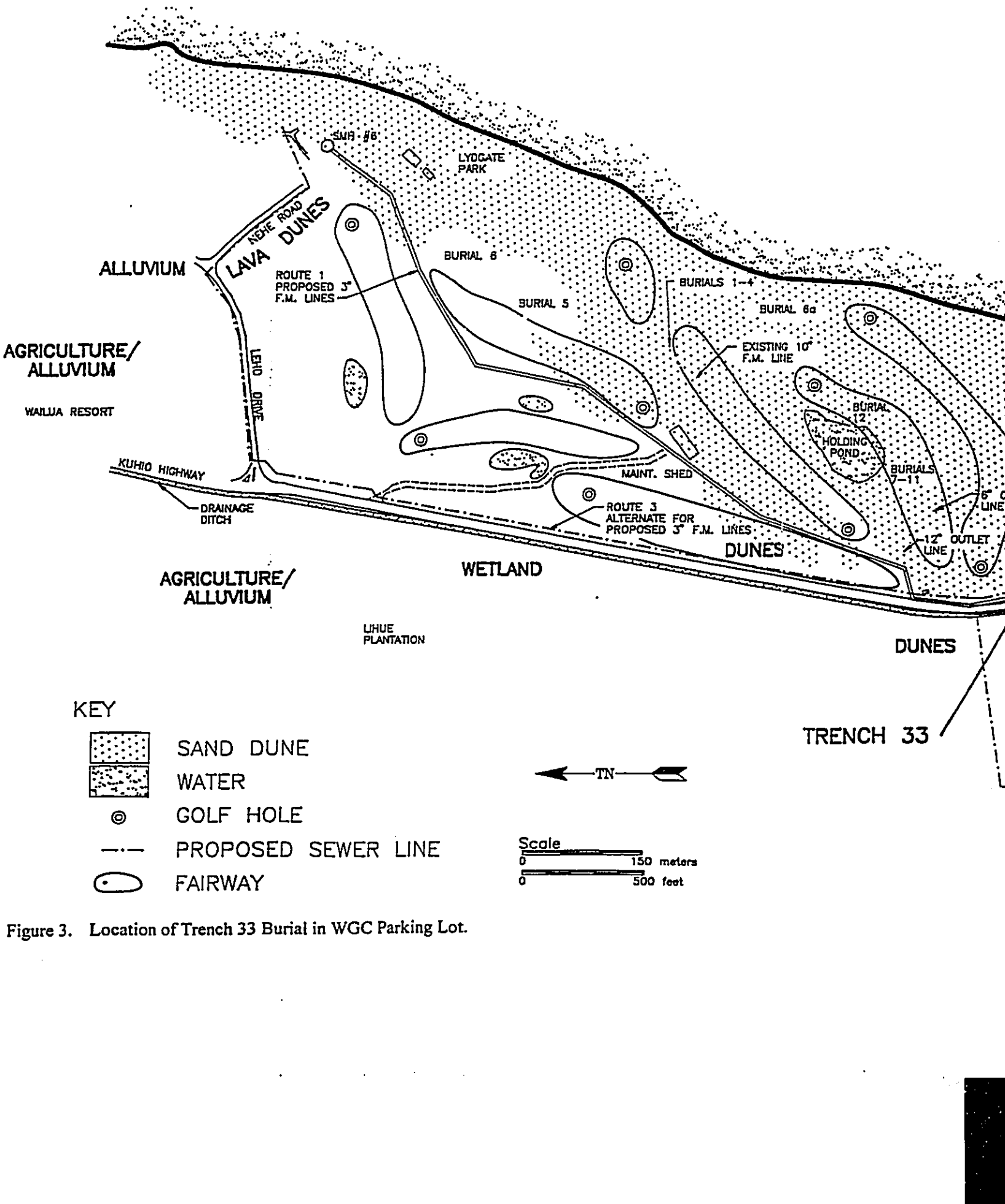
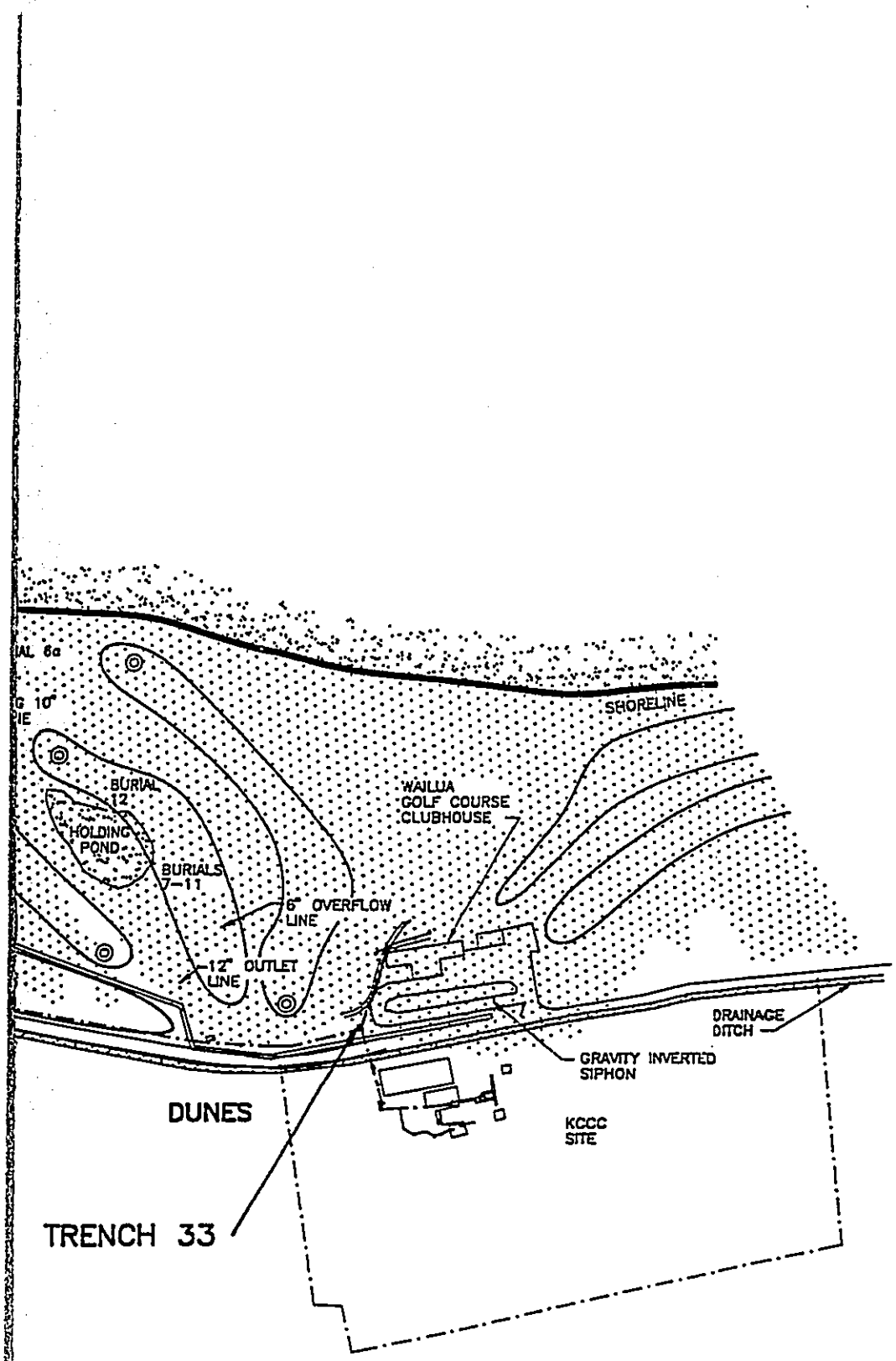


Figure 3. Location of Trench 33 Burial in WGC Parking Lot.


IAL 6a
G 10"
IE
SHORELINE
BURIAL 12
HOLDING POND
BURIALS 7–11
WAILUA GOLF COURSE CLUBHOUSE
6" OVERFLOW LINE
12" LINE
OUTLET
DRAINAGE DITCH
GRAVITY INVERTED SIPHON
DUNES
KCCC SITE
TRENCH 33

Other than the burial, little cultural material was encountered: the primary information retrieved from the trench profiles was geomorphological in nature—changes in both the horizontal and vertical extent of the landforms across which the sewer alignment passes. The cultural material consisted primarily of historic era materials observed in 5 of the 39 trenches. It included charcoal, sugarcane slag, shell (marine and terrestrial), marine fauna (crab, sea urchin), bone (toad, cow or horse), plastic, glass, milled lumber, and a squared basalt boulder that likely served as a guy line anchor. The landforms exposed included the dune formation, a lava flow, wetlands, the coastal plain alluvium, and agricultural lands; the changes observed included progradation of the shoreline, introduction and expansion of agricultural activity, contraction of the wetlands, stabilization and alteration of the dune land, development of humic sediments on the inland edge of the dunes, and increased sedimentation of the coastal plain alluvium.

No time depth or dates of occupation or use of the project area could be derived from the excavations other than relative dates based on palynological analysis, the nature of the cultural material, and the character of the disturbances along the force main alignment. The pollen analysis, from a sediment sample recovered from a buried wetlands stratum at the north end of the golf course (Test Trench 17), indicated the presence of a marsh land at least during the historic era, complete with pollen from 20th century introductions. The cultural material occurred in the form of long, thin lenses of broadcast burns with both charcoal and sugarcane slag in the dunes and in the agricultural strata above the wetlands layers, as well as trash deposits at the north end of the force main alignment on the grounds of the Kaha Lani condominium complex and the boulder guy line anchor by the WGC clubhouse. All this cultural evidence is indicative of historic era activities related to agricultural practices and the development of the WGC and Kaha Lani. The other disturbances along the project alignment include primarily pits and other excavations on the grounds of KCCC, WGC, and Kaha Lani, and are likely related to development of these facilities, as well as the adjacent highway, streets, and associated utilities. None of these historic era events, however, are directly associated with the burial.

The single identified burial is located at the south end of the sewer force main alignment, in front of the WGC clubhouse at the north end of the golf course parking lot. It was discovered at the base of Test Trench 33, a trench dug at the location of one of the sewer line jacking pits. The burial is located at 3 m bs, in the dune sand underneath about 2.75 m of imported fill associated with construction of the WGC parking lot (Fig. 4). The skeletal remains from the burial encountered at this depth included fragments of the cranium, portion of the jaw bone, and some teeth of an individual human. The location of the remains—on the lee side of what had at one time been a substantial dune, near the inland edge of the dune formation—is consistent with the pattern of burials reported farther north in the same formation (Cox 1977).

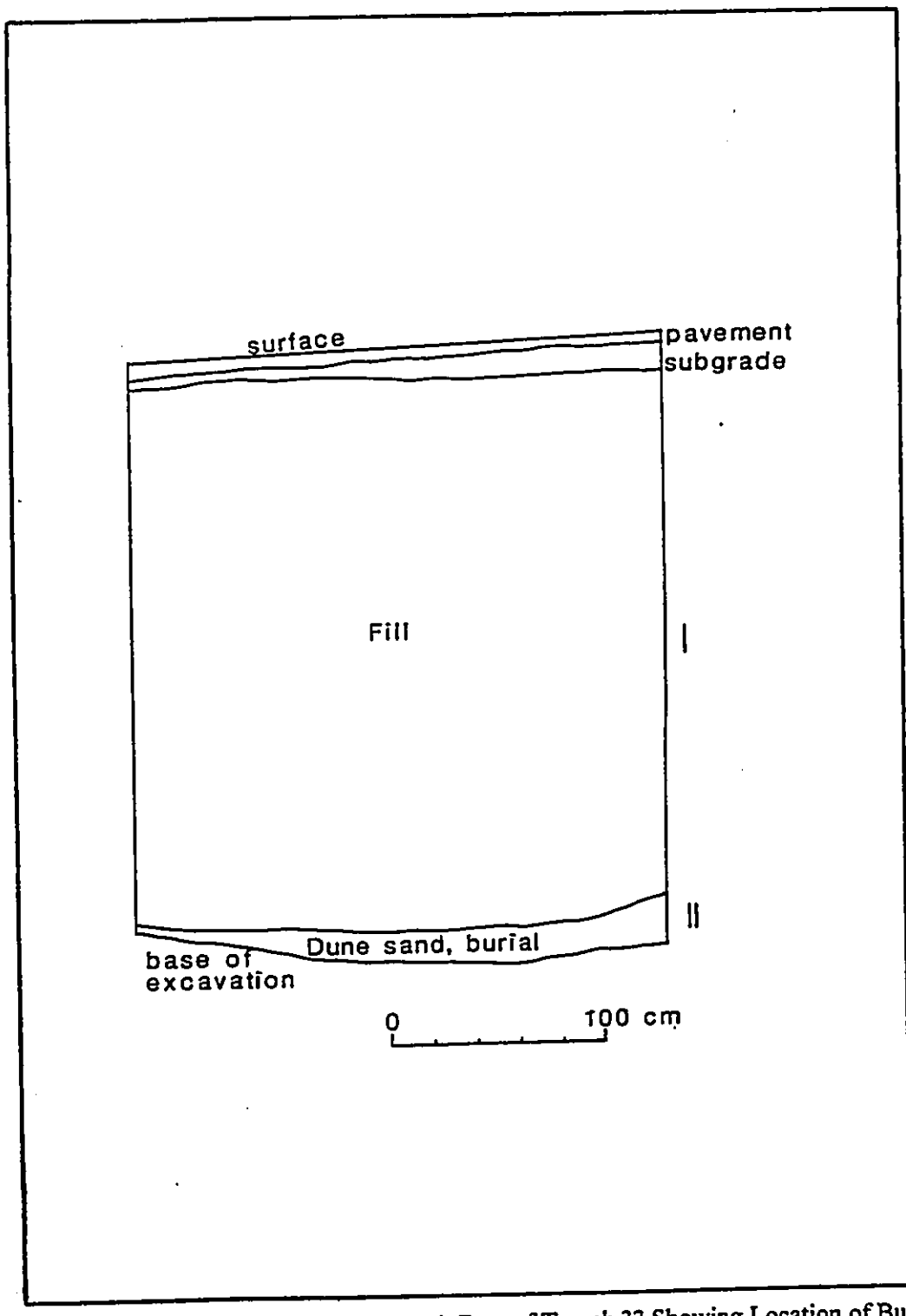


Figure 4. Stratigraphic Profile of South Face of Trench 33 Showing Location of Burial.

Upon discovery of the burial, the test excavations ceased, and the SHPD and Kaua'i Island Burial Council were notified. They recommended replacing the remains with the rest of the burial, refilling the test trench, and noting the location for future reference. The skeletal material that had been inadvertently removed by the backhoe bucket was collected, placed in a clean white cloth bag, and returned to the in situ burial. The burial was covered with the dune sand that had been removed in the course of the test excavation; the trench was then lined with a tarpaulin as a marker denoting the presence of the burial; then the trench was refilled with the material that had been removed, and repaved (a full account of the burial and subsequent actions upon its discovery can be found in Beardsley 1994: 49-52).

Neither a date nor ethnic affiliation could be assigned to the burial, other than to note that it is older than the WGC parking lot under which it is located. While the burial may be associated with other burials found at Wailua Golf Course, the ethnic identity of none of these remains has been determined. While the practice of dune burial is known to be a common practice of native Hawaiians, other ethnic groups have been known to place burial grounds in dunes, e.g. the Japanese cemetery at Barking Sands on the west coast of Kaua'i.

Burial Treatment Plan

This location of the burial is, unfortunately, that of a proposed jacking pit, a crucial segment in the force main alignment because it is the point at which the lateral lines from KCCC and the WGC clubhouse join the principal course of the force main. While preservation in place would be the preferred treatment, the nature of the project plan on this part of the alignment limits the extent to which the jacking pit location can be moved without requiring major and costly redesign. In addition, it is likely that other buried human remains are present in the near vicinity of the identified burial, and these would then require relocation during excavation of the newly placed jacking pit. Under these circumstances, it is recommended that the burial remains be respectfully disinterred to allow the construction of the proposed KCCC-WGC sewer force main to proceed as planned. DAGS is therefore requesting permission to disinter the burial and to relocate the remains to a nearby site.

As requested by the SHPD, legal notices have been placed for three days in the Honolulu Advertiser and the Kauai Times, including a weekend and a Wednesday edition, requesting that any individuals claiming lineal descent from these burials or having information about these burials notify the Kaua'i Island Burial Council, the SHPD, or IARII (see Appendix B).

The disinterment will be conducted following procedures that will allow the collection of all information relevant to documenting fully the significance of the burial and data that will be of importance in contributing to the understanding of Hawaii's past,

in particular past mortuary practices. Data collection and analysis will also be oriented toward determining the ethnicity of the individual and any other individuals buried at this location in order to determine the appropriate treatment of the remains as stipulated in HRS 6E.

In respect to the deceased, a solemn blessing ceremony will be performed prior to disinterment. A backhoe will remove the parking lot asphalt and excavate the underlying fill to its interface with the natural dune sand over the entire area that will comprise the jacking pit (a 16 by 10 foot block), a 5 foot wide strip surrounding the jacking pit, and the first 20 feet of the sewer line corridor leading north from the jacking pit. Hand tools, first shovels, then trowels, as appropriate, will be used to begin excavation of the underlying dune sand. The purpose will be to expose completely the burial discovered during the testing and also to identify any cultural remains or other burials in the near vicinity that might be associated with the Trench 33 burial. The excavation of this large an area will insure that all burials that might be adversely impacted by the excavation of the jacking pit will be identified and relocated prior to construction of the jacking pit.

Disinterment will proceed following standard archaeological practice, with the full context of the burial documented. A part of that standard practice includes recording all the details of provenience on standard burial and feature forms for both the burial and any associated material culture items that may be identified during disinterment. Upon their removal, both the burial and any associated material elements will then be transported to an appropriate laboratory facility within Hawaii, where they will be temporarily housed and where proper treatment and analysis can occur.

The skeletal remains will be carefully cleaned and temporarily reconstructed to the extent practicable; thereafter, the appropriate non-destructive observations and analyses will be conducted in an effort to document the remains and determine as accurately as possible the ethnicity of the individual. A qualified physical anthropologist with specialized training in osteology, comparative anatomy, pathology, and genetics will be responsible for the analysis and other observations regarding the skeletal remains. Concurrent to this examination, all associated material culture items will be catalogued and described by a laboratory technician or specialist.

Great care will be taken to insure the protection and careful handling of the skeletal remains at all times, whether in the field or in the laboratory. They will be kept covered once exposed and whenever the archaeologist, physical anthropologist, or other designated personnel are not working with them, and at no time will they be on public view or handled by persons other than those so designated.

The analyses and observations by the physical anthropologist will concentrate on a variety of metric and non-metric attributes in order to determine the ethnic affiliation, stature, age, sex, diet, cultural practices, and other factors. The skeletal remains will also

be examined for any signs of disease or trauma. All observations and analyses are routine for human remains and do not involve any intrusive, destructive, or experimental procedures; the analyses will not destroy or alter the remains in any way. However, should specialized analyses involving chemical examination of small fragments of bone be needed to answer an important question regarding the individual, then a written request for such work will be submitted to the SHPD with the understanding that the analysis will be contingent upon the professional evaluation and acceptance of the proposal.

When the analyses are completed, a written report will be prepared documenting the results of the fieldwork and analyses of the human skeletal remains and this report will be submitted to the SHPD. When the report is completed, the remains will be turned over to the SHPD for disposition. The appropriate disposition of the skeletal remains and any associated cultural material will be determined by the SHPD in consultation with the Kaua'i Island Burial Council, any lineal descendants, the appropriate ethnic organization(s), and the landowners. If the remains are reinterred, the selected site must be protected and any lineal descendants allowed access.

If no other involved groups request relocation elsewhere, then DAGS proposes to rebury the remains on the grounds of the Wailua Golf Course in the same burial location as that selected for individuals recently disinterred during excavation for the fiber optic cable being laid across the golf course. The Trench 33 individual and any nearby burial remains will thus be returned to a nearby location within the same dune from which they will be disinterred.

Inadvertent Discovery

As noted in the Background section above, only about 10 percent of the entire KCCC-WGC force main alignment has been examined for archaeological remains. With the discovery of the burial at the base of Test Trench 33 and the known burials reported in the same dune formation but outside the project alignment (Cox 1977; Folk, Ida, Novack, and Hammatt 1992; Bennett 1931), there is a possibility that additional human remains may be encountered over the course of project construction. This is particularly likely in the immediate vicinity of the already discovered human remains.

As such, monitoring has been recommended for the duration of the construction work (for project recommendations, see Beardsley 1994: 101-103). An archaeologist will be present during all excavation of new trenches along the sewer line. In the event another burial is inadvertently encountered, all construction work will stop in the immediate vicinity, although it can resume on another distant segment of the alignment. The SHPD will be notified immediately, and thereby begin the process of consultation, which will be conducted in accordance with the provision of Hawaii Revised Statutes Section 6E.

The first choice of treatment will be preservation in place. Along most of the sewer line, DAGS will make every effort to realign the sewer line to avoid disturbance to any burials. Wherever possible, the sewer line will be realigned, leaving at least a 6 foot buffer between the new location of the line and the human remains. Only at a few crucial points, such as the initial and final connecting points and the jacking pits will realignment be impossible.

Where in situ preservation is not possible, then consultation with the SHPD will be conducted regarding the proper treatment and disposition of the inadvertently discovered burial in accordance with the steps set out in HRS Section 6E-43.6. Disinterment and relocation, if agreed to by the SHPD, will be accomplished following the same thorough and respectful procedures described above for the Trench 33 burial. The remains will be reinterred at the same location as those of the Trench 33 burial.

References

Beardsley, F. R.
1994 *Dune Burials and Landscape Change: Archaeological Subsurface Testing Inventory Survey, Kauai Community Correctional Center and Wailua Golf Course Sewage Force Main Project, Wailua, Kauai.* Prepared for Division of Public Works, Department of Accounting and General Services, State of Hawaii. International Archaeological Research Institute, Inc., Honolulu.

Bennett, W. C.
1931 *Archaeology of Kauai.* Bernice P. Bishop Museum Bulletin 80. Bishop Museum Press, Honolulu.

Cox, D. W.
1977 *Report on the Burials Recovered during the Effluent Reclamation Project, at Wailua, Puna, Kauai Island.* ARCH Project 14-71 report prepared for Hood Corporation. Archaeological Research Center Hawaii, Inc., Lawai.

Folk, W. H., G. K. Ida, E. W. Novack, and H. H. Hammatt
1992 *Archaeological Assessment of the Proposed Fiber Optic Cable Landing for Wailua, Kauai.* Prepared for R. M. Towill Corporation. Cultural Surveys Hawaii, Kailua.

APPENDIX A.

LETTER OF SHPD ACCEPTANCE OF ARCHAEOLOGICAL INVENTORY SURVEY REPORT

JOHN WAIHEE
GOVERNOR OF HAWAII

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

KEITH AHUE, CHAIRPERSON
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HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

June 1, 1994

LOG NO: 11585
DOC NO: 9405NM20

J. Stephen Athens, Ph.D.
IARII
949 McCully St., Suite 5
Honolulu, Hawaii 96826

Dear Dr. Athens:

SUBJECT: **Historic Preservation Review -- Final Archaeological Inventory Survey Report (Beardsley, 1994) for the KCCC and Wailua Golf Course Sewage Force Main Project (DAGS)**
Wailua, Lihue, Kauai

Thank you for submitting the final report for our review. The report is sufficient and acceptable. One human burial was found in the project area.

Please have your client develop a proposal for treating this burial (preservation in-place or data recovery/reinterment) and submit this proposal to the Kaua'i Island Burial Council for a vote. Edward Ayau of our office (587-0010) should be contacted for information the Council will need to be placed on the agenda.

You propose that an archaeological monitor be present during actual construction. We agree with this proposal since it is highly likely that additional burials and subsurface historic sites may be present. An acceptable report must be submitted to our office on this work, with profiles and illustrations of any burials found. A treatment plan will need to be developed as a contingency to handle any burials found during construction.

J. S. Athens
Page 2

If you have any questions, please call Nancy McMahon 587-0006.

Sincerely,

DON HIBBARD, Administrator
State Historic Preservation Division

NM:amk

c: Kauai Island Burial Council
E. Ayau, DLNR Burials Program

APPENDIX B.

PUBLIC NOTICES CONCERNING DISCOVERY AND POSSIBLE RELOCATIONOF TRENCH 33 BURIAL

(Kaua'i Times Notice published May 15, May 22, and June 8)

IN THE MATTER OF

PUBLIC NOTICE
International Archaeological Research Institute, Inc. (IARII)

AFFIDAVIT OF PUBLICATION

PUBLIC NOTICE

NOTICE IS HEREBY GIVEN that International Archaeological Research Institute, Inc. (IARII), representative of the State of Hawaii Department of Accounting and General Services on its proposed KCCC sewer line project, may disinter, with appropriate dignity and respect, human skeletal remains of one or more individuals from an unmarked grave located on TMK 3:9:02, Wailua, Puna, Kauai in accordance with Chapter 6E, Hawaii Revised Statutes regarding treatment of human skeletal remains. The remains of one individual were located during archaeological testing in sand dune deposits beneath the parking lot of the Wailua Golf Course. The remains may be Hawaiian, but ethnic affiliation remains uncertain. The decision whether to preserve in place or disinter and relocate the remains of this individual and any others in the immediate vicinity may be made 30 days following final publication of this notice.

Persons having any knowledge of the identity or history of this burial or any individuals claiming lineal descent from persons buried at this location are requested to notify LaFrance Kapaka Arboleda, Kauai Island Burial Council, at 245-1996 (Kauai), Edward Ayau, State Historic Preservation Division, at 587-0010 (Oahu), or David Welch, IARII, at 946-2548 (Oahu) within 30 days of the date of this notice. A map showing the location of the grave may be obtained from IARII at 949 McCully St., Suite 5, Honolulu, HI 96826.

(Hon. Adv.: May 13, 18, 1994) (A-27528)

STATE OF HAWAII
City and County of Honolulu } ss.

Hiroko Nakamura, *being duly sworn, deposes and says that she is a clerk, duly authorized to execute this affidavit of the HAWAII NEWSPAPER AGENCY LIMITED PARTNERSHIP, a partnership of GANNETT PACIFIC CORPORATION, publisher of THE HONOLULU ADVERTISER, and LIBERTY NEWSPAPERS LIMITED PARTNERSHIP, publisher of the HONOLULU STAR-BULLETIN, that said newspapers are newspapers of general circulation in the state of Hawaii, and that the attached notice is a true notice as was published in the aforereferenced newspapers as follows:*

The Honolulu Advertiser: two *times, on*
May 13, 18, 1994

Honolulu Star-Bulletin: ..... *times, on* .....

Sunday edition of The Honolulu Advertiser: ..... *times, on* .....

and that affiant is not a party to or in any way interested in the above entitled matter.

Hiroko Nakamura

Subscribed and sworn to before me this 18th *day of* May *A.D. 19*94

Elsie A. Maruyama
Notary Public of the First Judicial Circuit, State of Hawaii
My commission expires March 7, 1996

IN THE MATTER OF

PUBLIC NOTICE
International Archaeological Research Institute, Inc. (IARII)

AFFIDAVIT OF PUBLICATION

PUBLIC NOTICE

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(Hon. Adv.: May 15, 1994) (A-27529)

STATE OF HAWAII
City and County of Honolulu } ss.

.....Hiroko...Nakamura..... , *being duly sworn, deposes and says that she is a clerk, duly authorized to execute this affidavit of the HAWAII NEWSPAPER AGENCY LIMITED PARTNERSHIP, a partnership of GANNETT PACIFIC CORPORATION, publisher of THE HONOLULU ADVERTISER, and LIBERTY NEWSPAPERS LIMITED PARTNERSHIP, publisher of the HONOLULU STAR-BULLETIN, that said newspapers are newspapers of general circulation in the state of Hawaii, and that the attached notice is a true notice as was published in the aforereferenced newspapers as follows:*

The Honolulu Advertiser:.....*times, on* .....

.....

.....

Honolulu Star-Bulletin:.....*times, on* .....

.....

.....

Sunday edition of The Honolulu Advertiser: one *times, on* .....

May 15, 1994

.....

and that affiant is not a party to or in any way interested in the above entitled matter.

Hiroko Nakamura

Subscribed and sworn to before me this 15th *day of* May *A.D. 19*94

Elsie A. Maruyama

Notary Public of the First Judicial Circuit, State of Hawaii
My commission expires March 7, 1996

REAL ESTATE FOR SALE

KALAHEO, BEAUTIFUL 2 ACRES, Rare Combo - Oceanview & stream, underground utilities, new subdivision. Best value around, don't wait/must sell, only $177,000 FS. CPR. terms. 828-1313.

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at 335-0075 for more information.

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