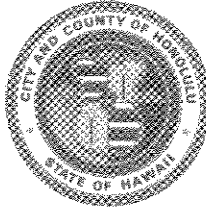


DEPARTMENT OF GENERAL PLANNING  
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET  
HONOLULU, HAWAII 96813

FRANK F. FASI  
MAYOR



RECEIVED BENJAMIN B. LEE  
CHIEF PLANNING OFFICER

ROLAND D. LIBBY, JR.  
DEPUTY CHIEF PLANNING OFFICER  
'91 JUL 17 10:54

OFC. OF ENVIRONMENTAL  
QUALITY CONTROL WM 6/91-2080

July 11, 1991

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

Dear Mr. Choy:

Acceptance Notice for the Proposed  
Waianae Kai Golf Course, Nanakuli, Oahu--Folder No. 91/W-5  
Final Environmental Impact Statement (Final EIS)

We are notifying you of our acceptance of the Final EIS for the proposed Waianae Kai Golf Course, as satisfactory fulfillment of the requirements of Chapter 343, Hawaii Revised Statutes.

Pursuant to Section 11-200-23 (e), Chapter 200, Title 11 ("Environmental Impact Statement Rules") of the Administrative Rules, this acceptance notice should be published in the July 23, 1991 OEQC Bulletin.

We have attached our Acceptance Report of the Final EIS for the Waianae Kai Golf Course. Should you have any questions, please contact Bill Medeiros at 527-6089.

Sincerely,

A handwritten signature in cursive script, appearing to read "Roland D. Libby, Jr.", written over a printed name and title.

ROLAND D. LIBBY, JR.  
Acting Chief Planning Officer

RDL:ft

Attachment

cc: Herbert K. Horita (Horita Investments, Inc.)  
Ron Watase (Horita Realty)  
David Hulse (PBR Hawaii)

1992 - Oahu - FEIS -  
Waianae Kai Golf

FILE COPY  
FILE COPY

WAIANAE KAI GOLF COURSE

WAIANAE, OAHU

---

Final Environmental Impact Statement

June 1991

# WAIANAË KAI GOLF COURSE

WAIANAË, OAHU

---

---

## Final Environmental Impact Statement

*Prepared for:*  
*Herbert K. Horita Investments*

*Prepared by:*  
*PBR HAWAII*

*June 1991*

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## Chapter I

## CHAPTER I

### INTRODUCTION AND SUMMARY

#### 1.0 PURPOSE OF THIS DOCUMENT

This Environmental Impact Statement (EIS) has been prepared in support of an amendment to the City and County of Honolulu Waianae Development Plan from the present "Agriculture" designation to "Parks and Recreation" or "Golf Course" in accordance with Ordinance 90-15, Chapter 21A, Revised Ordinances of Honolulu 1978, as amended. In addition, the proposed project will also require rezoning at a later date from the existing AG-2 General Agricultural district to P-2 Preservation, as appropriate.

Identified for planning and regulatory processing purposes as the Waianae Kai Golf Course, the project site is comprised of approximately 253 acres and located within the gently rolling slopes of Waianae Valley.

This EIS has also been prepared in compliance with the provisions of Hawaii Revised Statutes (HRS) Chapter 343 and Sections 11-200-14 through 11-200-18 of Title 11, Department of Health, Chapter 200, Environmental Impact Statement Rules and the rules and regulations adopted pursuant thereto. This EIS describes the proposed amendment, the existing environmental conditions of the proposed project site and surrounding area; the probable environmental impacts that might result from the proposed project; the proposed mitigation measures that would be employed to minimize potential adverse environmental impacts; the alternatives to the proposed project that have been investigated; and the relationship of the proposed project to existing land use policies and controls.

The information contained herein has been drawn from site visits, planning and engineering studies and plans prepared for the proposed project and generally available sources regarding the environmental characteristics of the project site and surrounding area.

#### 1.1 PROJECT DESCRIPTION

The subject property boundary is best illustrated on Figure 1, Tax Map Keys/Ownership. The project golf course master plan layout and conceptual configuration relative to property boundaries is depicted in Figures 1 and 6. While TMK 8-5-19:33 was not originally within the project boundary when first designed, it has since been acquired by the applicant and is included in this petition. It is anticipated the additional 2.8 acres of this parcel would be used for project related purposes such as storage, buffer, landscaping, or golf course green expansion. Due to the small area and for illustrative expedience, this parcel is shown only on Figure 1, but should be considered as part of the project area.

**PROJECT SITE**

MIKILUA FLUME EASEMENT  
(20 FEET WIDE)

TMK:8-5-03:31  
58.565 ac.  
HERBERT K. HORITA  
INVESTMENTS, INC.

TMK:8-5-03:43  
61.250 ac.  
MOUNTAIN VIEW DAIRY INC.

TMK:8-5-03:32  
83.816 ac.  
HERBERT K. HORITA  
INVESTMENTS, INC.

TMK:8-5-03:10  
0.057 ac.  
MAKAHA VALLEY, INC.

TMK:8-5-03:29  
18.907 ac.  
HERBERT K. HORITA  
INVESTMENTS, INC.

TMK:8-5-03:09  
0.057 ac.  
MAKAHA VALLEY, INC.

ALA LHEMA ROAD

ROAD

WAIANAE

VALLEY

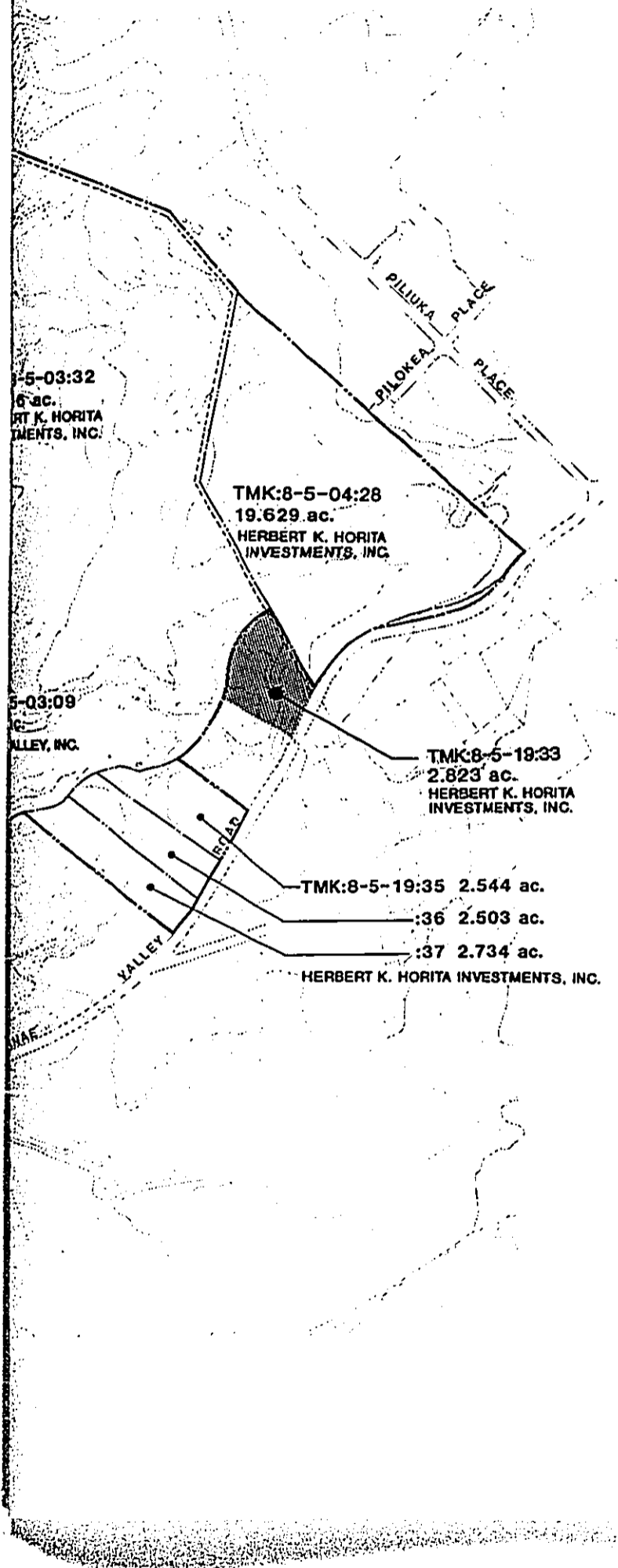
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FIGURE 1

WAIANAE KAI GOLF COURSE

WAIANAE, OAHU.

**TAX MAP KEYS/  
OWNERSHIP**



The property is presently vacant with the exception of the Mountain View Dairy which utilizes approximately 25 to 30 acres of the site for feed lots and milking operations.

***Landowners***

The property is owned in fee by several owners as indicated in Table 1 and shown on Figure 1, with Herbert K. Horita Investments, Inc. and the Mountain View Dairy owning the largest portions. A location map is provided as Figure 2.

**TABLE 1  
LAND OWNERSHIP**

<u>TAX MAP KEY</u>	<u>ACRES</u>	<u>OWNER</u>
8-5-03:09	.057	Makaha Valley, Inc.
8-5-03:10	.057	Makaha Valley, Inc.
8-5-03:29	18.907	Herbert K. Horita Investments, Inc.
8-5-03:31	58.565	Herbert K. Horita Investments, Inc.
8-5-03:32	83.816	Herbert K. Horita Investments, Inc.
8-5-03:43	61.250	Mountain View Dairy Inc.
8-5-04:28	19.629	Herbert K. Horita Investments, Inc.
8-5-19:35	2.544	Herbert K. Horita Investments, Inc.
8-5-19:36	2.503	Herbert K. Horita Investments, Inc.
8-5-19:33	2.823	Herbert K. Horita Investments, Inc.
8-5-19:37	<u>2.734</u>	Herbert K. Horita Investments, Inc.
Total:	252.885	

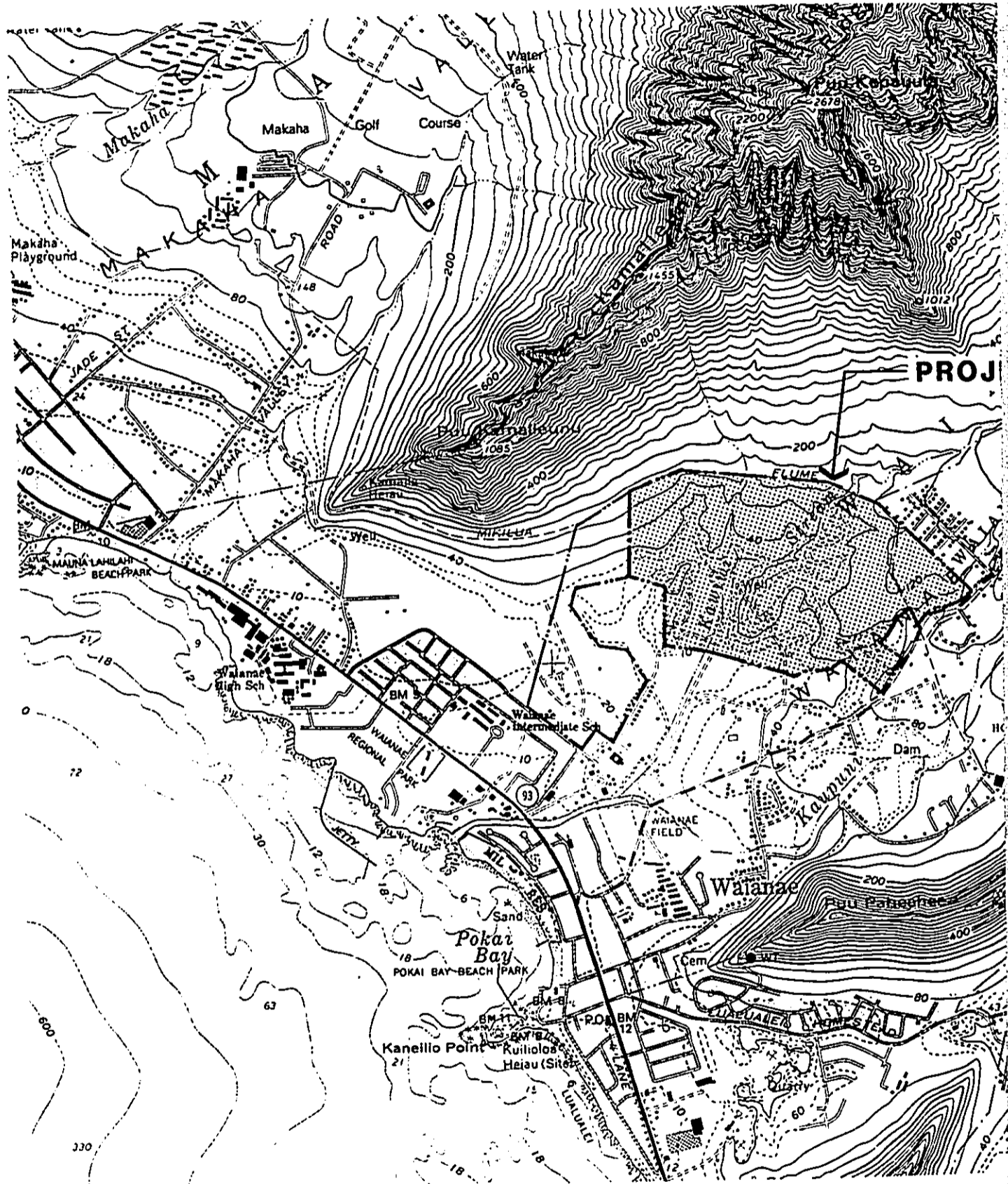
***Land Use***

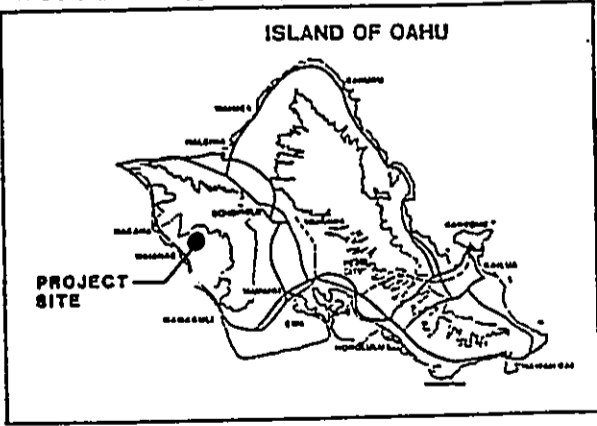
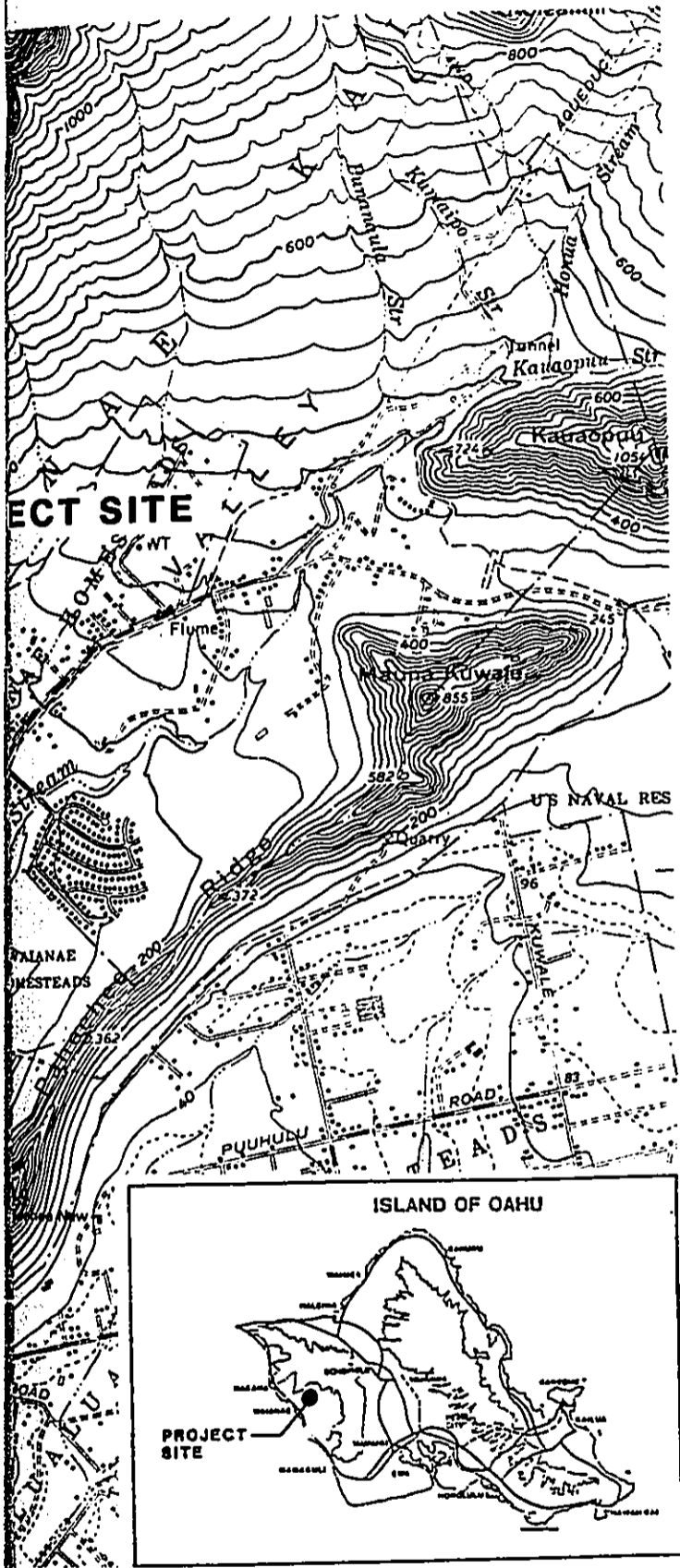
The Waianae Sugar Plantation, prior to the 1940's, controlled portions of the subject property and cultivated cane. Water was supplied by the Mikilua flume to the north of the property. When sugar became unprofitable, the land was returned to its vacant status and was acquired by Waianae Village Properties, Ltd. in 1950, with the exception of 19 acres (TMK: 8-5-04:28) which was owned by the F. Meyer Jr. Estate.

From the 1950's to the present, various parcels have been sold and leased as follows:

TMK: 8-5-03: 09,10 - Parcels were owned by Waianae Village Properties, Ltd. and sold to Waianae Valley Mutual Irrigation Co., Ltd. in 1950 as well sites, deeded to Waianae Development Co.Ltd. in 1969, and deeded to Makaha Valley, Inc. in 1988.

TMK: 8-5-03: 29 - Parcel owned by Waianae Village Properties, Ltd. and sold to Joseph Moon Wong in 1967. Herbert K. Horita Investments, Inc. purchased this property in December 1988.

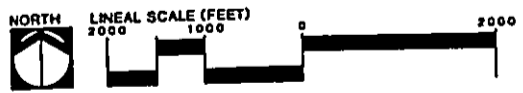




**FIGURE 2**  
**WAIANAE KAI GOLF COURSE**  
**WAIANAE, OAHU**

**LOCATION MAP**

SOURCE: U.S.G.S. QUAD, 1983





TMK: 8-5-03: 31 - Parcel owned by Waianae Village Properties, Ltd. and leased to Mountain View Dairy, Inc. in 1962. Antone Ruis Jr. purchased property during this time continuing to lease the land to the Dairy. E. E. Black purchased land in 1972, then sold to Queen Emma Redevelopment Corporation in 1980. 1981 property sold to Black Development Corporation, who subdivided the parcel into parcel 43 for the Mountain View Dairy which had been leasing since the 1950's. Herbert K. Horita Investments, Inc. purchased this parcel in April 1990.

TMK: 8-5-03: 32 - Parcel owned by Waianae Village Properties, Ltd. and sold to Timmy Au in 1950. In 1971 parcel sold to E. E. Black, Ltd. In 1980 the Queen Emma Redevelopment Corporation purchased the parcel and a year later resold to the Black Development Corporation. This property was purchased by Herbert K. Horita Investments, Inc. in April 1990.

TMK: 8-5-03: 43 - This parcel is recently (1987) created from parcel 31 and encompasses 61.250 acres sold to Mountain View Dairy Inc. in 1987 from Black Development Corporation.

TMK: 8-5-04: 28 - Parcel owned by F. Meyer Jr. Estate and was subdivided in 1962 to the smaller 19.698 acres deeded to Anther Meyer. In 1981 parcel sold to Li Tze Hi (Hawaii) Inc., and sold to Herbert K. Horita Investments, Inc. in 1988.

TMK: 8-5-19: 35,36,37 - Parcels owned by Waianae Village Properties, Ltd. and sold to Timmy Au in the early part of 1950. In 1971 the parcels were sold to E. E. Black, Ltd., then in 1980 to Queen Emma Redevelopment Corporation, and then to Black Development Corporation in 1981. These parcels were purchased by Herbert K. Horita Investments in April 1990.

TMK: 8-5-19: 33 - This parcel, owned by Lawrence Gonsales and Catherine Gonzales Haws, was purchased by Herbert K. Horita Investments, Inc. in March 1990.

Both State and County land use designations have remained as Agriculture since their inception in the early 1960's. The existing Mountain View dairy farm operation first existed in 1950 operated by Antone Ruis. The business changed operators ten years later in 1960, when the Wong family took over. Since then, the Wong's have leased lands from the Black Development Corporation until 1987 when the Wong's purchased TMK: 8-5-03: 43.

## 1.2 NEED FOR THE PROJECT

The "Public Need" for golf on Oahu can be evaluated from two perspectives. The first and most obvious demand for golf is derived from the recreational opportunities golf affords. A secondary or indirect impact, involves the need for expansion of economic benefits that would result from the creation of new jobs. It has been estimated that a 180 acre golf course will create between 29 and 82 jobs (Hawaii Golf Courses: Impacts and Benefit Assessment, Table 3, Decision Analysts Hawaii, Inc., February 1990).

According to the Hawaii Real Estate Research and Education Center, College of Business Administration, University of Hawaii, 3.38 new golf courses must be developed by the year 2000

to meet the local demand for golf by the year 2000 for the age group between 5 and 60. Senior citizen demand will add another demand for 3.43 golf courses during the same period. These combined figures total a demand or need for approximately 7 new golf courses by the year 2000. Current pent-up demand for new golf courses as described in the same study is estimated to result in a current shortfall of 25 golf courses.

### *Intended Market*

The proposed golf course, privately owned and operated with memberships, will be available for public play. Such an operation is expected to service 400 to 600 people daily. The proposed design is configured so that players can participate in one, two or all three nine-hole courses, thus allowing a variety of time spans one can spend on the course. Green fees will be comparable to other privately owned courses available for public play. Membership and fee structure are undetermined at this time.

Golf course hours of operation are anticipated to be between 7:00 am and 7:00 pm, typical of similar golf course operations. The operational use of the driving range may extend into the early evening hours if such demand is indicated. The clubhouse facility will be open to the public for golf related activities such as the pro shop, food and beverage service and other accessory uses. The accessory uses would be designed and scaled to meet only the requirements of the members, guests, or users of the facility. The proposed master plan for the Waianae Golf Course is shown in Figure 3.

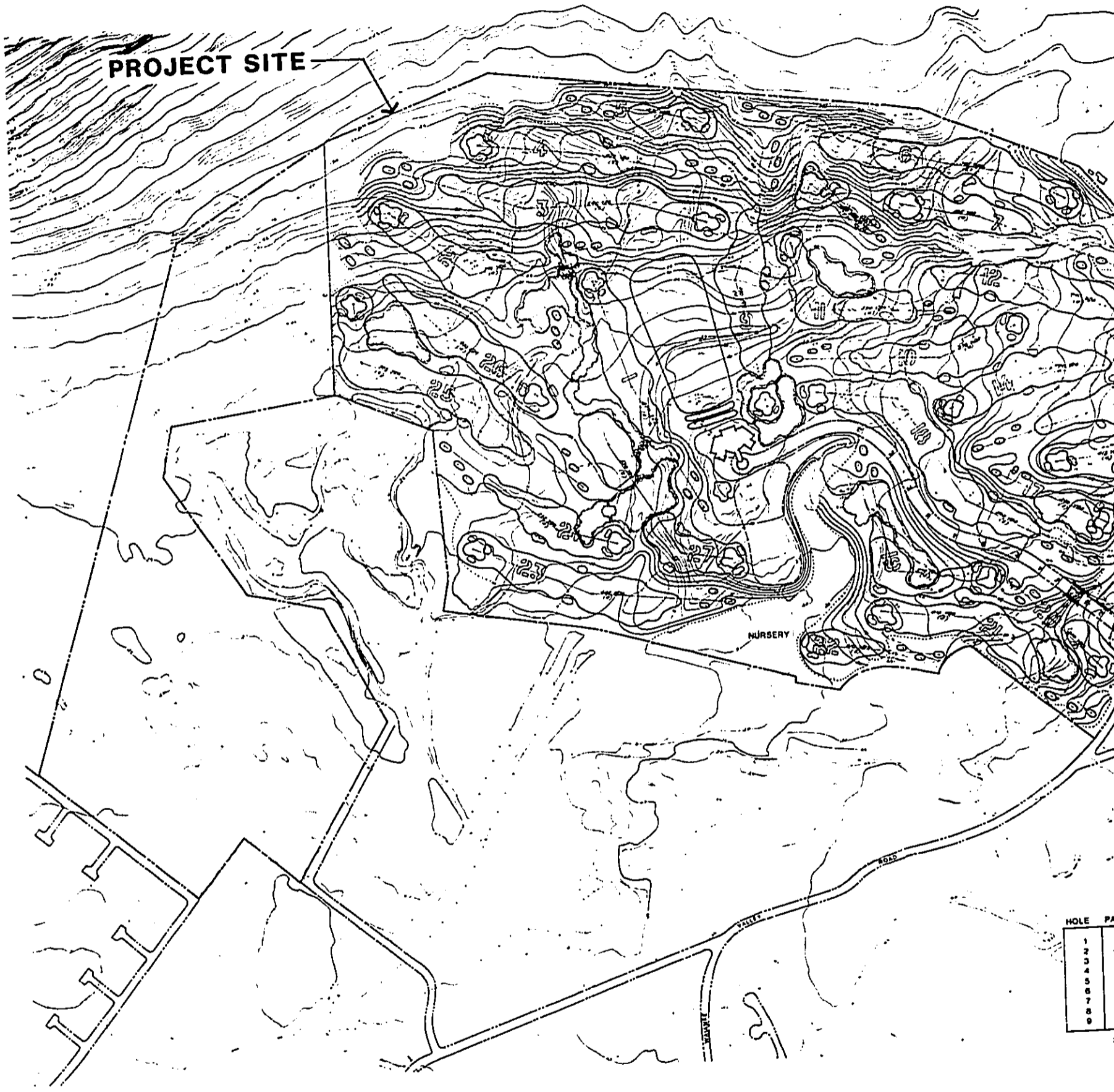
### **1.3 SUMMARY OF ENVIRONMENTAL IMPACTS**

In general, the proposed golf course is expected to have beneficial and/or minimal impacts on the physical, natural and socioeconomic environments of the project area. The summary of impacts listed below is based on published information concerning the study area; special studies conducted for the proposed project; and projections of the types of activities that would be associated with the proposed project.

Golf course design will employ conscious efforts to mitigate any potential conflicts (such as noise and/or stray golf balls) which may impact agricultural and residential activities. The fairways are aligned to minimize the opportunity for golf balls to be driven into property of other adjacent land owners. Earth berm landscaping and a perimeter fence will act as a physical barrier and a security measure, further reducing potential conflicts. Additionally, greens, fairways and tees are located a minimum of 25 to 30 feet from the property lines.

Short-term impacts will result in the initial construction phase which will require on-site grading, trenching, and movement of vehicles within the project site. This activities will generate localized noise and dust during construction periods. Mitigation measures to minimize adverse air quality would include frequent watering of unpaved roads and construction areas, and planting of ground cover and other vegetation as soon as possible after construction. Construction activities would be limited to daytime hours and comply with all applicable noise control

PROJECT SITE



HOLE	PA
1	
2	
3	
4	
5	
6	
7	
8	
9	

FIGURE 3

WAIANAE KAI GOLF COURSE

WAIANAE, OAHU

**PROPOSED MASTER PLAN**



HOLE	PAR	YARDS	HOLE	PAR	YARDS	HOLE	PAR	YARDS
1	4	420	10	4	370	19	4	370
2	4	390	11	4	350	20	3	200
3	5	540	12	4	440	21	4	410
4	4	425	13	3	190	22	3	210
5	3	215	14	4	390	23	4	440
6	5	545	15	5	520	24	4	335
7	4	385	16	4	415	25	5	525
8	3	150	17	3	200	26	4	400
9	4	450	18	5	560	27	5	530
36 3520			36 3435			36 3420		



regulations of the City.

Long-term impacts from the operation of a golf course are expected to produce minimal impacts, if any, to the adjacent property owners. Dust levels would be less than present conditions due to extensive landscaping encompassing the course layout. Golf course operation and maintenance are expected to be performed during daylight hours and equipment used would meet appropriate federal and state noise and air quality control regulations. The proposed access road will create increased noise generated from traffic utilizing the clubhouse access road.

Traffic noise levels would conform to the above mentioned noise regulations. The visual character of the property will be improved from its open space, scrub vegetation and barren appearance to an aesthetically landscaped, maintained site. It appears that abutting property owners will not be significantly affected by the proposed golf course and that the underlying zoning uses allowed on adjoining properties will be unaffected.

#### **1.4 PHYSICAL ENVIRONMENT**

##### **1.4.1 Physiography and Geology**

The proposed alterations to the existing physiography and geology will be limited primarily to grading and minor topographical improvements associated with golf greens, tees, and fairways. As such, these changes will be relatively insignificant compared to the existing overall geologic character of the site and region.

##### **1.4.2 Soils and Agricultural Potential**

Approximately 3 percent of the subject property is classified as "B" by the Land Study Bureau (LSB) and as "Prime" by the Agricultural Lands of Importance to the State of Hawaii (ALISH) system. Consequently, the conceptual site plan identifies the use of this area as a nursery for the production of foliage. The remainder of the site, identified as either "E" by the LSB or "Unclassified" by ALISH, is planned for golf course development. These lands have very little or no potential for soil based agricultural land uses.

##### **1.4.3 Hydrology and Drainage**

An extensive system of storm drainage improvements was established in 1972 by the U.S.D.A. Soil Conservation Service. These improvements include the Kaupuni and Kawiwi Stream channels that extend from the subject property to the Pacific Ocean. All proposed improvements for the Waianae Kai Golf Course will include grassed swales and ponding basins for desilting storm runoff.

##### **1.4.4 Natural Hazards**

No known natural hazards presently exist on the subject property. The Flood Insurance Rate

Maps designate the entire property as Zone D "Areas of undetermined, but possible flood hazards." Drainage structures have been designed and sized in accordance with this designation. No structures will be developed within any flood zone or surface drainageway.

The club house and infrastructure will be constructed for protection from earthquakes in accordance with the 1988 Uniform Building Codes adopted by the County.

#### **1.4.5 Climate and Meteorology**

The proposed project is not expected to have any impact on the micro climate of the project area or region. Planned structures would not be tall enough to significantly effect existing wind patterns; and new landscaping associated with the golf course will not significantly effect temperature, although some localized cooling can be expected to result from the establishment of golf course landscaping.

#### **1.4.6 Air Quality**

In the short term, air quality may be impacted by construction activities and emissions from construction equipment. Increased vehicular activity, and electrical generation off-site will generate air quality impacts over the long term. No significant adverse impacts are anticipated. The air quality may be improved by establishment of a well managed, formalized landscape which will assist in fugitive dust control.

Mitigation measures available to minimize air quality impacts include dust control measures (frequent watering) and rapid establishment of plant materials. Increased vehicular traffic will not violate state or federal air quality standards based on the moderate level of existing traffic volumes in the project region.

#### **1.4.7 Noise Quality**

Presently, noise quality of the project site is dominated by noise associated with existing dairy operations. These include sounds generated from truck and tractor operation, the presence of farm animals in the area, and natural factors including wind moving through the vegetation on the site.

Potential impacts on the noise quality of the site are primarily limited to those generated by the increased volume of traffic, construction activity noise, and noise associated with golf course operation and maintenance activities. However, golf course operation and maintenance activities are expected to be performed during daylight hours and equipment used would meet appropriate Federal and State noise control regulations. Overall noise levels should not exceed those currently associated with the existing dairy operation.

#### **1.4.8 Visual Attributes**

No specific or predominate natural feature is visually associated with the project site. However, the vacant and under-utilized nature of the subject parcels has established a generally negative visual image of scrub vegetation, some scattered refuse, and other visual features associated with the dairy operation.

Development of the proposed golf course will alter the present condition to a more formalized landscape visually comprised of large green open space areas. As such, the visual attributes of the subject property will generally improve with project development.

#### **1.4.9 Natural Environment**

No endangered plant or animal species are known to exist in the subject property. In addition, no wetlands, streams, estuaries or other specific habitats that could accommodate endangered plant and animal species are present on the subject property. However, upon project development, planned water features, drainage retention basins, and establishment of a more numerous plant materials, will expand the diversity of potential habitats relative to the current dairy operation and remaining vacant condition of the subject property.

#### **1.4.10 Historical and Archaeological Resources**

An archaeological survey which included surface and subsurface testing, identified 34 sites. Of these, 26 are of recent age related to sugar cane cultivation and a 1950's dairy operation. The remaining 8 sites were initially considered to be significant solely for their information content and have been recorded in detail. Only one remain site (T-24) has some prehistoric remains and is recommended for further data recovery prior to land clearing and grading for the golf course development.

A qualified archaeologist will selectively monitor initial grubbing activity and/or vegetation clearing within the project area.

#### **1.4.11 Socioeconomic Environment**

To mitigate potential socioeconomic impacts associated with golf course development, the City and County of Honolulu has required that a community benefit fee or project impact fee be charged against golf course development. As such, all applicable fees will be paid in accordance with City and County of Honolulu requirements. As part of proposed socio-economic mitigation measures, existing land uses will be relocated, golf tee times and meeting rooms for community groups will be made available.

Population within the Waianae region will not be affected by development of the proposed project. A majority of the site is vacant and not used or designated for residential land uses by either the Development Plan or Land Use Ordinance.

As for the character or culture of the neighborhood, the proposed golf course will ensure a rural

atmosphere, generate employment, demand minimal existing public services and infrastructure, and add a needed recreational facility to the community. In addition, the economic base of the region would expand, employment opportunities will be enhanced, and government revenues would be generated.

The availability of new affordable housing will not be impacted by this project, although the value of residences in the project region may increase. The affordability of existing housing will be primarily impacted by many factors that influence the price of market housing. However, if the proposed golf course development is restricted by regulatory methods, the land value of other potential golf course sites on Oahu can be expected to increase since the economic demand for golf would not be met. Consequently, the value of all land could indirectly escalate thereby making it more difficult to provide housing that is affordable.

#### **1.4.12 Infrastructure**

All necessary water, sewer, electrical, communications and transportation improvements necessary to accommodate the needs of the proposed project will be provided by the project developers. Drainage will be accommodated by existing facilities, through new drainage improvements, and on-site retention areas. No significant off-site infrastructure improvements will be required.

Potable water will be used only for the clubhouse; non-potable water used to irrigate the tees, fairways and greens. Waste water will be disposed of via cesspools or septic systems in accordance with Department of Health regulations.

The only transportation related improvement which may be required would be the modification of the traffic signal timing at the Farrington Highway/Waianac Valley road intersection.

#### **1.4.13 Public Facilities**

Public facilities will be provided from existing police, fire and health services which can currently accommodate the needs of the proposed golf course. On-site private security will be provided by the developer as necessary to augment public police services. Fire protection capabilities will also be enhanced by the improved water distribution system required for the proposed golf course.

In addition, the developer will work with the area schools to provide access for golf teams or physical education classes.

#### **1.4.14 Recreational Facilities**

The developer will provide land for public park use as determined appropriate by officially adopted City policy. However, the development of the proposed golf course will inherently expand the potential for recreation within the Waianae region. The developer will continue to work with community groups and others to make the recreational opportunities of the project



available to the maximum number of residents.

## 1.5 SUMMARY OF PROPOSED MITIGATION MEASURES

As indicated above, few potential adverse impacts to the area are expected to result from the proposed project. Mitigation measures to minimize potential adverse environmental impacts of the proposed project include the following:

### *Short term:*

- o Frequent watering during construction activities to maintain dust control.
- o Grassing of swales and sodding as soon as practicable once grading has been completed.
- o Wind screening as appropriate to limit fugitive dust.

### *Long term:*

- o Provision of a \$25 million community benefits package.
- o Landscaping to maintain long-term air quality.
- o Use of appropriate engineering, design and construction measures to ensure adequate drainage and irrigation of the site.
- o Use of appropriate landscaping to increase the potential habitat diversity for fauna and to increase the visual attractiveness of the area.
- o Maintenance of open space and enhancement of land management practices to improve the current vacant condition.
- o Relocation of existing dairy feedlot, which is proximate to adjoining residential land uses.
- o Transportation improvements to mitigate traffic generated by the project.
- o Adoption of an integrated golf course management program for sound management practices with regard to fertilizer and pesticide application.

## 1.6 SUMMARY OF ALTERNATIVES

The project alternatives evaluated include a wide range of densities, facilities and amenities, in addition to differing environmental, social and economic impacts. While other configurations, combination of facilities, layouts and amenities are possible, the alternatives analyzed cover the spectrum of feasible alternative that meet project objectives.

Alternative 1: The Proposed Action

The 27-hole golf course proposed for the site is consistent with existing State land use entitlements. The development of the course would add to existing recreational facilities in the Waianae area in addition to providing a positive economic impact in the region and to Oahu. This alternative also offers a connected community benefits package, devised to mitigate any potential adverse impacts while providing direct economic contribution to the community.

This alternative has been judged as the preferred alternative due to: 1} an appropriate mix of grades and soils for golf course layout and amenities; 2} expected high quality visitor and resident experience resulting from the development of the project; 3} preservation and improvement of existing open space; and 4{ expected positive fiscal and expenditure impacts.

Alternative 2: No Action

This alternative would maintain the site as unimproved open space. No County amendments would be required. The overall environmental impacts to the area would be minimized, but the natural attributes of the area would continue to be under utilized. The ability to improve the recreational possibilities of the site for residents of the area and visitors, as well as to enhance and manage the open space character of the area, would be lost with this alternative.

Alternative 3: Golf/Residential Community

Under this alternative a residential component would be introduced to the golf course. As a result, the golf course would become more confined and the open space character of the site would be diminished. This alternative would lead to greater impacts on existing infrastructures. Since the site is only about 250 acres, feasible residential use would be limited to market level homes with golf course frontage. In addition, State Land Use and County General Plan amendments for urbanization would be required to implement this alternative.

Alternative 4: Intensified Agricultural Use

While limited agricultural use exists on the site (the dairy), environmental factors of the site tend to work against the agricultural potential of the site. Temperature and rainfall characteristics, as well as poor soil conditions require measures to be taken to protect livestock or shade crops such as floral or nursery products. Another factor affecting the use of the project site for more intensified agricultural use is the cost of constructing an irrigation system and the high cost (and general lack) of small, long term agricultural leases. Because of these considerations, alternative or intensified agricultural activity on the subject property would not be competitive with other existing agricultural operations in the area or in other areas of Oahu or the State.

### **1.7 SUMMARY OF UNRESOLVED ISSUES**

A major unresolved issue is the proposed comprehensive golf course policy for the City and County of Honolulu. Bill 129 has been introduced to Council which would establish criteria for golf course development. During the formation of this EIS, attention has been paid to the general content of Bill 129 and effort has been made to address the general social and environmental concerns expressed therein.

The suitability of allocation and contents of the proposed community benefits package has not yet been acceded to by the County government and is thus an unresolved issue, however this issue may be addressed at during the County zoning review process.

### **1.8 SUMMARY OF LAND USE POLICIES AND CONTROLS COMPATIBILITY**

The proposed project is generally consistent with the applicable Hawaii State Plan and various functional plans, and with portions of the County General Plan and the Waianae Development Plan. While the City and County Council's action in regard to Bill 129 may affect the compatibility of the project with land use policies and controls, re-designation of the site from Ag-2 to P-2 is necessary to comply with the County General Plan.

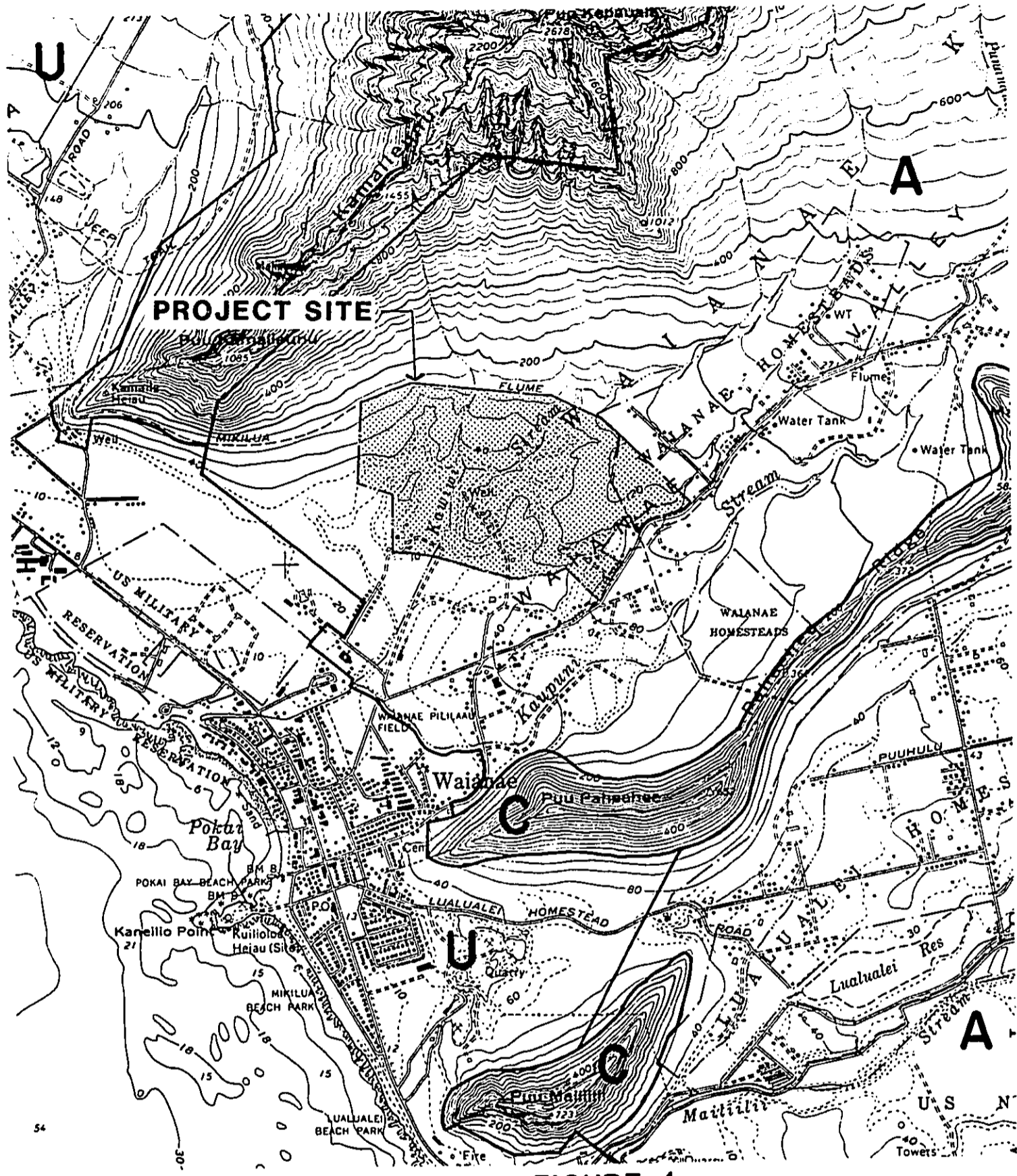
### **1.9 NECESSARY APPROVALS AND PERMITS**

The entire site is currently designated by the State Land Use Commission as "Agriculture". Please refer to Figure 4. The Waianae Development Plan Land Use Map has also designated the entire subject property as "Agriculture". The Waianae Development Plan Public Facilities Map does not designate any proposed public facilities for the subject property. No State Land Use change will necessary.

#### ***Zoning***

The subject property as illustrated on Figure 5, has been designated by the City and County of Honolulu Land Use Ordinance as General Agriculture (Ag-2). A zoning amendment is planned that would reclassify the subject golf course area to P-2 Preservation.

The following is an approximate list of major approvals and permits required for the implementation of the proposed project. Additional approvals and permits may be necessary. The developer will seek all necessary approvals and permits for the development of the project.



**PROJECT SITE**

**FIGURE 4**  
**STATE LAND USE**  
**WAIANAE KAI GOLF COURSE**  
**WAIANAE, OAHU**

**LEGEND**

- U URBAN
- A AGRICULTURE
- C CONSERVATION

SOURCE: STATE LAND USE COMMISSION  
 SHEET: O-2

NORTH

LINEAL SCALE (FEET)  
 2000 1000 0 2000

**PBR**  
 HAWAII

In the implementation stages of the project, the developer will be working with the City and County of Honolulu review agencies for examination and approval of project plans and specifications, as well as for issuance of required permits as called for in Chapter 15-73A, Hawaii Administrative Rules.

<u>Permit or Approval</u>	<u>Authority</u>
Accepted Environmental Impact Statement (Pending)	City and County of Honolulu
Drilling permit for wells (Complete)	State Department of Water and Land Development
Wastewater Permit (To be submitted)	State Department of Health
County Zoning Amendment (Estimated Amendment Completion - Fall or Winter 1992)	City and County of Honolulu
Development Plan Amendment (Estimated Amendment Completion - December 1991)	City and County of Honolulu
Building/Grading permit (Spring - 1993)	City and County of Honolulu, Department of Public Works

## Chapter II

## CHAPTER II

### **2.0 DESCRIPTION OF THE PROPOSED PROJECT**

The proposed project entails the development of a 27-hole golf course on approximately 250 acres at Waianae, Oahu. All on-site improvements will be funded by the developer. Off-site improvements that may be required as a result of project development will also be funded by the developer. No use of public funds or lands will be required.

### **2.1 REGIONAL SETTING**

The Waianae community and the immediate neighborhood surrounding the site is characteristically of a "rural" atmosphere, with abundant open space and view planes of natural features.

Adjoining property ownership is comprised various different individuals or organizations. Wahiona Acres, a County zoned residential area, is located to the northeast. Immediately to the north is the State of Hawaii - Waianae Agricultural Park. To the northwest are large vacant parcels owned by the State of Hawaii and World Union Industrial Corp., Ltd. To the west, the City and County of Honolulu owns the Waianae Land Fill site. To the south, five individual owners are involved in crop farming front the edge of the property. Four residential parcels are located to the southeast.

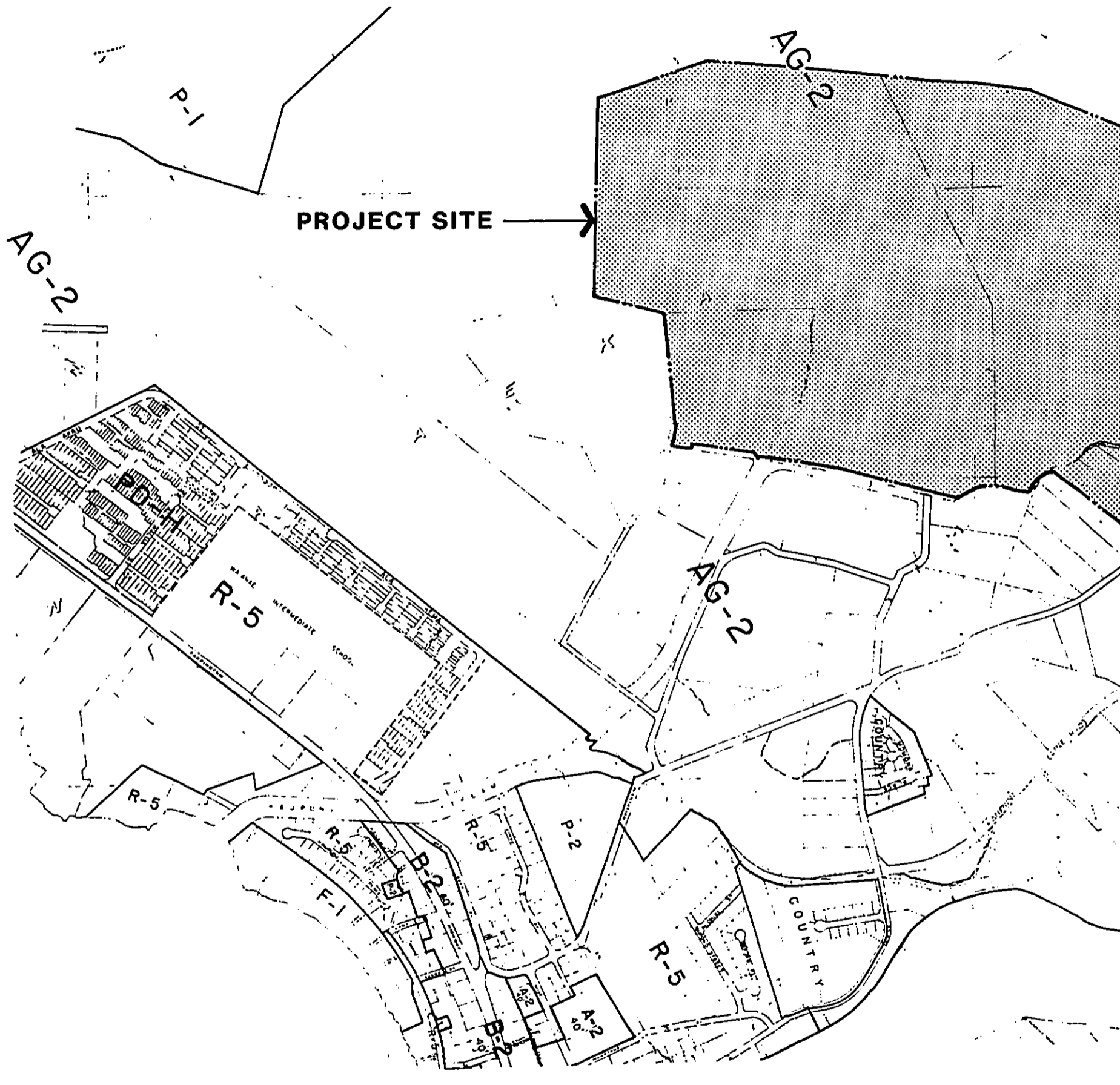
### **2.2 DESCRIPTION OF THE PROPERTY**

The proposed golf course master plan encompasses the use of approximately ±246 acres of land situated about one mile northeast of Waianae town between Puu Paheehee and Puu Kamaileunu. The project site is accessed via Waianae Valley Road from Farrington Highway and the H-I Freeway located approximately nine miles south of the site. (See Figure 2.)

The Tax Map Keys and ownership of the subject parcels are listed under Table 1. County zoning is shown in Figure 5.

Currently, dairy operations encompass approximately 25 to 30 acres of the subject property including nine feed lots, feed storage, settling ponds, milking facility, one family and six employee houses. The operation contains a total of 1,400 head of cattle of which 900 are milked three times daily. All feed is imported in the form of grain/silage and/or hay. Average daily milk production is estimated at 6,800 gallons which is transported to a Honolulu milk processor. The operation employs approximately 30 full-time employees. Surrounding uses and existing conditions are shown in Figure 6.

The remaining balance of approximately 220 acres is vacant.



PROJECT SITE

AG-2

AG-2

P-1

R-5

AG-2

R-5

R-5

R-5

P-2

R-5

B-2

B-2.65

F-1

A-2

COUNTRY CENTER

N

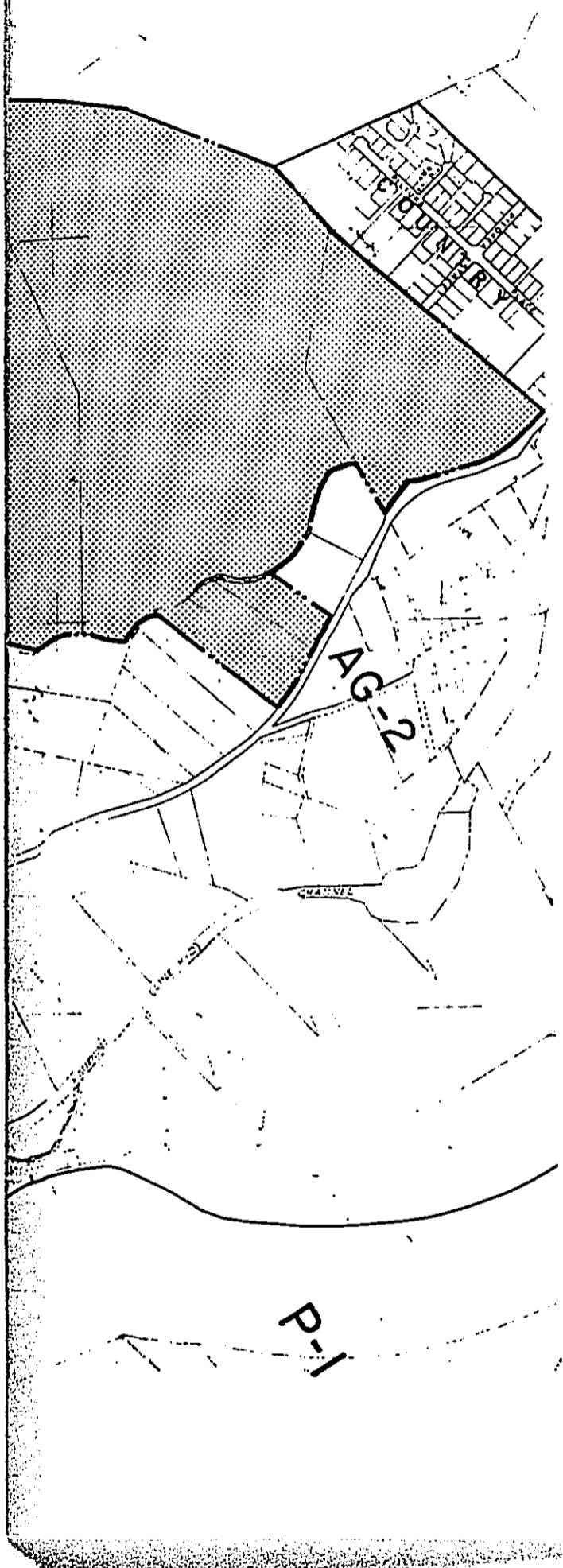


FIGURE 5

# WAIANAE KAI GOLF COURSE

WAIANAE, OAHU

## COUNTY ZONING



### LEGEND

<b>PRESERVATION ZONES</b>	<b>BUSINESS ZONES</b>
P-1 RESTRICTED	B-1 NEIGHBORHOOD BUSINESS
P-2 GENERAL	B-2 COMMUNITY BUSINESS
F-1 MILITARY AND FEDERAL	
<b>RESIDENTIAL ZONES</b>	<b>BUSINESS MIXED USE ZONES</b>
R-20 RESIDENTIAL	BMX-3 COMMUNITY
R-10 RESIDENTIAL	BMX-4 CENTRAL
R-7.5 RESIDENTIAL	
R-5 RESIDENTIAL	<b>INDUSTRIAL ZONES</b>
R-3.5 RESIDENTIAL	I-1 LIMITED
	I-2 GENERAL
	I-3 WATERFRONT
<b>APARTMENT ZONES</b>	<b>INDUSTRIAL MIXED USE ZONE</b>
A-1 APARTMENT	MX-1 INDUSTRIAL MIXED USE
A-2 APARTMENT	
A-3 APARTMENT	<b>AGRICULTURAL ZONES</b>
	AG-1 RESTRICTED
<b>APARTMENT MIXED USE ZONES</b>	AG-2 GENERAL
AMX-1 LOW DENSITY	
AMX-2 MEDIUM DENSITY	<b>COUNTRY ZONE</b>
AMX-3 HIGH DENSITY	C COUNTRY
<b>RESORT ZONE</b>	<b>PLANNED DEVELOPMENT ZONE</b>
RESORT	PD-H PLANNED DEVELOPMENT HOUSING

ORD. NO. 86-117 DATE: 10-22-86

SOURCE: DEPARTMENT OF LAND UTILIZATION  
CITY & COUNTY OF HONOLULU



VACANT  
STATE OF HAWAII

# PROJECT SITE

WAIANAE AGRICULTURAL PARK  
STATE OF HAWAII

MIKILUA FLUME EASEMENT  
(20 FEET WIDE)

8-5-03:31

8-5-03:32

8-5-03:43

FEED LOTS

FEED LOTS

FEED LOTS

LAND FILL  
CITY & COUNTY  
OF HONOLULU

MILKING  
FACILITY

8-5-03:10  
WELL

RESIDENCES

8-5-03:29

RESIDENCES

8-5-03:09  
WELL

VACANT  
WORLD UNION  
INDUSTRIAL CORP. LTD.

CROP  
FARMING

8-5-19:  
35

8-5-19:  
36

8-5-19:  
37

CROP FARMING

CROP  
FARMING

ALFA HEMA ROAD

KAWIWI  
CHANNEL

ROAD

WAIANAE  
VALLEY

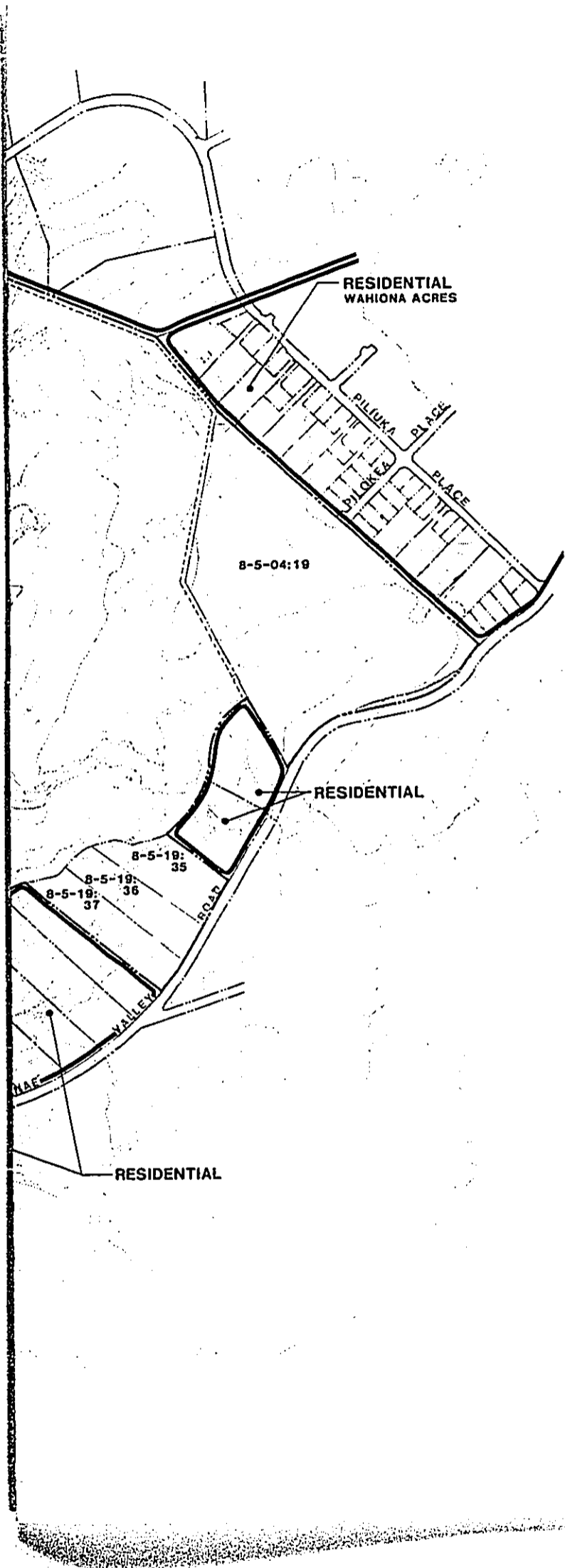
RESIDENTIAL

ROAD

FIGURE 6

**WAIANA KAI GOLF COURSE**  
WAIANA, OAHU

**EXISTING CONDITIONS AND  
SURROUNDING USES**



### **2.3 DESCRIPTION OF THE PROPOSED ACTION**

The proposed action (project) involves the development of a 27-hole golf course, encompassing approximately ±246 acres of a ±252 acre site. Planned accessory uses include a clubhouse, 20 tee stall driving range, parking and a maintenance facility.

The proposed layout consists of three nine-hole courses each averaging par 36 and 3,458 yards. The course layout is designed to create challenging shots over water ponds from varying elevations. Extensive landscaping will provide buffering between the golf course and adjacent properties, while creating a unique aesthetic character both within and outside the project area.

Access into the golf course will be accommodated by a private right-of-way extending approximately 2,350 feet from the Waianae Valley Road and terminating at the clubhouse. As shown on Figure 3, this right-of-way will establish the only ingress-egress for the project.

The clubhouse is situated centrally to the site and is expected to range in size from 20,000 to 30,000 square feet. Features within the clubhouse include men's and women's locker rooms, a pro shop, club storage, a kitchen, snack bar and dining/lounge area. Parking adjacent to the clubhouse is expected to accommodate 266 to 294 cars, based upon a daily service of 400 to 600 people. All parking facilities will be designed in accordance with applicable regulations of the Land Use Ordinance (LUO).

In addition to the proposed golf course, a small parcel will be established for productive agricultural uses (encompassing ± 6 acres) to be utilized for foliage production.

### **2.4 NEED FOR THE PROPOSED PROJECT: MARKET ASSESSMENT**

Development of the proposed project is supported by the ongoing recreational demand for golf courses on Oahu. The demand for golf on Oahu can be evaluated from two perspectives. The first and most obvious demand for golf is derived from the recreational opportunities golf affords. A secondary or indirect impact, involves the need for expansion of economic benefits that would result from the creation of new jobs. It has been estimated that a 180 acre golf course will create between 29 and 82 jobs (Hawaii Golf Courses: Impacts and Benefit Assessment, Table 3, Decision Analysts Hawaii, Inc., February 1990).

According to the Hawaii Real Estate Research and Education Center, College of Business Administration, University of Hawaii, 3.38 new golf courses must be developed by the year 2000 to meet the local demand for golf by the year 2000 for the age group between 5 and 60. Senior citizen demand will add another demand for 3.43 golf courses during the same period. These combined figures total a demand or need for approximately 7 new golf courses by the year 2000. Current pent-up demand for new golf courses as described in the same study is estimated to result in a current shortfall of 25 golf courses.

### ***Intended Market***

The proposed golf course, privately owned and operated with memberships, will be available for public play. Such an operation is expected to service 400 to 600 people daily. The proposed design is configured so that players can participate in one, two or all three nine-hole courses, thus allowing a variety of time spans one can spend on the course. Green fees will be comparable to other privately owned courses available for public play. The community benefit package proposed by the developer includes provision for public play a minimum of 3.5 days per week, or a minimum of 50 percent of the available tee time per week of an 18-hole golf course. Of the public play time, one day shall be provided on a weekend. Membership and fee structure are undetermined at this time.

### **2.5 PROJECT SCHEDULE**

Construction of the proposed golf course will begin within one year after the applicable zoning, PRU, and grading permits are issued. Based on the timing involved for the proposed Development Plan review, zoning, PRU, and grading permit processing, construction is anticipated to begin in the fall of 1992 or early 1993. Construction should require no more than 6 to 12 months after initial site work commences.

### **2.6 ESTIMATED PROJECT COSTS**

Based on an estimated construction cost of approximately \$650,000 per golf hole, the total grading, irrigation, and landscaping cost should range between \$17,000,000 and \$20,000,000. Accessory uses such as the clubhouse, maintenance facilities, roadways, and other miscellaneous expenses could double this amount to total approximately \$40,000,000 to \$50,000,000.

## Chapter III

## CHAPTER III

### **3.0 ALTERNATIVES TO THE PROPOSED PROJECT**

#### **3.1 INTRODUCTION**

In compliance with the provisions of Title 11, Department of Health, Chapter 200, Environmental Impact Statement Rules, Section 11-200-17(f), the "known feasible" alternatives to the proposed project are limited to those that would allow the objective of the project to be met, while minimizing potential adverse environmental impacts. An exploration of the environmental impact of all reasonable alternative actions, particularly those that might enhance environmental quality or avoid or reduce some or all of any identified adverse environmental impacts, costs and risks, is included in order not to prematurely foreclose options which might enhance environmental quality or have less detrimental effects.

The proposed golf course is necessary to meet the pent-up and growing demand for golf courses in the State of Hawaii, and in the national and international markets. The recreational opportunities for residents and visitors, as well as the environmental setting, would be enhanced by the proposed golf course development. The open space provided by the golf course also satisfies a functional need by providing a buffer between agricultural operations and existing residential areas.

In conformance with applicable regulations, other possible alternatives to the proposed project have been investigated and rejected for the reasons discussed in this chapter. In addition to the proposed project (the preferred alternative), the alternatives of no-action, alternative sizes and configurations of project elements, and alternative uses of the site were evaluated. These alternatives have been rejected because they do not meet the objectives of the proposed project; some alternatives would have greater environmental impacts than the proposed project; or because they are not entirely feasible.

#### **3.2 ALTERNATIVE USES OF THE SUBJECT PROPERTY**

In addition to the alternative agricultural crops described previously, various land use alternatives have been considered. The range of feasible alternatives considered is limited to those that would provide the same type of service that the proposed action would, while providing that service for about the same cost with similar efficiencies.

The alternatives investigated have included alternative golf course layouts, various combinations of single and multi-family units, combinations of golf course layouts and residential units, alternative agricultural uses of the property and the alternative of "no-action".

### **3.2.1 THE PREFERRED ALTERNATIVE**

Although the final layout and configuration of the proposed project needs to be refined through actual golf course construction drawings, the proposed layout is considered to be "best" from land use, infrastructure, traffic, and return on investment perspectives. In addition, the proposed layout preserves view planes and provides adequate open spaces.

The 27-hole golf course proposed for the site is consistent with existing State land use entitlements. The development of the course would add to existing recreational facilities in the Waianae area in addition to providing a positive economic impact in the region and to Oahu. This alternative also offers a connected community benefits package, devised to mitigate any potential adverse impacts while providing direct economic contribution to the community.

This alternative has been judged as the preferred alternative due to: 1) an appropriate mix of grades and soils for golf course layout and amenities; 2) expected high quality visitor and resident experience resulting from the development of the project; 3) preservation and improvement of existing open space; and 4) expected positive fiscal and expenditure impacts for both the community and the County.

### **3.2.2 "NO-ACTION ALTERNATIVE"**

The "no-action" alternative would not be consistent with stated governmental policies of establishing open space and facilities for leisure in the Waianae coast area; would not accomplish the stated objectives of the proposed project; and/or provide the economic gains to the residents of the area or the State and City and County that the proposed project would provide.

This alternative would maintain the site as unimproved open space. No County amendments would be required. The overall environmental impacts to the area would be minimized, but the natural attributes of the area would continue to be under utilized. The ability to improve the recreational possibilities of the site for residents of the area and visitors, as well as to enhance and manage the open space character of the area, would be lost with this alternative.

### **3.2.3 RESIDENTIAL LAND USE**

Under this alternative a residential component would be introduced to the golf course. As a result, the golf course would become more confined and the open space character of the site would be diminished. This alternative would lead to greater impacts on existing infrastructure, including increased use of potable water, intensified generation of wastewater and solid wastes, and greater urbanization in a rural area. Since the site is only about 250 acres, feasible residential use would be limited to market level homes with golf course frontage. In addition, State Land Use and County General Plan amendments for urbanization would be required to implement this alternative.



For comparative purposes, a single family residential dwelling utilized approximately 500 gallons per day of potable water and generated 400 gallons per day of wastewater. The City and County of Honolulu imposes a one-time facility charge of \$2,100 for water hook-up and approximately \$1,200 for sewer. Assuming a 1200 unit single family development could be designed for the subject property, the facility charges for water and sewer would total approximately \$3,960,000 for off-site improvements. On-site improvements would increase this expenditure approximately \$10,000 per unit or \$1,200,000 for the entire project. As such, the total off-site and on-site water and sewer costs equate to \$5,160,000.

should the city and County of Honolulu elect to fund infrastructure improvements for an affordable housing project of comparable size, the \$25,000,000 proposed in the developers community benefit package would more than offset these costs.

#### **3.2.4 INTENSIFIED AGRICULTURAL LAND USE**

While limited agricultural use exists on the site (the dairy), environmental factors of the site tend to work against the agricultural potential of the site. Temperature and rainfall characteristics, as well as poor soil conditions require measures to be taken to protect livestock or shade crops such as floral or nursery products. Another factor affecting the use of the project site for more intensified agricultural use is the cost of constructing an irrigation system and the high cost (and general lack) of small, long term agricultural leases. Because of these considerations, alternative or intensified agricultural activity on the subject property would not be competitive with other existing agricultural operations in the area or in other areas of Oahu or the State.

## Chapter IV

## **CHAPTER IV**

### **4.0 DESCRIPTION OF THE AFFECTER ENVIRONMENT, PROBABLE ENVIRONMENTAL CONSEQUENCES AND PROPOSED MITIGATION MEASURES**

#### **4.1 PHYSICAL ENVIRONMENT**

The proposed project site consists of approximately 246 acres situated in Waianae, Oahu. Access to Waianae Kai Golf Course would be obtained via H-1 Freeway which connects to Farrington Highway about nine miles south of the site. The property is located 1 mile northeast of Waianae Valley between Puu Paheehee and Puu Kamaileunu.

#### **4.1.1 PHYSIOGRAPHY AND GEOLOGY**

##### **4.1.1.1 Existing Conditions**

The proposed project site is rectangular in shape with two extending parcels connecting to Waianae Valley Road. Slopes rise gently upward from the southern boundary at about 10 feet mean sea level (MSL) to approximately 150 feet MSL. A general slope analysis of the area (Figure 7 and Table 2), identifies approximately 163 acres (67 percent of the site) with slopes less than or equal to 10 percent, approximately 49 acres (20 percent of the site) with slopes ranging from 11 to 20 percent, and the remaining 32 acres (13 percent of the site) characteristic of slopes greater than 20 percent .

General slope analysis indicates that approximately 169 acres (67 percent of the site) are of slopes ranging between 0 and 10 percent, 49 acres (20 percent of the site) are of slopes ranging from 11 and 20 percent and the remaining 32 acres (13 percent) are of slopes greater than 20 percent, as shown on Figure 7.

##### **4.1.1.2 Probable Impacts**

The golf course layout has been designed to best utilize slopes predominantly up to 10 percent to maintain the existing drainage pattern and topographic features to the greatest extent possible. This relationship is shown on Figures 7 and 11.

##### **4.1.1.3 Proposed Mitigation Measures**

Proposed grading for construction of the golf course, driving range, clubhouse, access road and parking lot will maintain the present storm drainage patterns. Grading will be undertaken in accordance with the City's Grading Ordinance and recommendations of a soils engineer, with appropriate grading permits will be secured from the City prior to commencement of the grading

**PROJECT SITE**

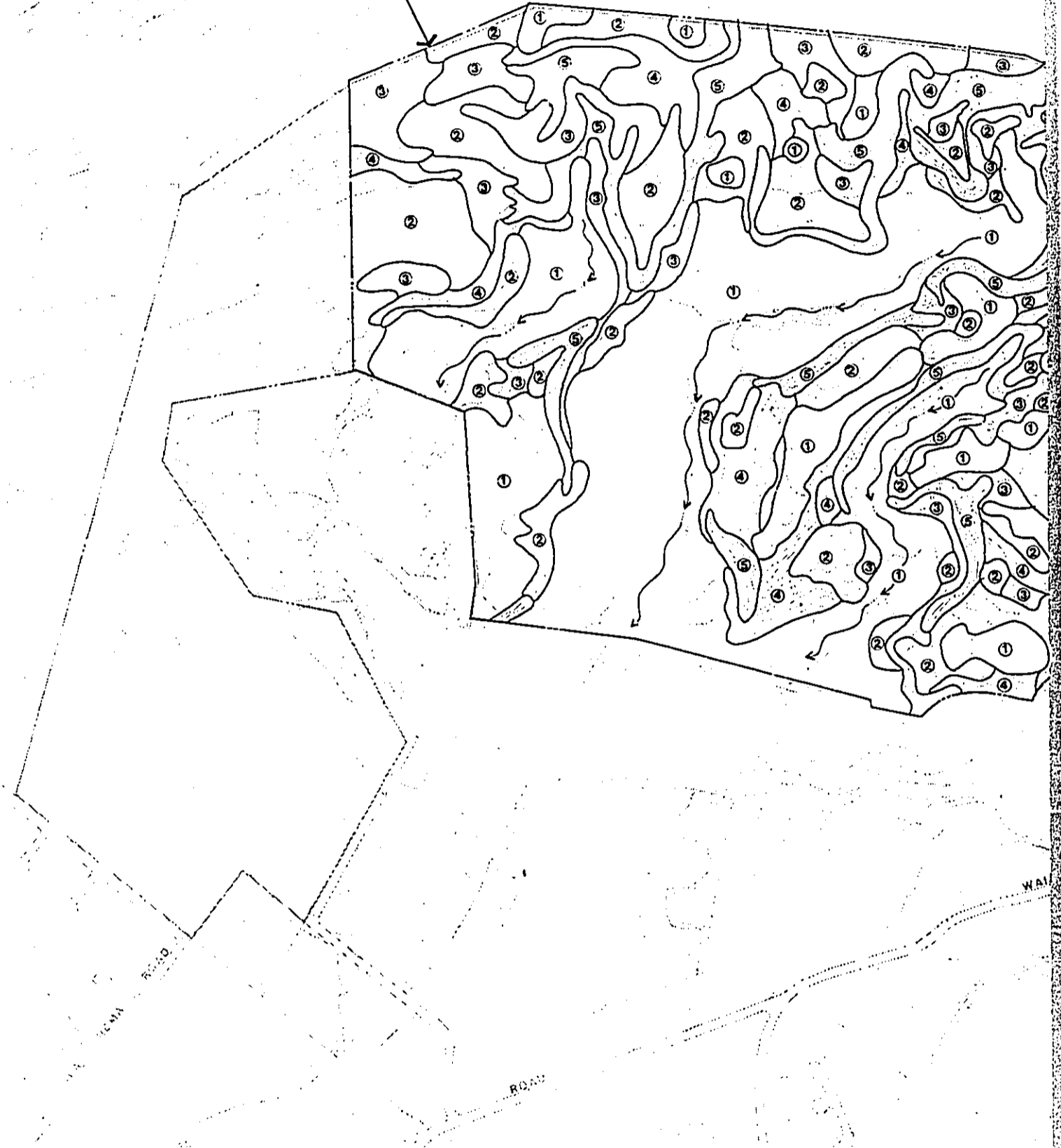
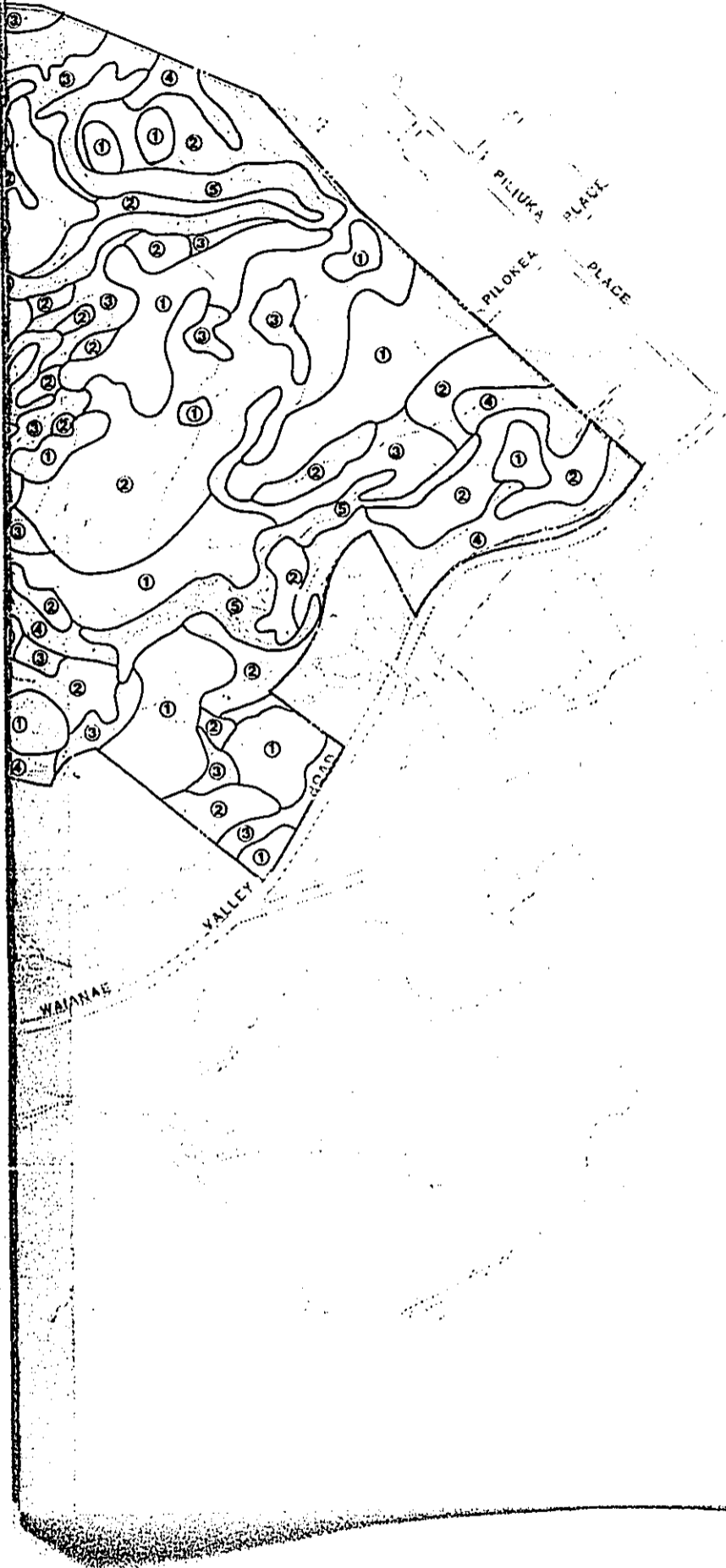


FIGURE 7

**WAIANAE KAI GOLF COURSE**

WAIANAE, OAHU

**SLOPES/  
SURFACE DRAINAGE**



**LEGEND**

**SLOPES**

- ① SLOPES LESS THAN 5%
- ② 6-10%
- ③ 11-15%
- ④ 16-20%
- ⑤ 20% AND GREATER

**DRAINAGE**

- ← SURFACE DRAINAGE



LINEAL SCALE (FEET)



operations. Erosion control measures including temporary desilting basins, berms, swales, grassing and watering to control fugitive dust emission, will be employed during grading operations. These measures will be included in preparation of an erosion control plan to be submitted for City review and approval.

**TABLE 2**  
**GENERAL SLOPE ANALYSIS**

<u>CATEGORY</u>	<u>Acres</u>	<u>Percent of Site</u>
Less than 5%	± 95	39
6% to 10%	± 70	28
11% to 15%	± 26	11
16% to 20%	± 23	9
Greater than 20%	± 32	13
<b>TOTALS:</b>	<u>± 246</u>	<u>100%</u>

#### 4.1.2 SOILS AND AGRICULTURAL POTENTIAL

Soils in Hawaii are commonly rated in terms of three classification systems: 1) a Detailed Land Classification; 2) Agricultural Lands of Importance To The State of Hawaii (ALISH); and 3) a U.S.D.A. Soil Survey.

##### 4.1.2.1 Existing Conditions

###### *Detailed Land Classification*

The physical characteristics, (i.e., soils, of the property) are generally unsuited for most soil based forms of agriculture. The University of Hawaii's Land Study Bureau (LSB) Detailed Land Classification of Oahu, has classified the subject property according to overall productivity as approximately 85 percent Class E (63, 64, 100, 102, 103, 104, and 112), 13 percent Class C (13), and 2 percent Class B (13i). The "B" rated lands are identified in the golf course master plan as a foliage production facility or nursery, and will not be part of the golf course.

As defined by the Land Study Bureau, the E soils have "very poor suitability" for productive agriculture (see Figure 8). The C rated soils are labeled as "fair to marginal suitability" and can be made productive with irrigation and sound management practices, but may not be economically feasible due to marketing and cost considerations.

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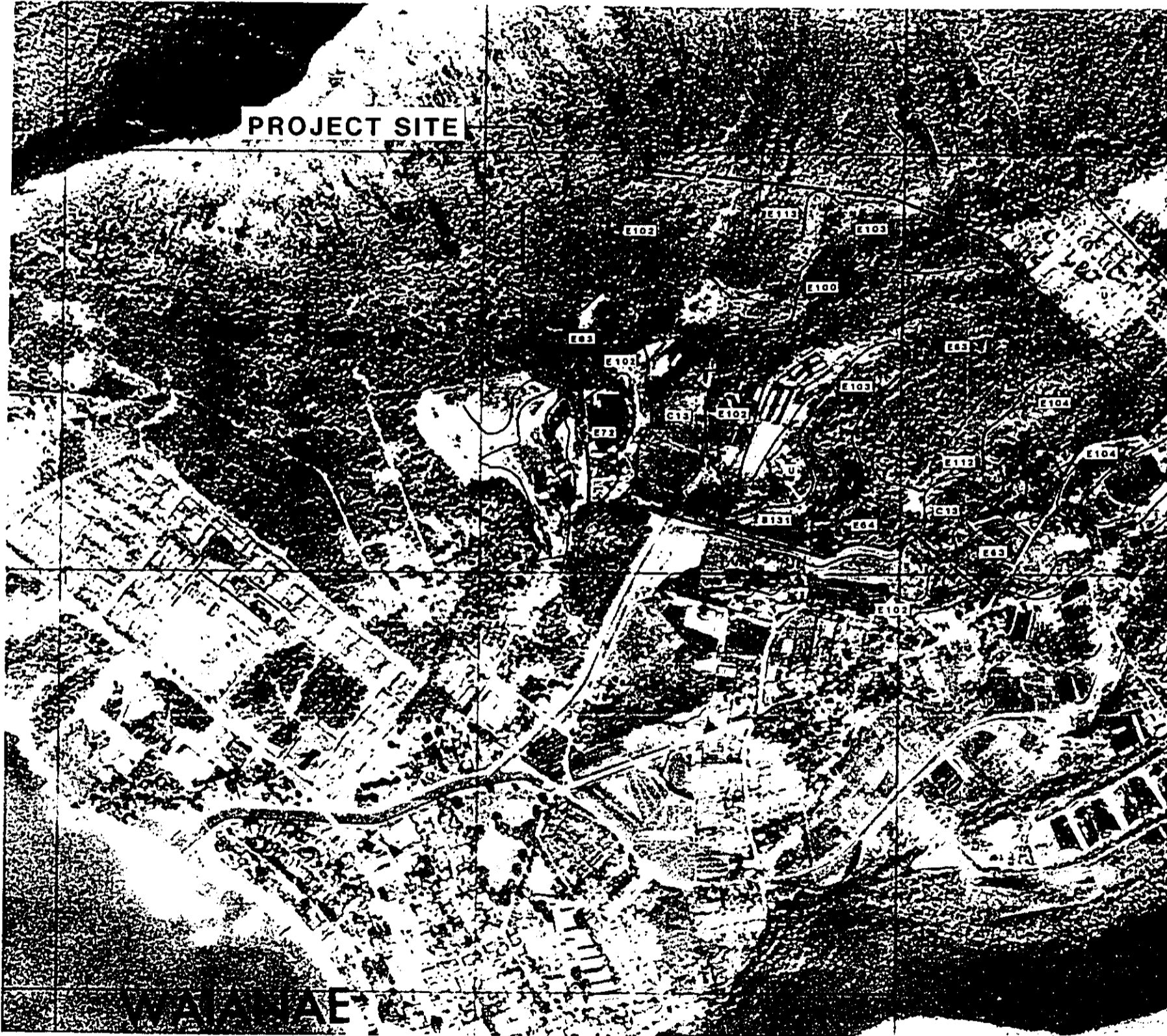


FIGURE 8  
WAIANA KAI GOLF COURSE  
WAIANA, OAHU



**DETAILED LAND  
CLASSIFICATION**

SOURCE: DETAILED LAND CLASSIFICATION, 1971-73





In accordance with the provisions of Chapter 205, HRS, golf courses within the State Agricultural District are a permitted use if located on lands not rated as "A" or "B" by the Land Study Bureau system. As such, the proposed golf course is a permitted use within the State Agriculture District.

*Agricultural Lands of Importance To The State of Hawaii*

Similarly, the State Department of Agriculture Agricultural Lands of Importance to the State of Hawaii (ALISH) system of defining agricultural suitability (ALISH), designates the property into: (1) Prime Agricultural Land, and; (2) Other Important Agricultural Land (Figure 9). A majority of the site, however, is not classified.

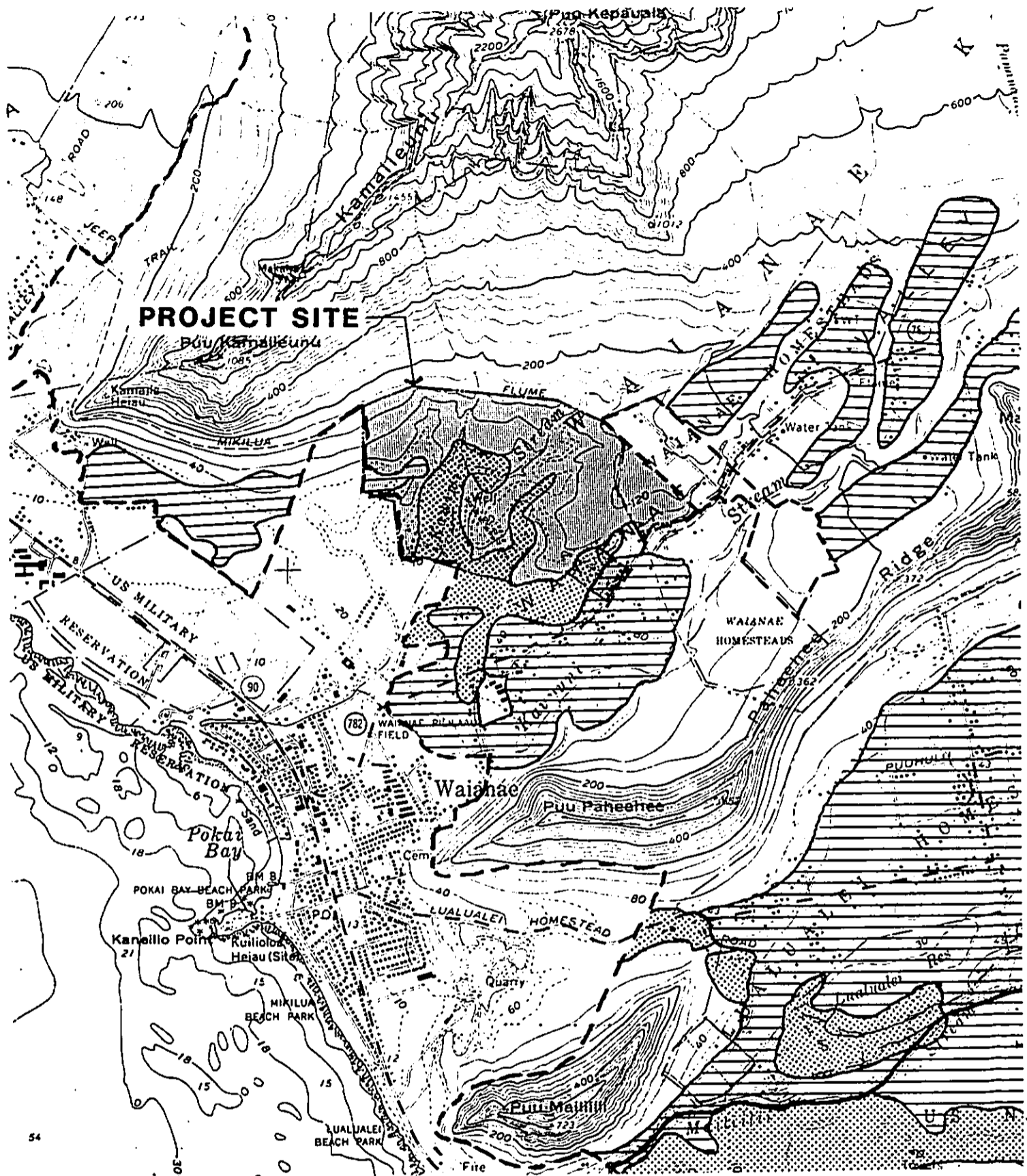
Prime Agricultural Land, encompassing approximately 3 percent of the site (Table 3), is defined as "Land best suited for the production of food, feed, forage and fiber crops. The land has the soil quality, growing season and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods." (It should be noted that these lands are generally rated "E" by the LSB)

Other Important Agricultural Land, encompassing about 10 percent of the site, is defined as "Land other than Prime or Unique Agricultural Land that is of state-wide or local importance for the production of food, feed, fiber and forage crops. The lands in this classification are important to agriculture in Hawaii yet they exhibit properties, such as seasonal wetness, erodibility, limited rooting zone, slope, flooding or droughtiness, that exclude them from Prime or Unique Agricultural Land classifications."

**TABLE 3  
INVENTORY OF AGRICULTURAL LANDS  
BY ALISH CLASSIFICATION**






<u>ALISH Classification</u>	<u>ACREAGE</u>		
	<u>Waianae Kai</u>	<u>Oahu</u>	<u>State</u>
Prime	7.5	55,500	304,300
Unique	0	9,000	31,300
Other	25.0	29,000	642,500
Unclassified	217.5	Unknown	Unknown

1. Based on 1986 data. Acreages of some classifications may have changed in recent years.



**PROJECT SITE**

**LEGEND**

-  PRIME AGRICULTURAL LAND
-  UNIQUE AGRICULTURAL LAND
-  OTHER IMPORTANT AGRICULTURAL LAND
-  EXISTING URBAN DEVELOPMENT
-  U.S. GOVERNMENT

SOURCE: AGRICULTURAL LANDS OF IMPORTANCE TO THE STATE OF HAWAII MAP, ISLAND OF OAHU SHEET: 0-2 JANUARY, 1977

**FIGURE 9**  
**ALISH**  
**WAIANAE KAI GOLF COURSE**  
**WAIANAE, OAHU**



**PBR**  
**HAWAII**

### Soil Survey

The U.S.D.A. Soil Survey, Islands of Kauai, Maui, Molokai, and Lanai, State of Hawaii classifies the subject property into six categories, of which Lualualei extremely stony clay (LPE), comprises the major portion. The soils and respective characteristics of each are described below and illustrated on Figure 10.

- LvB - Lualualei stony clay, 2 to 6 percent slopes, Unified Soil Classification - CH. Runoff is slow and erosion hazard is slight. Stones within the soil hinder machine cultivation. Capability classification IIIe if irrigated, Vis if non-irrigated.
- LPE - Lualualei extremely stony clay, 3 to 35 percent slopes, Unified Soil Classification - CH. Medium to rapid runoff, moderate to severe erosion hazard. It is impractical to cultivate this soil unless the stones are removed. Capability classification VIIs, non-irrigated.
- LuA - Lualualei clay, 0 to 2 percent slopes, Unified Soil Classification - CH. Permeability slow, runoff slow and erosion potential slight. Capability classification IIIs if irrigated, Vis if non-irrigated.
- HnA - Hanalei silty clay, 0 to 2 percent slopes. Permeability is moderate, runoff is very slow, and the erosion hazard is no more than slight. Capability classification IIw irrigated or non-irrigated.
- CR - Coral outcrop derived from coral reefs composed of cemented calcarious sand and coral. Vegetation is sparse, and suitable for urban development, and quarrying. Capability classification VIIIs non-irrigated.
- rSY - Stony steep land, slopes ranging from 40 to 70 percent. Consists of massed boulders and stones. Capability classification VIIs non-irrigated.

The environmental factors of the site limiting its agricultural potential are primarily the temperature and rainfall characteristics.

Temperatures in the project area average between 72 and 80 degrees F. Although these are not considered to be "high" temperatures, the daily temperature can reach highs in the low 90's (F) for several hours per day, several days per year. As such, measures must be taken to protect dairy cows, hogs and poultry as well as under shade type crops such as floral or nursery products. These measures generally include water spraying barn or shelter roofs with relatively high cost potable water.

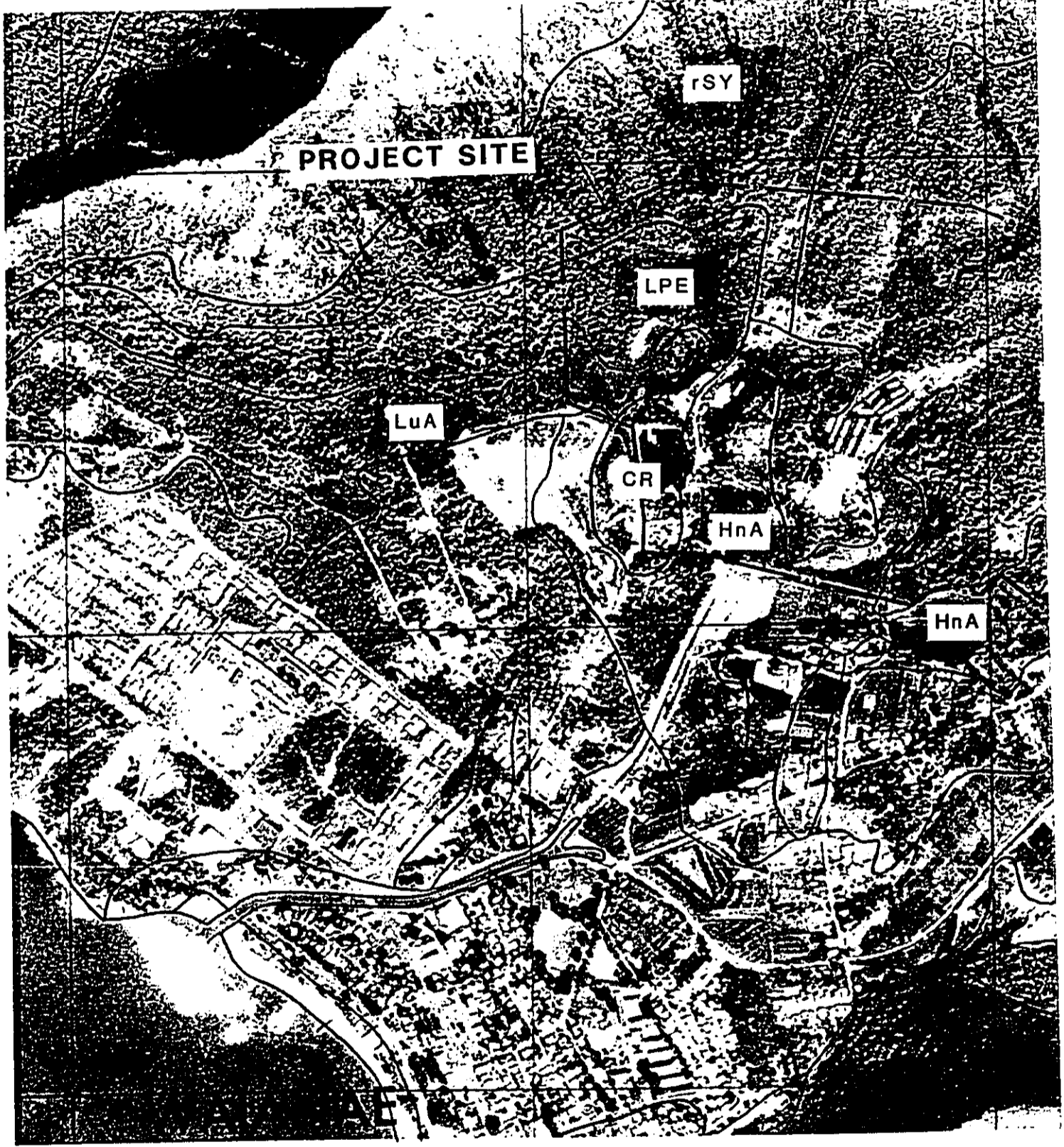
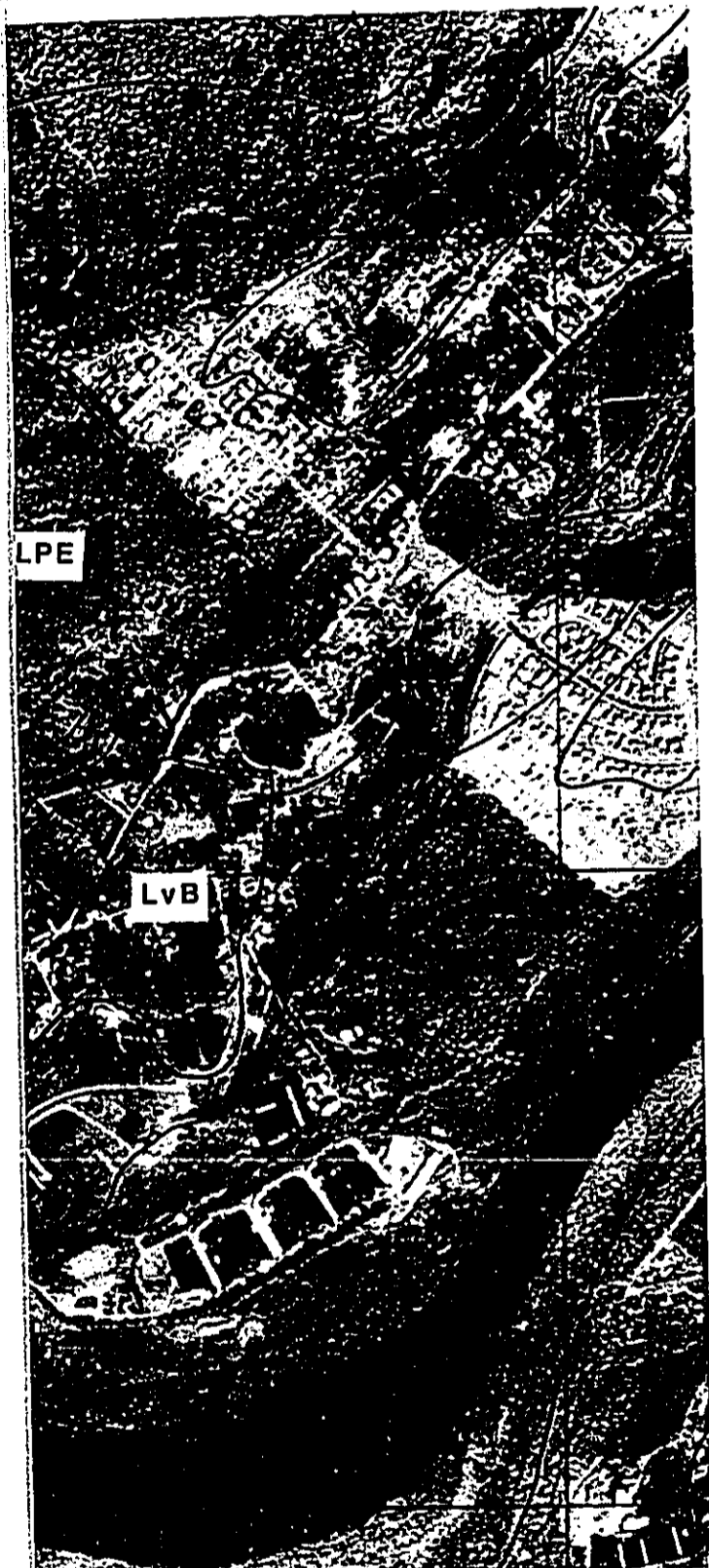


FIGURE 10  
WAIANA KAI GOLF COURSE  
WAIANA, OAHU



## SOIL SURVEY

### LEGEND

- LvB** LUALUALEI STONY CLAY
- LPE** LUALUALEI EXTREMELY STONY CLAY
- LuA** LUALUALEI CLAY
- HnA** HANAIEI SILTY CLAY
- CR** CORAL OUTCROP
- rSY** STONY STEEP LAND

SOURCE: SOIL SURVEY OF ISLANDS OF KAUAI, OAHU,  
MAUI, MOLOKAI, AND LAHAI, STATE OF HAWAII,  
UNITED STATES DEPARTMENT OF AGRICULTURE  
AND UNIVERSITY OF HAWAII  
AUGUST 1972

U.S.G.S. AERIAL PHOTOGRAPHY, 1977



Rainfall in the project area averages about 20 inches per year, which is insufficient for soil based agricultural crops or to provide sufficient quantities that could be collected and stored for roof spraying or irrigation purposes. As with the soils of the project site, other areas on Oahu and in the state exist where climatological conditions are better suited for agricultural purposes.

#### **4.1.2.2 Probable Impacts**

The potential and/or continued use of the project lands for agricultural purposes appears to be severely limited due to the poor soil qualities and relatively high development costs for development of new types of agricultural production. Market support for any new forms of diversified agriculture must be sufficient to support the financial investment. Competition for land from higher intensity residential, commercial, and other types of land uses also drive up the market value of land, thereby making the need for higher returns from agricultural production of greater importance.

Potential agricultural uses of the property that have been examined, include continued operation of the existing dairy, alternative crops such as forage crop production, seed production, floral and nursery products, and livestock production such as cattle, hogs and poultry. In all instances, other diversified agriculture on the subject property would not be competitive with other agricultural operations in the area or elsewhere in the state.

New agricultural activities would require clearing of the land, the development of water sources, installation of all utilities (sewer, water and electricity) and the construction of appropriate structures. These costs would be "up front" fixed costs that the "farmer" would have to recover over the life of the agricultural activity. The higher costs of production and resultant higher prices to consumers would result in less marketability for the products produced. The up front costs, associated with production in Hawaii (due to high labor, water and land costs relative to mainland US or foreign producers) and potentially higher marketing costs, limit the potential profitability for agricultural production on the site.

The potential secondary impacts of the proposed golf course project on surrounding agricultural activities is generally positive. The golf course would act as a buffer between existing agricultural activities, primarily the agriculture park immediately north of the proposed project, truck crop farms located makai of the project property, and existing residential developments located northeast and east of the proposed golf course property.

These operations are also protected under the state's Right To Farm Act. Similarly, establishment of a golf course on the Waianae Kai property would serve to decrease the level of wind blown dust and particulate matter from the site, thereby benefitting both the adjacent farms and residences and would provide an open green space below the present residential units (Wahiona Acres). The proposed project would not cause present or future agricultural operations on adjacent properties to be impacted such that there would be any violations of the state's Right to Farm Act.

The land use classifications at all levels (State Land Use, Waianae Development Plan Land Use Map, County Zoning) are all currently Agriculture as previously described.

The subject lands contain a very small percentage of the island-wide (Oahu) inventory of Prime or Other Important Agricultural Land. There are approximately 120,000 acres in total farm acreage on Oahu, of which about 26,000 are in sugar cane and 12,000 in pineapple production. The subject lands including the nursery site with a Prime ALISH rating, account for approximately 0.01 percent of the island-wide total. Those lands with a rating of "Other Important Agricultural Lands" represent approximately 0.08 percent of the island-wide total. Consequently, agricultural lands of similar or better quality are available in sufficient quantities elsewhere on Oahu.

#### **4.1.2.3 Proposed Mitigation Measures**

The golf course design has incorporated both existing and planned surrounding uses into landscape elements of the golf course to serve as a buffer between residential areas and the more "active" portions of the golf course. As compared to the existing cattle feedlot and dairy operation, the golf course appears to provide a more compatible land use with existing residential neighborhoods. Development of the golf course on marginal agriculture lands will assist in lessening the pressure to develop Prime agricultural lands elsewhere on Oahu.

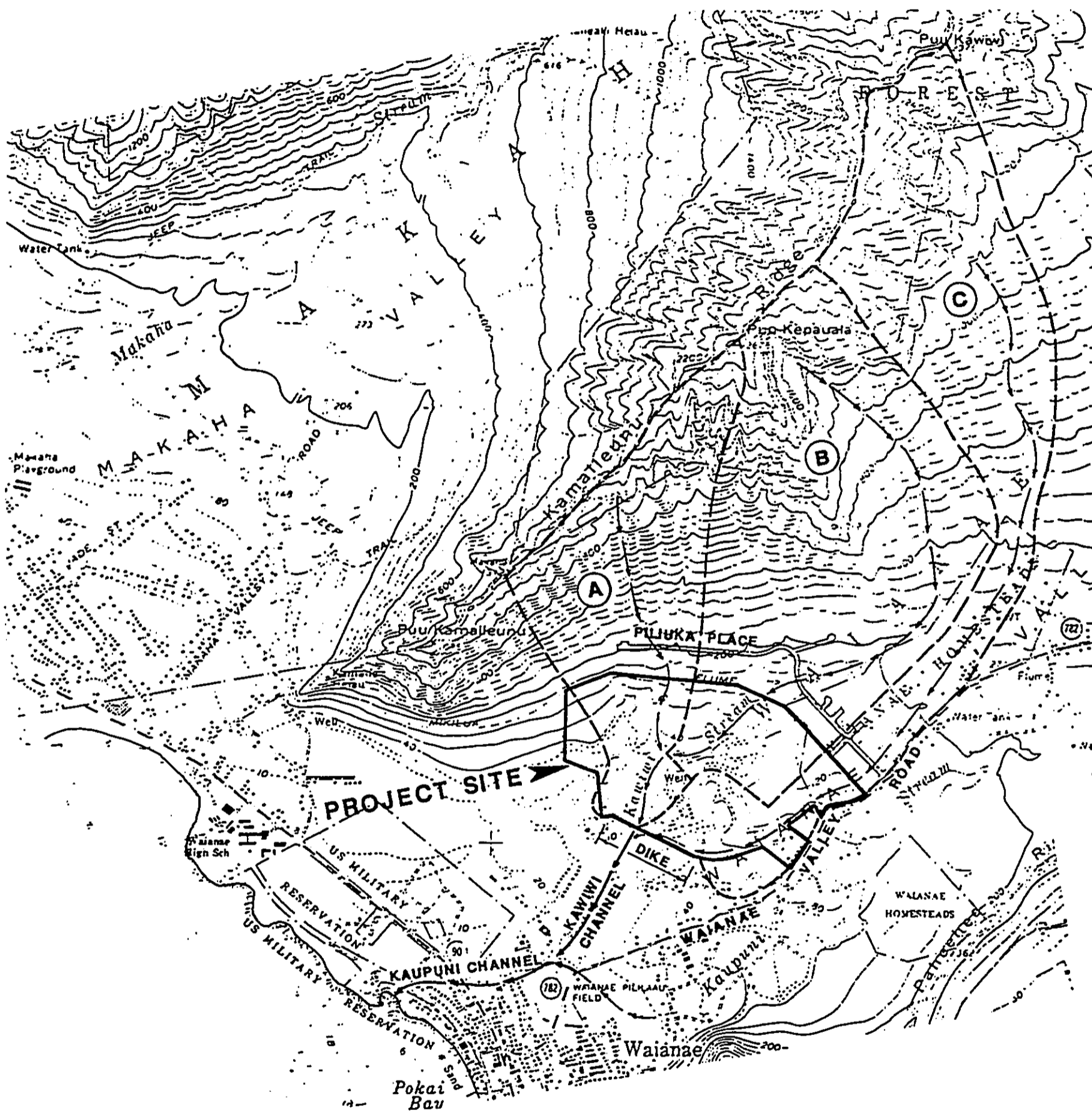
### **4.1.3 HYDROLOGY AND DRAINAGE**

#### **4.1.3.1 Existing Conditions**

No significant water resources are known to exist on the subject property except for non-potable groundwater which is currently withdrawn for use in the dairy operation.

Above the project site, approximately 1,265 acres contribute storm runoff to three major existing natural waterways which traverse the project site as shown on Figure 11. The majority of these mauka tributary areas are mountainous, undeveloped land with exception of the adjacent Wahiona Acres subdivision and Waianae Agricultural Park. The storm runoff crosses Piliuka Place in underground drain culverts. The existing storm drainage system, was established in 1972 by the U.S. Department of Agriculture, Soil Conservation Service (SCS). Presently, it includes the Kaupuni and Kawiwi Stream channels that extend from the subject property to the Pacific Ocean.

There is one intermittent drainage channel indicated as Kawiwi Stream which bisects the site terminating in the concrete Kawiwi Channel established by the Soil Conservation Service. This gulch is predominantly dry except during intense storm events. Additional water retained in the southern most portion of the channel results from the 1,800 foot linear dike (berm) along the project's southern boundary which dams and directs the runoff west towards the concrete Kawiwi Channel.





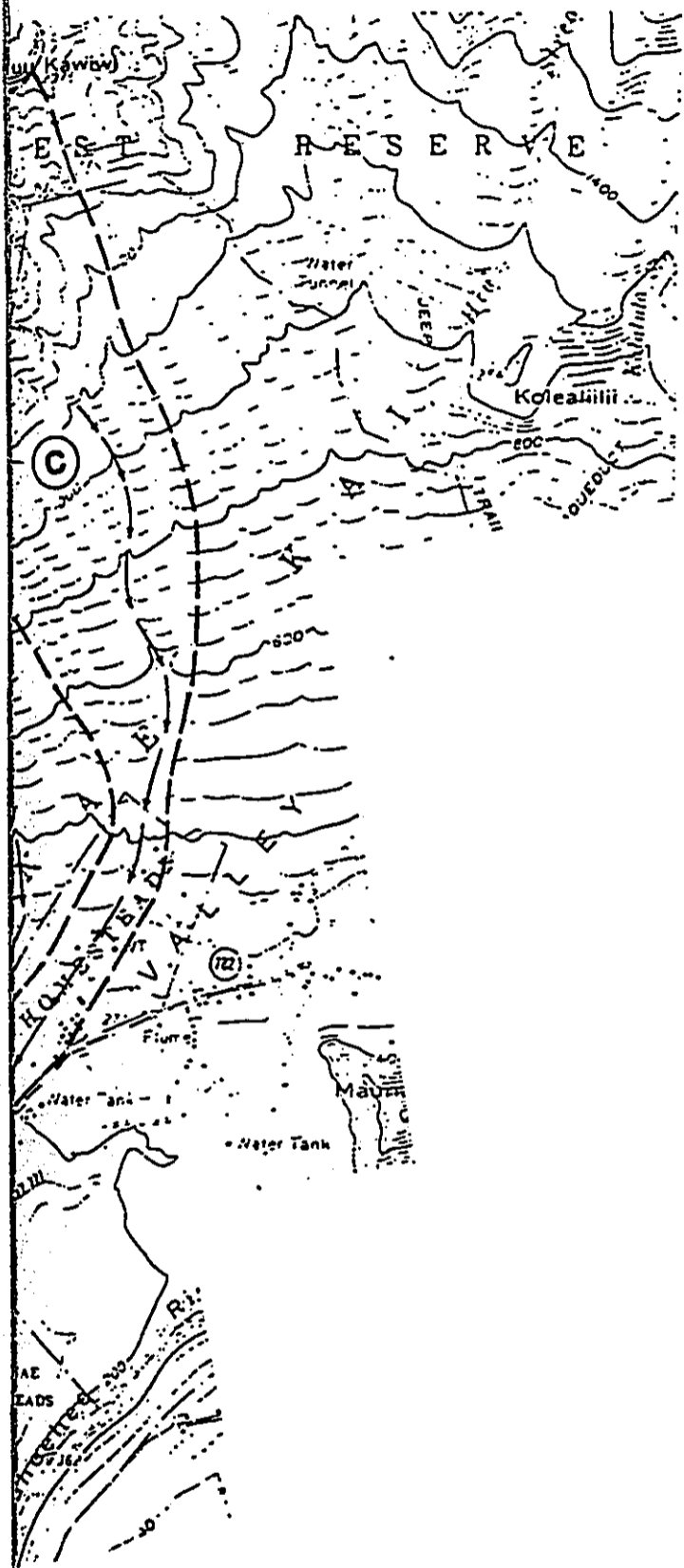


FIGURE 11

**WAIANAE KAI GOLF COURSE**  
**WAIANAE, OAHU**

**SLOPES/SURFACE  
 DRAINAGE PLAN**

**TABULATION OF STORM RUNOFF  
 THRU PROJECT SITE**

<u>TRIBUTARY</u>	<u>AREA (Ac)</u>	<u>Q (cfs)</u>
Ⓐ	340	
Ⓑ	630	
Ⓒ	545	
<b>TOTALS</b>	<b>1515</b>	<b>3800</b>

(Runoff based on C & C PLATE 6  
 modified for Leeward & Ewa)

SOURCE: COMMUNITY PLANNING INC.



The existing Kawiwi Stream channel with SCS design freeboard of about 2.5 feet is adequate to convey storm runoff from its total tributary area including the agricultural park and proposed golf course to the ocean. The Kaupuni Stream channel is similarly adequate.

The Kawiwi concrete lined trapezoidal channel with a 30-foot bottom width was designed by SCS for a total tributary area of 1,894 acres and storm runoff of 4,170 cfs. The Kaupuni Stream channel with an 80-foot bottom width, drains the much larger 5,254-acre Waianae Valley. Also, included in the SCS drainage improvement was construction of an 1,800-linear foot dike (berm) along the project's southern boundary which dammed and directed collected storm runoff to the channel inlet as shown on Figure 11.

No wetlands as designated by the U.S. Army Corps of Engineers exists on the subject property.

#### **4.1.3.2 Probable Impacts**

While the existing drainageways are adequate for present land use, development of Waianae golf Course would likely generate increased runoff due to the creation of a impervious surface. The 27-hole golf course will utilize potable water for the club house and employ a private system using brackish water for irrigation of tees, fairways and greens.

A potential impact on surface and groundwater concerns the possible leaching of chemicals, such as fertilizers and pesticides, into groundwater. While various studies have investigated the possibility of chemical leaching through a number of methods, including modeling (M & E Pacific, 1990; Environmental Assessment Co., 1990; Decision Analysts Hawaii, Inc., 1990), findings generally agree that the environmental impacts of golf courses on surface and ground water can be extensively minimized.

#### **4.1.3.3 Proposed Mitigation Measures**

Potable water will be supplied by the County system and is sufficient for club house use. Proposed on-site drainage improvements will include grassed swales and channels (lined where velocities are erosive) to convey storm runoff from the mauka areas into the Kawiwi Stream channel. To mitigate potential erosion problems, appropriately sized ponding basins will be constructed on-site for desilting storm runoff from graded areas prior to discharge into the Kawiwi Stream channel.

The key to mitigating any potential groundwater contamination due to fertilizers and pesticides is to develop baseline measurements for existing groundwater which may be affected by the project, and to install a monitoring system to confirm and regulate water quality. With such a system in place, an good integrated management program can mitigate adverse impacts to groundwater. Under proposed management practices, including use of inovative technologies and management procedures, along with sound drainage controls and proper soil depth, potential adverse impacts can be mitigated

#### **4.1.4 NATURAL HAZARDS**

##### **4.1.4.1 Existing Conditions**

The subject property is above the historic tsunami inundation and high wave level. Flood Insurance Rate Map (FIRM) dated September 28, 1990 designates the entire property as Zone D, areas in which flood hazards are undertermined.

Earthquakes in the Hawaiian Islands are associated with volcanic eruption and magmatic or tectonic movement. Oahu is rated in seismic zone one in the Uniform Building Code, and the likelihood of volcanic eruption is considerably lower than on younger island formations or Hawaii, which has active volcanos.

##### **4.1.4.2 Probable Impacts**

The project is not likely to have any impact on natural hazard conditions, however, natural hazards could directly effect the project area.

##### **4.1.4.3 Proposed Mitigation Measures**

Mitigation of hazards associated with earthquakes include design and construction of infrastructure and buildings in compliance with applicable building codes and standards. Drainage structures have been designed and sized in accordance with this designation. No structures will be developed within any flood zone or surface drainageway.

#### **4.1.5 CLIMATE AND METEOROLOGY**

##### **4.1.5.1 Existing Conditions**

Waianae is located in West Oahu which experiences a hotter, drier climate because it is situated in the lee of the Waianae mountain range. Temperatures in the project area average 72 - 80° F. Rainfall averages 20 inches per year at the project site.

##### **4.1.5.2 Probable Impacts**

The proposed project is not expected to have any impact on the micro climate of the project area or region. Planned structures would not be tall enough to significantly effect existing wind patterns; and new landscaping associated with the golf course will not significantly effect temperature, although some localized cooling can be expected to result from the establishment of golf course landscaping.

#### **4.1.5.3 Proposed Mitigation Measures**

Due to the lack of anticipated significant adverse impacts of the project on the macro or micro climate near the site, no mitigation measures appear warranted.

#### **4.1.6 AIR QUALITY**

##### **4.1.6.1 Existing Conditions**

Both Federal and State standards have been established to control ambient air quality. At present, six parameters are regulated including: 1) particulate matter; 2) sulphur dioxide; 3) nitrogen dioxide; 4) carbon monoxide; 5) ozone; and 6) lead. Hawaii state standards are more stringent than comparable national limits except for sulphur dioxide; State and national standard are the same.

Regional and local climate, together with the type and amount of human activity, generally dictate the air quality at a given location. Present air quality is estimated to be good (primarily due to the predominant northeast tradewinds), with dust from agricultural activity and current vehicular travel providing the only potentially significant air quality problems.

##### **4.1.6.2 Probable Impacts**

Air quality impacts will result from increased vehicular activity, off-site electrical generation, and construction activities. However, it is anticipated that no State or Federal air quality standards will be violated. Long term air quality impacts that may result from the development of this project are expected to be insignificant. Fugitive dust during construction will be mitigated by grassing, watering, and other accepted techniques. Cumulative island-wide increased in auto emissions will not be significant.

##### **4.1.6.3 Proposed Mitigation Measures**

Because the proposed project is in a dry area, a fugitive dust program during construction would be initiated. Mitigation measures include frequent watering, covering trucks transporting topsoil, and use of wind screens. After project development, landscaping should greatly reduce or eliminate fugitive dust emissions and odors in the project area. Additionally, the potential for wildfires, which can be a significant contributor of suspended particulates, will be reduced by the establishment of well irrigated turf grasses.

#### **4.1.7 NOISE QUALITY**

##### **4.1.7.1 Existing Conditions**

The existing background ambient noise levels are estimated to be less than the average level of

a residential neighborhood. Existing noise results from the natural sounds of wind, foliage and birds, as well as intermittent aircraft and traffic.

#### **4.1.7.2 Probable Impacts**

Noise impacts are limited to those generated by increased traffic and short-term construction noise. Increased human noise generation associated with golf course oriented land uses are also expected to occur in localized areas in the vicinity of greens and tees at different times, generally during maintenance periods.

Potential short term noise impacts may result during construction and site preparation stages from the operation of heavy equipment. Primary noise sources after project completion will be dominated by vehicular traffic, especially at access points to the project site, and by the use of motorized equipment associated with golf course maintenance machinery.

#### **4.1.7.3 Proposed Mitigation Measures**

Standards and guidelines from the City and County of Honolulu and State Department of Health will be followed to mitigate the impacts of construction or other noise sources on existing ambient noise levels. The applicant will alleviate potential noise conflicts to the greatest extent possible through enforcement of construction noise controls. No significant increase in noise level is anticipated over the long term, therefore, no further mitigation measures are suggested.

### **4.1.8 VISUAL ATTRIBUTES**

#### **4.1.8.1 Existing Conditions**

The Waianae Kai property, located near the mouth of the Waianae Valley exhibits an undulating terrain including gulches and ridges. There is no single dominant natural feature on the project site. Predominant natural features such as mountain ridges surround the site. Panoramic view corridors of the Waianae Range, Kamaileunu and Pahechee ridgelines will be retained from Farrington Highway, Pokai Bay and Waianae Intermediate and High Schools, as well as from within the site (Figure 12). The southern boundary is at 10 feet mean sea level (MSL) and the northern boundary in at 150 MSL, with a total elevation change of 140 feet.

Although the project site is surrounded by very low density residential and agricultural developments, the property does represent a significant open space natural feature in the area from a visual perspective. No on-site amenities are planned that would impact the open space resource beyond the construction of the club house.

#### **4.1.8.2 Probable Impacts**

Short term impacts of the proposed project include disturbance of scrub vegetation by grading and on-site location of temporary buildings to house personnel and supplies which will encroach

on the landscape. Over the long term, development of the Waianae Golf Course would have long term impacts on the visual attributes of the site. The open space character of the area will be retained, however, landscaping will provide more greenery and trees, thus transforming the site to a more formal landscape. Long range views of the Waianae coast would remain substantially unaffected.

#### **4.1.8.3 Proposed Mitigation Measures**

In the short term, mitigation measures involve limiting the time rock and bare soils are exposed to erosion, placing sod as soon as practicable. The golf course design utilizes the existing undulating terrain to provide an interesting and challenging course. The Preliminary Grading Plan indicates the ridges and gulches will be modified marginally, thus retaining the majority of the topographic features.

Development of the proposed golf course would preserve the existing open space character of the property both visually and functionally. The site will become more accessible to more people and provide an important aesthetic amenity compatible to the surrounding neighborhood. The golf course is viewed as a beneficial element to the visual resource, so no other mitigation measures appear warranted.

## **4.2 NATURAL ENVIRONMENT**

### **4.2.1 FLORA**

#### **4.2.1.1 Existing Conditions**

A botanical survey of the proposed project site was conducted in May 1988 to inventory and identify the species of vascular plants found on the site (Appendix D). The survey using a walk-through method covered 100 percent of the site. The species recorded are indicative of the season (rainy versus wet) and environmental conditions under which the survey was made. Surveys taken at different times of the year, under varying environmental conditions would yield slight variations in the species list, especially the weedy annual taxa.

The study area was divided into two areas, Kiawe Forest and Dairy Area. The Kiawe Forest vegetation consists of kiawe (*Prosopis pallida*) in various stages of maturity, with mature forest covering most of the site. Such trees are 35 and 40 feet high in the gullies, and 25 to 30 feet high on the more exposed high areas. Beneath the canopies there is an understory of koa-haole (*Leucaena leucocephala*) approximately 10 to 12 feet tall. In most places the ground is covered with an almost uninterrupted growth of green panic grass (*Panicum maximum* var. *trichoglume*), with occasional small patches of buffel grass (*Cenchrus ciliaris*) or hurricane grass (*Bothriochloa pertusa*). The younger forests are correlated to areas of most recent disturbance due to fires and clearing for dairy use.

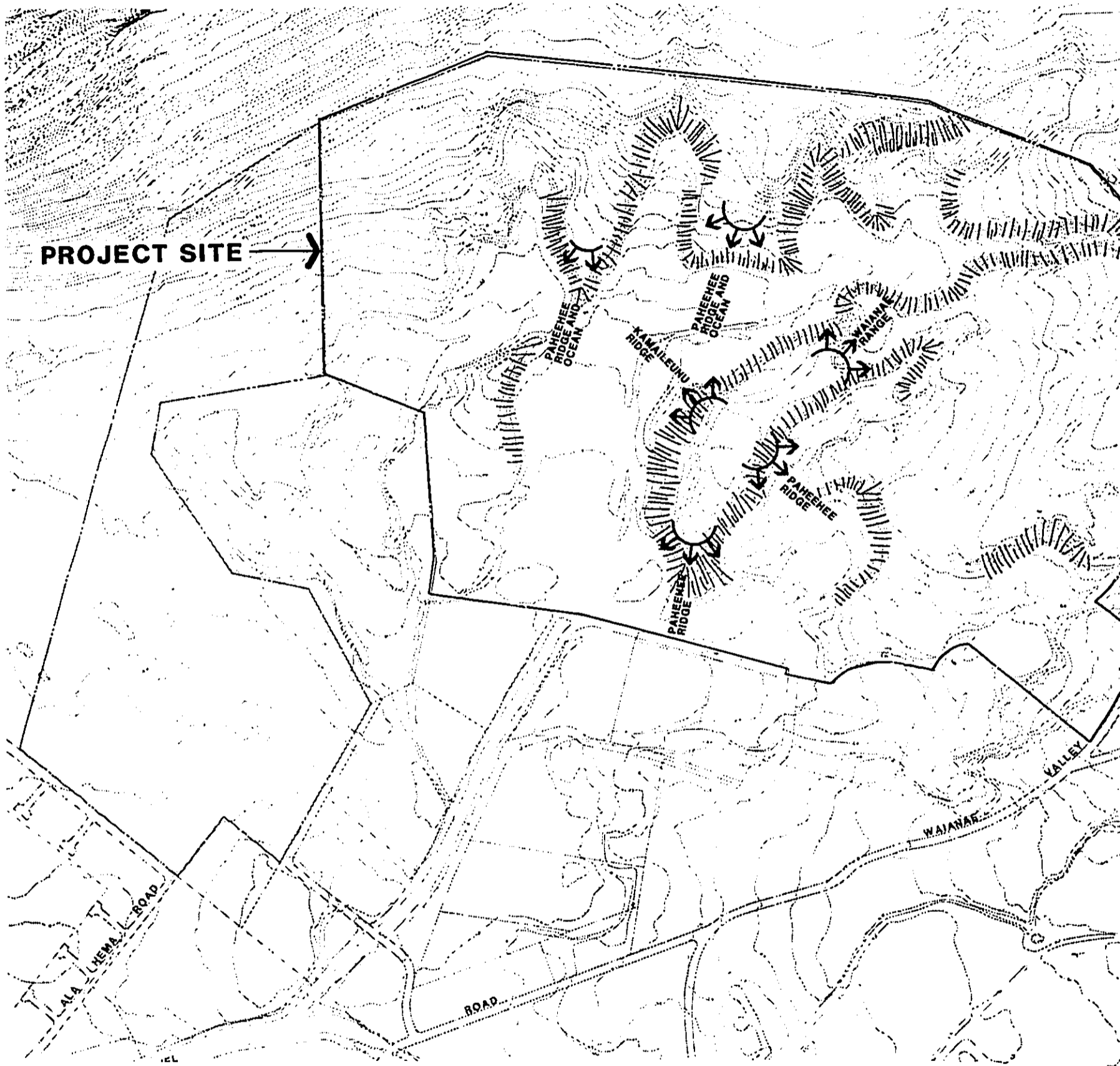


FIGURE 12

**WAIANAE KAI GOLF COURSE**

WAIANAE, OAHU

**VIEWS**

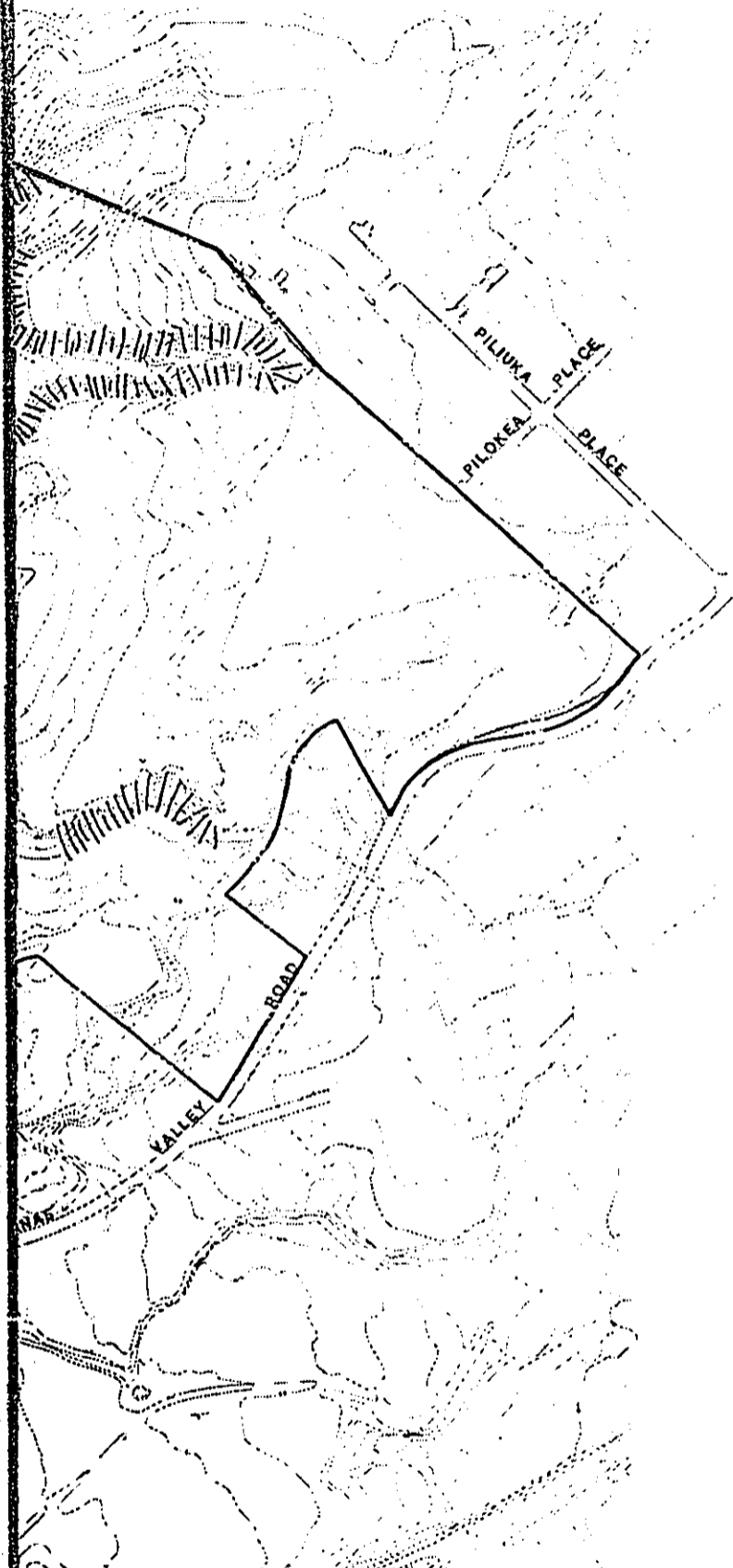
**LEGEND**



VIEWS & DIRECTION



SLOPES GREATER THAN 20%



LINEAL SCALE (FEET)





The Dairy Area is centrally located on the site and is subjected to continued disturbance by machinery and penned cattle. Ruderal weeds persist in this area; approximately one third of all species found on the site are annuals and short lived perennials which are unstable plant populations. Within a few years after the last major disturbance, the weeds are replaced by longer living shrubby species and then by nearby saplings. The site exhibits ruderal grasses (Cenchrus echinatus, Chloris barbata, Cynodon dactylon, Eleusine indica), pigweeds and saltbush (Amaranthus spinosus, Amaranthus viridis, Atriplex semibaccata, Atriplex suberecta, Chenopodium carinatum and Chenopodium murale), mallows (Malva parviflora, Malvastrum coromandelianum and Sida spinosa), and composites (Sonchus oleraceus and Tridax procumbens). Shrubby species representative of the area are lion's ear (Leonotis nepetifolia), tree tobacco (Nicotiana glauca), castorbean (Ricinus communis), cotton (Gossypium hirsutum), popolo (Solanum americanum), currant tomato (Lycopersicon pimpinellifolium), pluchea (Pluchea indica and symphytifolia), and golden crown beard (Verbesina encelioides). Along the lower portion of the Kawiwi Stream channel, adjacent to the dairy site, is found California grass (Brachiaria mutica), which is to be retained for nursery purposes only.

#### 4.2.1.2 Probable Impacts

Only 78 species of vascular plants are found on the site, an extremely low number for an area of this size. Of these, 70 (90 percent) are exotic weeds or deliberately introduced plants, and 8 (10 percent) native, or presumed native plants. Because the site has long been disturbed, there are no remnant native plant communities. None of the species found on the site are officially listed as endangered or threatened; nor are any species proposed or candidate for such status. No Exceptional Trees, which are protected by Honolulu City and County Ordinance 78-91 occur on the site. Earthwork and excavation would result in the loss of much of the existing vegetation. However, as noted below, the potential adverse impacts will largely be mitigated.

#### 4.2.1.3 Proposed Mitigation Measures

To the extent possible, the proposed golf course will utilize landscaping with indigenous flora appropriate to the setting and in recognition of water conservation principles.

### 4.2.2 FAUNA

#### 4.2.2.1 Existing Conditions

Common urban and field birds have been observed in the project area. Feral cats, dogs, and mongoose, as well as rats and mice are likely to occur in the area due to agricultural and urban influences on habitat.

#### 4.2.2.2 Probable Impacts

Development of the golf course is not expected to adversely effect the bird or mammal species

in the area. Newly landscaped golf course areas could provide more habitat for common introduced species.

#### **4.2.2.3 Proposed Mitigation Measures**

Given the lack of significant adverse faunal impacts, specific mitigation measures for fauna are not warranted. As indicated, additional habitat for introduced species may be provided as new landscaping is installed.

### **4.2.3 HISTORICAL AND ARCHAEOLOGICAL RESOURCES**

#### **4.2.3.1 Existing Conditions**

Archaeological resources within the project area were studied and the findings of the reconnaissance survey are documented in Appendix E. The basic purpose of the survey was to identify and evaluate all sites of possible archaeological significance present within the project area. Field survey methods consisted of 100 percent coverage ground survey by means of variable intensity (30-90 ft. transect intervals). The survey identified 34 sites which are summarized in Table 5 according to site number, formal type, tentative functional interpretation, nature and degree of significance (PHRI cultural resource management value modes) and components. In addition, subsurface testing was conducted by means of backhoe trenching in selected areas to determine the presence or absence of potentially significant buried cultural remains. The site and trenching locations are identified in Appendix G.

Formal feature types present within the project area include rock piles, walls, dams, flumes, ditches, a terrace, a coral and basalt lithic scatter, a concrete swimming pool, a well, concrete foundations, a bridge and a culvert. Probable functional interpretations for the feature types include agricultural (historic), tool manufacture, habitation, transportation, recreation and erosion and water control. A complete description of the findings is included in Appendix E.

An overall evaluation of the reconnaissance survey findings reveal a total of 34 sites have been located and all sites assessed as important solely for information content. Tentative conclusions indicate 26 of the 34 sites are of recent age, related to sugar cane cultivation and a 1950's dairy operation and are not significant. The remaining 8 sites were initially considered to be significant solely for their information content and have been recorded in detail included in Appendix E. Studies indicate 7 of these sites to be historic in age (post - A.D. 1778) and are considered "no longer significant." The one remaining site (T-24) has some prehistoric remains and is recommended for further data recovery prior to land clearing and grading for the golf course development.

#### **4.2.3.2 Probable Impacts**

The detailed data recovery plan for site T-24 will be prepared by the consulting archaeologist and submitted for approval by the permitting agency and by the Historic Sites Section prior to

initiation of field work. Such data collection section will consist of surface clearing, sweeping of possible paved areas, detailed recording, test excavation, and possibly subsequent data recovery (mitigation) excavations.

As part of the survey, twelve backhoe trenches were excavated in the general areas of former LCA awards and land grants. Seven of the 12 trenches yielded evidence (gley for gley-like deposits) which indicates that wetland taro cultivation had occurred along the drainageways within the project area. Five samples were submitted for radio carbon analysis. The remaining three samples (RC-364, -366 and -368) yielded age ranges which overall span 340 years (AD 170 - 1510) (excluding the least likely of the three ranges yielded by RC-366). When the two most likely ranges yielded by sample RC-366 are considered a single long range (AD 1299 - 1510), the ranges of the three samples overlap to produce a most likely range of 130 years (AD 1300 - 1430).

Based on the dating results and the fact that no other subsurface cultural remains were encountered during trenching, it was determined that no further backhoe trenching was necessary in the project area. Dating results were reported orally to Dr. Joyce Bath, Department of Land and Natural Resources (DLNR) staff archaeologist for Oahu. Dr. Bath concurred that the results were as expected, and that the results warranted no further backhoe trenching.

The significance categories used in the evaluation process are based on the National Register criteria contained in the Code of Federal Regulations (36 CFR Part 60). DLNR-HSS uses these criteria to evaluate eligibility for both the Hawaii State and National Register of Historic Places. Sites determined to be potentially significant for information content (Category A, Table 6) fall under Criterion D, which defines significant resources as ones which "...have yielded, or may be likely to yield, information important in prehistory or history." Sites potentially significant as representative examples of site types (Category B, Table 6) are evaluated under Criterion C, which defines significant resources as those which "...embody the distinctive characteristics of a type, period, or method of construction..., or that represent a significant and distinguishable entity whose components may lack individual distinction".

Sites with potential cultural significance (Category C, Table 6) are evaluated under guidelines prepared in 1985 by the Advisory Council on Historic Preservation (ACHP) entitled "Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review". The guidelines define cultural value as "...the contribution made by an historic property to an ongoing society or cultural system. A traditional cultural value is a cultural value that has historical depth". The guidelines further specify that "(a) property need not have been in consistent use since antiquity by a cultural system in order to have traditional cultural value".

#### 4.2.3.3 Proposed Mitigation Measures

A qualified archaeologist will selectively monitor initial grubbing activity and/or vegetation clearing within the project area. The general significance evaluations and recommended general

treatments presented here and in Appendix E are based on the findings of the surface reconnaissance survey field work only, which involved limited subsurface testing.

These evaluations and recommendations are given with the general qualification that during any development activity involving the extensive modification of the land surface, there is always the possibility, however remote, that previously unknown or unexpected subsurface cultural features, deposits or burials might be encountered, work will be halted and consultation with Historic Sites Section will take place.

#### **4.2.4 SOCIOECONOMIC ENVIRONMENT**

##### **4.2.4.1 Existing Conditions**

At present a small dairy operation is located on the subject property. The balance of the site consists of under-utilized open space. Other than normal property taxes, no significant amount of revenue is generated on site.

##### **4.2.4.2 Probable Impacts**

Probable impacts of the Waianae Golf Course on residential population, visitor population, character of the neighborhood, displacement, and other community concerns are addressed in this section.

##### ***Residential Population***

Development of the proposed project should neither increase or decrease the residential population in Waianae or the surrounding neighborhood. A majority of the site is currently vacant and not designated for residential land uses on either the Development Plan or Land Use Ordinance zoning maps. Indirectly, however, the use of the property for a golf course will help to maintain the population by providing stable employment opportunities in addition to continued employment created by the dairy operation which would be relocated.

##### ***Visitor Population***

The visitor population in the area will likely increase as a result of the proposed golf course. This impact, however, is in accordance with provisions of the Hawaii State Plan for expanding the tourism based economy of Hawaii.

##### ***Character or Culture of the Neighborhood***

The proposed Waianae Kai golf course is expected to contribute in a positive manner to the

general welfare of the Waianae community and surrounding neighborhoods. Development of the golf course will maintain a low density rural atmosphere; generate employment; demand minimal existing public services and infrastructure; and add a needed recreational facility.

The Development Plan Special Provisions for the Waianae District note that "it is the intent of the Waianae Development Plan that the pattern of urban development in Waianae remain linear along Farrington Highway, with relatively low building heights. The overall agricultural and open space setting is to be retained". As such, agricultural land uses will not be significantly impacted and the open space character of the area will be maintained and enhanced.

### *Displacement*

The proposed project utilizes eleven separate parcels owned by three land owners who collectively wish to devote their land to the development of a 27-hole golf course. The only relocation required is that of the Mountain View Dairy operation which is one of the land owners. The dairy is presently working with the Department of Agriculture to relocate to its proposed Livestock Agricultural Park.

### *Other Social Impacts*

Discussions with adjacent property residents and members of the community indicate concerns from two primary interest groups; adjacent property residents and nearby residents of Waianae Valley. Some of these individuals have been contacted by small group meetings and on an individual basis.

Those members of the community in close proximity (adjacent property residents) are comprised of residents in Wahiona Acres, residents along Waianae Valley Road, and farmers adjacent to the property. These individuals view the proposed project as a means of ensuring a continuous green belt, maintaining a rural life style, and reducing dust, odors and potential urbanization.

The second interest group comprised of nearby residents residing within the Waianae Valley also view the project as a means to continue their rural life style. Development of the golf course is considered beneficial and or non-threatening when compared to (as an example) residential development which may would overburden the existing public services.

Residents of Waianae Valley have also expressed the desire to improve the aesthetic quality of the Waianae Valley Road. The applicant intents to explore alternatives in beautifying the Waianae Valley Road up to the entrance of the project access.

Concerns raised by individuals are listed below;

- a. Traffic impacts to Waianae Valley and Plantation Roads.

*Comment:* The traffic study attached as Appendix B, reports that all existing facilities are adequate to handle increased traffic which may be created by the proposed project.

- b. Adequacy of the archaeological reconnaissance survey report.

*Comment:* The archaeological report was reviewed by the author with community leaders who appeared satisfied with the adequacy of the report.

- c. Water availability for the golf course and the clubhouse.

*Comment:* Potable water requirements for the clubhouse can be met through existing BWS facilities, as described in Section D-2. Irrigation water for the golf course would be supplied by private wells on the property, and in case of drought conditions, from the lined water features to be constructed on-site.

- d. Employment arrangements for the existing Mountain View Dairy employees.

*Comment:* The proposed project would provide new employment opportunities for dairy employees who chose not to relocate and work at the new dairy site.

#### *Economic Impacts*

Agricultural land values in the area are currently assessed at \$9.00 per \$1,000.00 of assessed value. Due to the proposed improvements, an increase in assessed land valuations is anticipated above those currently collected by the State and County. Some increase in the market value of the properties near the golf course is expected, but this is not necessarily construed as a negative impact.

The proposed golf course will contribute to the community from an economic standpoint. Maintenance and operation will generate full time employment opportunities and indirect employment off-site. In addition, increased State and County revenues will be generated from the golf course operation above those currently generated by the dairy and under utilized vacant lands. Based on the property appreciation of other similar golf course developments in Central Oahu, it can be expected that the adjoining property values will increase approximately one third above the current levels.

#### *Employment*

According to a study conducted by Decision Analysts Hawaii, Inc., entitled Hawaii Golf Courses: Impacts and Benefit Assessment, February 1990, a 180 acre golf course will generate between

29 and 82 jobs. Indirect jobs could result in another 9 to 30 new positions. Currently, the only employment generator is the dairy operation which employs approximately 30 individuals. However, current plans indicate that the dairy can be relocated resulting in relatively minor job loss. Considering the added jobs created by the proposed golf course, overall employment opportunities should be enhanced by the proposed project.

#### ***Government Revenues***

Annual tax revenues projected in the same study, are estimated at \$80,000 to \$175,000 to the County and over \$100,000 to the State. This compares to a current assessment rate for agricultural land and building value at \$9.00/\$1,000 assessed valuation. If the subject agricultural land were assessed at \$20,000/acre, this equates to an annual revenue collection of \$45,000 from the existing land uses.

#### ***Location and Intended Market***

Due to the relatively high demand for golf and limited availability of golf courses on Oahu, the proposed project will draw golfers from an island-wide basis and not depend solely on residents from the Waianae region. This is generally true for all golf courses on Oahu.

#### ***Housing Impacts***

The golf course master plan does not include development of residential dwelling units, and the land is not currently identified on the Development Plan or Land Use Ordinance for residential purposes. As such, no loss of residential building capacity is involved. Indirectly, however, the area-wide demand for housing may increase as a consequence of the added amenities the golf course will provide to the community and the net increase in the number of jobs generated by the golf course.

#### ***Affordable Units***

Similarly, affordable housing units are not included as part of the development scheme for this project. To the extent that approval of the proposed project will relieve some of the (golf course) development pressure directed toward other properties on Oahu more suitable for housing, approval of the project may assist in reducing the escalation of land prices currently paid for new golf course development. Therefore, reasonably priced land suitable for housing could indirectly increase if the proposed Development Plan Amendment is approved.

Conversely, by limiting the amount of golf course development and assessing large impact fees, the golf courses that are permitted will command higher land values, require higher greens fees, and push the value (i.e. price) of other potential golf course sites even higher. In this way, limiting the development of one type of land use (golf courses) may indirectly push the price of housing higher by limiting the availability of golf course sites and thereby pushing up the price of all land.

#### 4.2.4.3 Proposed Mitigation Measures

The applicant will comply with City and County of Honolulu requirements for community benefits fee or project impact fee for a golf course development. This benefits package is intended to reasonably address impacts which may be generated by the proposed project. The following programs are proposed:

1. Establish and fund a non-profit community foundation.
  - a. Form a non-profit foundation consisting of representatives from community organization within the Waianae region, the district council person, state legislators and developer's representative.
  - b. Contribute a total of \$2 million in the following manner:

i.	\$100,000	Within 30 days from the effective date of the rezoning ordinance from Agricultural District to P-2 General Preservation District.
ii.	1,900,000	One year after the receipt of grading permit for the golf course.
	\$2,000,000	TOTAL
  - c. Foundation responsible to review, fund and administer benefits affecting the Waianae community.
    - i. Scholarships, facility improvements and equipment purchases benefiting the elementary, intermediate and high schools serving residents of Waianae.
    - ii. Youth-related activities in Waianae, including anti-drug, crime prevention and recreational programs or activities.
    - iii. Health related programs in Waianae that provide rehabilitation and counseling.
    - iv. Cultural programs or facilities in Waianae that promote cultural education.
  - d. Foundation established as a permanent vehicle for charitable giving; engage the services of an established trust company to oversee the administration and the funding.
2. Public play at the golf course for the residents of the State of Hawaii.



- a. A minimum of 3.5 days per week, or a minimum of 50 percent of available tee times per week of an 18-hole golf course, shall be made available for public play for Hawaii State residents. Of these public play times, a minimum of one day shall be provided on weekend days.
  - b. Green fees comparable to other private golf courses which allow public play, such as Pearl, Hawaii Kai, Mililani, and Olomana golf courses.
3. A fee payable to the City and County of Honolulu of \$23 million to be deposited into the City's general fund.
- a. \$1,000,000 Upon receipt of grading permit for golf course.
  - b. 1,000,000 Within one year of grading permit.
  - c. 7,000,000 Upon commencement of operations of the golf course.
  - d. 7,000,000 One year after commencement of operations of the golf course.
  - e. 7,000,000 Two years after commencement of operations of the golf course.

\$23,000,000 TOTAL

4. Other Community Programs of Golf Course Developer.
- a. Waianae Valley Maintenance Program. Remove weed, cut grass and clean rubbish and debris along both sides of Waianae Valley Road, thereby, allowing school children to walk on the existing sidewalk instead of the road. Landscaping, as may be permitted, from the golf course entrance to intersection of Waianae Valley Road and Plantation Roads. Estimated cost: \$100,000.
  - b. Plantation Road. Landscaping on both sides of the road, with built-in irrigation, as necessary; asphalt sidewalk, 4-feet wide, from the intersection of Waianae Valley Road and Plantation Road down to the bridge and the elementary school. Estimated cost: \$75,000.00.
  - c. Waianae High School Golf Team. Maintain and support the Waianae High School golf team (and other high school teams on the Leeward Coast) by offering free practice rounds of golf after school, junior golf instruction programs during the summer, etc.
  - d. Employment Opportunities. Workers not absorbed by Mountain View Dairy when it relocates, or another dairy operation, will be retrained for work in golf course maintenance, etc.

#### 4.3 INFRASTRUCTURE

The proposed Waianae Kai project requires water, sewer, drainage, access, electric and telephone

services. The 27-hole golf course will utilize potable water for the clubhouse and private non-potable irrigation water for the tees, fairways and greens. Domestic waste water (sewage) will be disposed of via cesspools or septic systems and installed in accordance with applicable state and county rules and regulations. Drainage will be accommodated by existing facilities, through new drainage improvements, and on-site retention areas. Access is via the Waianae Valley Road. The following section provide details regarding infrastructure conditions and impacts.

#### **4.3.1 TRAFFIC**

##### **4.3.1.1 Existing Conditions**

Access to the proposed project site is from Waianae Valley Road, a minor two-lane roadway, is situated in the east-west or mauka-makai direction. Waianae Valley Road intersects Farrington Highway at a signalized cross-intersection, and continues makai of Farrington Highway servicing the Pokai Bay Beach Park. Existing roadways are shown in Figure 3.

The Waianae Valley Road approaches have a single lane for all movements and Farrington Highway has a shared through-left turn lane and a shared through-right turn lane. An alternative route from Farrington Highway is provided by Old Government Road at a signalized intersection, forming the east leg of the Farrington Highway intersection and heads into Waianae Valley where it changes to Plantation Road. Mauka from Farrington Highway, Plantation Road terminates at Waianae Valley Road in an un-signalized Y-intersection with Plantation Road being the west branch at this intersection.

The descriptions of existing traffic conditions at the Farrington Highway/Waianae Valley Road intersection, the signalized Farrington Highway/Old Government Road intersection and the Waianae Valley Road/Plantation Road intersection are based on manual traffic counts and field observations taken on a weekday afternoon and mid-day Saturday in April 1988. Additional traffic count data was obtained from the state of Hawaii, Department of Transportation.

The Highway Capacity Manual methodologies for the analysis of multi-lane highways, signalized intersections and un-signalized intersections were used to evaluate traffic conditions.

Existing weekday traffic volumes on the four-lane Farrington Highway near Kahe Point, located south of Waianae, shows that the northbound lanes (to Waianae) are at Level of Service (LOS) C and that the south bound lanes (to Honolulu) are at LOS B. The analysis of existing conditions at the signalized intersections of Farrington Highway/Waianae Valley Road and Farrington Highway/Old Government Road shows that these intersections operate at Level of Service (LOS) B during both the weekday and Saturday peak hours. The Waianae Valley Road/Plantation Road intersection operates at LOS A during both peak hours.

##### **4.3.1.2 Probable Impacts**

The traffic generated by the project was estimated using trip rates and equations for golf courses

from the Institute of Transportation Engineers' informational report, Trip Generation, Fourth Edition. Table 4 shows the trip generation rates and trip generation for the project.

**TABLE 4**  
**TRIP GENERATION**

	<u>Daily (vpd)</u>	<u>Enter (vph)</u>	<u>Exit (vph)</u>
<u>Trip Rates (per acre)</u>			
Weekday Peak Hour	8.325	0.031	0.355
Saturday Peak Hour	7.535	0.223	0.414
<u>Trip Generation (250 acres)</u>			
Weekday Peak Hour	2,080	8	89
Saturday Peak Hour	1,880	56	104

Note: vpd = vehicles per day  
vph = vehicles per hour

The project generated traffic would use Farrington Highway to travel to and from Honolulu or Makaha. Within Waianae Valley, project traffic would be expected to use either Waianae Valley Road or Plantation Road to access the project.

Weekday traffic was estimated to be 70 percent in the Honolulu direction and 30 percent in the Makaha direction. On Saturdays, the project is estimated to have 90 percent of its traffic in the Honolulu direction with 10 percent in the Makaha direction.

Existing traffic volumes were used as a baseline for future impact conditions. Analysis of the new "T"-intersection at the proposed project's connection to Waianae Valley Road, with all project traffic entering as east bound left turns from Waianae Valley Road, indicates that a separate left turn storage lane on Waianae Valley Road would not be warranted. An analysis of the weekday peak hour traffic volumes on the four-lane Farrington Highway at Kahe Point (south of Waianae) shows that northbound and southbound lanes would remain at LOS C and LOS B, respectively.

#### 4.3.1.3 Proposed Mitigation Measures

Although project traffic could be expected to be distributed between Waianae Valley Road and Plantation Road, the analyses of impacts within Waianae used two "worst-case" traffic assignments. Case 1 assigned all project traffic entirely onto Waianae Valley Road while Case 2 assigned all project traffic to the Plantation Road and Old Government road corridor. Table 4 summarizes the findings from the analyses for each case. Based upon the analysis, the existing roadway facilities will be able to

handle the increased traffic in the area due to the project. While the increases in traffic volumes on Waianae Valley Road and on Plantation Road could be relatively large, the analysis of turn movements to and from driveways on these roadways shows that LOS A would continue to describe conditions along these roadways.

The analysis of "worst-case" conditions at the Farrington Highway intersections indicate that there would be adequate capacity at the affected intersections if all the project traffic were assigned to either Waianae Valley Road or Plantation Road. The only improvement which may be required would be the modification of the signal timing at the Farrington Highway/Waianae Valley Road intersection.

#### **4.3.2 WATER SUPPLY**

##### **4.3.2.1 Existing Conditions**

Existing water systems include two municipal 12-inch water mains located along Waianae Valley Road. This line currently provides water for both domestic and agricultural uses, as well as fire protection. Additionally, two private wells located on the project site are presently used for the water requirements of the dairy. Existing utilities are shown in Appendix E and F.

##### **4.3.2.2 Probable Impacts**

The present Board of Water Supply "242" system is adequate to serve the golf course clubhouse's estimated potable average water demand of between 24,000 to 36,000 gallons per day (gpd.). That demand is based on the average daily use of 400 to 600 persons at a rate of 60 gpd. For potable water, the developer proposes to request municipal service from the Board of Water Supply and pay the appropriate facility charge for source, storage and transmission.

##### **4.3.2.3 Proposed Mitigation Measures**

The developer proposes to use existing wells and develop additional private on-site wells to irrigate the golf course. The water would be stored and pumped into the irrigation pipe system from lined ponds located in the golf course. Based on 4,000 gallons per acre, the estimated average irrigation water demand is about 1,000,000 gallons per day for the 252 acres. Although the water system will remain private, appropriate permits will be secured from the Board of Water Supply and/or State Water Commission for construction and use of the wells.

#### **4.3.3 WASTEWATER DISPOSAL**

##### **4.3.3.1 Existing Conditions**

The existing municipal wastewater system serves only the lower Waianae area with its nearest collection pipeline being approximately 4,000 feet from the access road to the proposed golf course. Consequently, homes unable to connect into the central sewer line collection system, currently dispose of their

wastewater in underground cesspools.

#### **4.3.3.2 Probable Impacts**

Until the municipal wastewater system is extended to the project site, sewage from the clubhouse will be disposed of into a series of underground cesspools or septic systems within the boundaries of the proposed golf course. The disposal facilities would be located near the clubhouse makai of the no-pass line set by the Board of Water Supply (BWS) and Department of Health (DOH).

#### **4.3.3.3 Proposed Mitigation Measures**

The proposed clubhouse is estimated to generate 20,000 to 30,000 gallons per average day of domestic waste water based on 400 to 600 persons at a rate of 50 gallons per day. Appropriate permits and approvals will be requested from the Department of Health and Board of Water Supply for the proposed waste water disposal system.

### **4.3.4 SOLID WASTE DISPOSAL**

#### **4.3.4.1 Existing Conditions**

At present, solid waste generated in neighboring residential areas is collected and disposed of by the City and County, Department of Public Works, Refuse Division. Due to the lack of expected significant impacts to the existing and/or planned solid waste refuse collection and disposal system, mitigation measures to minimize potential adverse impacts do not appear warranted.

#### **4.3.4.2 Probable Impacts**

It is estimated the proposed project would generate fewer tons of solid waste per day than neighborhood areas. It has been estimated that an average generation rate of approximately 18 pounds per day per dwelling unit is generated by residential dwellings in the Waianae District. During the construction phase, solid wastes would be collected and disposed of by the building contractor(s). It is presumed that the domestic solid waste generated by the residents of the development would be of similar composition to that generated in other Oahu residential neighborhoods. The overall levels of solid waste generated by the Waianae Golf Course should not significantly add to the existing levels.

#### **4.3.4.3 Mitigation Measures**

During project construction, solid waste (such as waste concrete, etc.) will be disposed of on-site to the extent permitted by applicable City ordinances. Once the construction phase is complete, clubhouse refuse will be disposed of at the appropriate City landfill or the new waste/electrical generation facility located at Campbell Industrial Park. Consequently, impacts to the existing City and County refuse collection and disposal system appears to be minimal and insignificant.

#### **4.3.5 ELECTRICAL POWER AND COMMUNICATION SYSTEMS**

##### **4.3.5.1 Existing Conditions**

Existing overhead facilities along Waianae Valley Road will be available to service the proposed golf course clubhouse, access road and parking lot area. New lines will be placed underground as determined practical. The developer will request that Hawaiian Electric Company provide electric service at the appropriate time.

The developer will request that Hawaiian Telephone Company provide service at the appropriate time. No significant increase in telephone service improvements in the area is anticipated.

##### **4.3.5.2 Probable Impacts**

Significant increases in either electrical demand or telephone service due to the proposed project are not anticipated.

##### **4.3.5.3 Proposed Mitigation Measures**

Beyond working with the utility companies to provide an extension of services, no other mitigation measures are warranted.

#### **4.4 PUBLIC SERVICES AND FACILITIES**

##### **4.4.1 PUBLIC SCHOOLS**

###### **4.4.1.1 Existing Conditions**

At present, nine public schools service the Waianae District. Maili Elementary School and Playground are near the project site and Nanakuli and Waianae Intermediate and High Schools are within a few miles of the project site.

###### **4.4.1.2 Probable Impacts**

Inasmuch as no residential dwellings are included in the conceptual plan for the proposed golf course, no significant impact on the schools in the region is anticipated. However, the developer will work with the area schools to provide access for golf teams or physical education classes.

###### **4.4.1.3 Proposed Mitigation Measures**

The developer has set forth a community benefit package which provides for maintenance of high school

golf teams, offers after school tee times, as well as establishing a community trust fund which could be used to equip local schools with needed educational or recreational items.

#### **4.4.2 PARKS**

##### **4.4.2.1 Existing Conditions**

Existing public recreational facilities in the Waianae District include Ulehawa and Maili Beach Parks, Maili Playground and Nanakaipono Playground, Makaha Beach Park, Waianae Regional Park and Waianae Boat Harbor (Pokai Bay). In addition, there are several privately owned recreational facilities, a majority of which are open to the general public, e.g., Makaha Valley Country Club golf courses.

##### **4.4.2.2 Probable Impacts**

The proposed project is not expected to significantly impact any of the present or planned public recreational facilities in Waianae District. The Waianae Golf Course would add to the recreational opportunities in the region.

##### **4.4.2.3 Proposed Mitigation Measures**

Due to lack of significant adverse impacts of the proposed project, no additional mitigation measures are submitted.

#### **4.4.3 HEALTH CARE FACILITIES**

##### **4.4.3.1 Existing Conditions**

Public health care in the Waianae District is provided by and from the Waianae Coast Comprehensive Health Care Center, located just to the north of the project site. Additionally, ambulance service is available from the Waianae Fire Station, approximately 3.5 miles northwest of the project site.

##### **4.4.3.2 Probable Impacts**

The proposed project will not increase population levels of the Waianae District, therefore, the Waianae Golf Course is not expected to impact the levels of service provided by either the Waianae Coast Comprehensive Health Care Center or fire department ambulance service.

##### **4.4.3.3 Proposed Mitigation Measures**

Due to lack of significant adverse impacts to health care services in the Waianae District, no mitigation measures appear necessary.

#### **4.4.4 POLICE AND FIRE PROTECTION**

##### **4.4.4.1 Existing Conditions**

Police protection services are located in Waianae town and based in a police substation, approximately 3.5 miles northwest of the project site. Both the police and fire departments are working with the residents of the district to maintain and/or improve existing levels of service. Existing and planned police and fire protection services and facilities are considered adequate.

Currently, there is one fire station located in Waianae and another with similar capabilities located in Nanakuli, located approximately 3.5 miles southeast of the project site. A new station located in the Campbell Industrial Park will provide an additional engine and ladder company with 13 on-duty personnel as required.

##### **4.4.4.2 Probable Impacts**

Although no significant increase in area-wide population is anticipated from project development, fire protection will be necessary. However, it should be noted that the establishment of the irrigated landscape buffer of the golf course, will largely protect existing residential dwelling from grass and brush fires that frequent the Waianae region during summer months. Additionally, the added availability of the private water system will add to fire protection capability.

##### **4.4.4.3 Proposed Mitigation Measures**

Although no significant increase in area-wide population is anticipated from project development, police protection will be necessary. The applicant will advise the police department of project implementation and phasing to permit adequate planning and advance notice of project completion. The applicant will advise the fire department of project implementation and phasing to permit adequate planning and advance notice of project completion.



## Chapter V

## CHAPTER V

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

#### 5.1 THE HAWAII STATE PLAN

#### 5.2 STATE LAND USE LAW, CHAPTER 205

The Hawaii State Plan (Chapter 226, Hawaii Revised Statutes), establishes a set of goals, objectives and policies that are to serve as long-range guidelines for the growth and development of the state. The Plan is divided into three parts. Part I (Overall Theme, Goals, Objectives and Policies); Part II (Planning, Coordination and Implementation); and Part III (Priority Guidelines). Part II elements of the State Plan pertain primarily to the administrative structure and implementation process of the Plan. As such, comments regarding the applicability of this part to the proposed project are not appropriate. The following sections of the Hawaii State Plan are directly applicable to the proposed project:

#### 226-6 Objectives and Policies for the Economy – General

##### Objective:

(a)(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people.

(a)(2) A steadily growing and diversified economic base that is not overly dependent on a few industries.

##### Policies:

(b)(10) Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems.

(b)(11) Maintain acceptable working conditions and standards for Hawaii's workers.

(b)(13) Encourage businesses that have favorable financial multiplier effects within Hawaii's economy.

Response: Development of the proposed golf course in Waianae, will improve the overall living standards for Hawaii's people by providing needed jobs in the area, continued enhancement of Hawaii's tourist related industries, and produce a climate conducive to the stimulation and development of new and expansion of existing businesses in the area.

## **226-7 Objectives and Policies for the Economy - Agriculture**

### **Objective:**

(a) Planning for the State's economy with regard to agriculture shall be directed toward achievement of the following objectives:

(a)(1) Continued viability in Hawaii's sugar and pineapple industries.

(a)(2) Continued growth and development of diversified agriculture throughout the state.

### **Policies:**

(b)(6) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.

**Response:** Although approximately 30 acres of the entire 252 acre site is utilized as a dairy cattle feedlot and milk production facility, the remaining balance of 220 acres is essentially non-productive vacant land. Additionally, if the project is approved, the dairy operation will be relocated and another form of permitted diversified agriculture land uses (foliage production and golf course) will be established in its place. If the golf course (a permitted use in the State Agriculture District) is defined as a diversified agriculturally related industry, the total number of agricultural jobs created by the golf course, foliage operation, and relocated dairy, will actually increase area employment above the current levels.

As described in the Preliminary Engineering Report, on-site wells will be used for golf course irrigation purposes. Potable water from the Board of Water Supply's water distribution system will be used only for the golf clubhouse. As such, non-potable water will be adequate to accommodate the irrigation needs of the golf course and nursery, while potable water not used for the golf course can be more efficiently used for residential purposes elsewhere in Waianae. As previously described, the surrounding lands are not agriculturally suitable.

## **226-12 Objectives and Policies for the Physical Environment - Scenic, Natural Beauty and Historic Resources.**

### **Objectives:**

(a) Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/historical resources.

**Policies:**

(b)(3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.

(b)(5) Encourage the design of developments and activities that complement the natural beauty of the islands.

**Response:** The proposed project has been planned and designed to maintain and/or enhance the natural features of the site. Buildings have been planned and sited to maintain the primary vistas to the mountains. The heavily landscaped open space character of the project would complement the surrounding environment and be more visually compatible than the existing dairy operation and feedlot. Any historical/cultural or archaeological sites will be protected in accordance with an accepted archaeological mitigation plan.

**226-13 Objectives and Policies for the Physical Environment - Land, Air and Water Quality.**

**Objectives:**

(a) Planning for the State's physical environment with regard to land, air and water quality shall be directed towards achievement of the following objectives:

(a)(1) Maintenance and pursuit of improved quality in Hawaii's land, air and water resources.

(a)(2) Greater awareness and appreciation of Hawaii's environmental resources.

**Policies:**

(b)(2) Promote the proper management of Hawaii's land and water resources.

(b)(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground and coastal waters.

(b)(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.

(b)(6) Encourage design and construction practices that enhance the physical qualities of Hawaii's Communities.

**Response:** The proposed project has been planned and designed in an environmentally compatible and beneficial manner that would foster the recognition, importance, and value of the area's land, air and water resources. The site is not subject to unusual hazards associated with

erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters. Effective measures will be implemented to mitigate and monitor any possible impacts of the golf course on ground water. Retention basins and other design features will be incorporated to permit on-site infiltration of surface water and allow additional time for the sedimentation of silt. Given the relatively low rainfall levels in the region, generally all of the surface runoff will be retained on site. Design and construction will both take advantage of the existing aesthetic quality of the area while enhancing the physical attributes of Waianac.

## **226-16 Objectives and Policies for Facility Systems - Water**

### Objectives:

(a) Planning for the State's facility systems with regard to water, shall be directed toward achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational and other needs within resource capacities.

### Policies:

(b)(1) Coordinate development of land use activities with existing and potential water supply.

(b)(3) Reclaim and encourage the productive use of runoff water and waste water discharges.

(b)(4) Assist in improving the quality, efficiency, service and storage capabilities of water systems for domestic and agricultural use.

Response: Water for the proposed golf course will be withdrawn from on-site wells and stored in retention/storage ponds. Every effort will be made to mix treated effluent with brackish water to use for golf course irrigation purposes. All applicable Department of Health standards for irrigation, ground water monitoring, and disposal of sewage waste water, will be implemented to ensure continued high quality of the ground water resource.

## **5.3 STATE FUNCTIONAL PLANS**

The Hawaii State Plan directs the appropriate state agencies to prepare functional plans for their respective program areas. As such, these functional plans serve as the primary implementing vehicle for the goals, objectives and policies of the Hawaii State Plan. The following sections of the listed State Functional Plans are directly applicable to the proposed project.

### 5.3.1 STATE HISTORIC PRESERVATION FUNCTIONAL PLAN

The objectives, policies and implementing actions of the State Historic Preservation functional Plan are directed toward state agencies, primarily the Department of Land and Natural Resources, Historic Sites Section (DLNR-HSS). The archaeological resources of the project site have been surveyed and evaluated by DLNR-HSS. The developers of the project, will implement the mitigation measures recommended by the consulting archaeologist for site T-24 which requires additional investigation.

### 5.3.2 STATE RECREATION FUNCTIONAL PLAN

The objectives, policies and implementing actions of the State Recreation functional Plan are oriented toward improving public recreation opportunities both now and in the future. The State Recreation Functional Plan evaluates existing and future recreation demand and facilities, and establishes policies to promote an overall conservation ethic, preservation and restoration of significant natural and historic resources, proper management of resources, enhance educational programs, and consolidate State and County governmental functions. Other objectives of the plan include "guiding State and County agencies in acquiring and preserving lands of recreational value, and ensuring public access to recreational areas."

Response: Development of the proposed golf course would utilize lands suitable for recreation without impacting significant natural and historic resources. Public access to the facility is also ensured by the developer as a component of the proposed community benefits package. A minimum of 3.5 days per week, or a minimum of 50% of the available tee times per week of an 18-hole golf course, shall be made available for public play for State of Hawaii residents. Of these public play times a minimum of one day shall be provided on weekend days. Green fees will be comparable to other private golf courses which allow public play.

### 5.3.3 STATE AGRICULTURE FUNCTIONAL PLAN

One of the primary goals of the State Agriculture Functional Plan, centers on the preservation and continued use of important agricultural lands in support of the state-wide agricultural industry. To assess the agricultural significance (potential) of the subject property relative to agricultural resources of the State of Hawaii, a variety of potential agricultural land uses were evaluated for the subject property.

These possible agricultural uses have been determined by evaluating three sets of factors: (1) the physical, agronomic and environmental characteristics of the land; (2) economic variables such as the existence and locations of markets for goods that can feasibly be produced on the land, the cost of inputs required to produce the goods and the supply of similar products from other sources; and (3) the current and future demand of agricultural producers for land having the same physical, agronomic and environmental characteristics as the subject property.

Response: Based on the findings of this analysis, the redesignation of the project to permit the proposed golf course, and subsequent loss of agriculturally designated lands, will not significantly impact agricultural activities on Oahu or on a State-wide basis. The agronomic qualities of the subject property

are not conducive to economically productive agriculture.

Relocation of the dairy to a more suitable site, will maintain the agricultural productivity of the dairy, preserve agricultural employment, and establish a more compatible land use proximate to residential development.

Inasmuch as the golf course is a permitted use under Chapter 205, HRS, and no significant loss of agriculturally suitable land is involved, development of the site for the uses proposed are consistent with the intent of applicable sections of the Hawaii State Plan and Agricultural Functional Plan.

Additionally, the agricultural significance of the subject property has been examined relative to the State's "Right To Farm" Act, Hawaii Revised Statutes, Chapter 165. The Right To Farm Act is important as the act specifies that "The preservation and promotion of farming is declared to be in the public purpose and deserving of public support" and "No court, official, public servant or public employee shall declare any farming operation a nuisance for any reason if the following have been proven:

- (1) That the farming operation was not in violation of this section at its established date of operation;
- (2) That the stated or implied basis for the nuisance complaint is that conditions have changed in the vicinity of the farming operation since its established date of operation;
- (3) That the farm operation was lawfully in operation for at least one year prior to the nuisance complaint;
- (4) That the alleged nuisance did not result from the negligent conduct or improper operation of the farming operation; or from any aspect of the operation which is determined to be injurious to public health or safety; and,
- (5) That the alleged nuisance does not involve water pollution or flooding."

Response: The proposed project would serve as a buffer between existing residential areas and existing farming activities. As such, the open space character of the project would promote the intent of the "Right to Farm" Act by providing a transitional area from agricultural to residential land use. Odors, dust, and noise sometimes associated with agricultural operations would be largely buffered from higher density residential land uses.

#### 5.4 CITY AND COUNTY OF HONOLULU GENERAL PLAN

The proposed project implements the objectives and policies of the City's General Plan in the areas of population, economic activity, natural environment and culture and recreation. The specific General Plan objectives and policies and their applicability to the proposed project are discussed below.

Population, Objective B - To Plan for Future Population Growth

Policy 2: Provide adequate support facilities to accommodate future growth in the number of visitors to Oahu.

Comment: The proposed project is in keeping with the population distribution policy set forth in the Waianae Development Plan while providing an important recreational facility for future Waianae area residents and visitors.

Economic Activity, Objective A - To promote employment opportunities that will enable all the people of Oahu to attain a decent standard of living.

Policy 1: Encourage the growth and diversification of Oahu's economic base.

Comment: The proposed Waianae Kai project will directly provide expanded economic opportunities in many areas, including construction, golf course operation and maintenance, and indirectly in businesses that provide goods and services to the surrounding community.

Economic Activity, Objective E - To prevent the occurrence of large scale unemployment.

Policy 1: Encourage the training and employment of present residents for currently available and future jobs.

Comment: The proposed project anticipates creating an employment base of up to 30 or 40 people for service operation and maintenance purposes. Many of these employees will receive on-the-job training that will be transferable to future job opportunities should they arise. In addition, some of these jobs will be higher paying than those currently provided by the dairy. However, relocation of the existing dairy operation will maintain many of the exiting jobs relating to this enterprise.

Natural Environment, Objective A - To protect and preserve the natural environment of Oahu.

Policy 1: Protect Oahu's natural environment, especially the shoreline, valleys and ridges, from incompatible development.

Comment: The proposed Waianae Kai project will not affect the shoreline, and will be environmentally compatible with the valleys and ridges in the area. Drainage control structures and landscaping will enhance the ability to control erosion and discharges during intense storm events.

Natural Environment, Objective B - To preserve and enhance the natural monuments and scenic views of Oahu for the benefit of both residents and visitors.

Policy 2: Protect Oahu's scenic views, especially those seen from highly



developed and heavily travelled areas.

Comment: Although the proposed project will not affect the scenic views of the Waianae Range, Kamaileunu ridgeline or Paheehēe ridgeline from either Waianae Valley Road or from within the project itself, it will improve the scenic makai views from areas mauka and above the project area.

Policy 4: Provide opportunities for recreational and educational use and physical contact with Oahu's natural environment.

Comment: The proposed project will provide additional recreational opportunities that will be available to the public. Currently, the site is generally inaccessible and non-recreational in its present vacant condition. As such, no on-site recreational opportunities currently exist.

Physical Development and Urban Design, Objective A - To coordinate changes in the physical environment of Oahu to ensure that all new developments are timely, well-designed and appropriate for the areas in which they will be located.

Comment: The timeliness of the Waianae Kai project is warranted by the fact that no other golf course has been developed recently in the Waianae community. In addition, the site is centrally located with a design that complements surrounding land uses, views and aesthetic qualities.

Physical Development and Urban Design, Objective A, Policy 2: Coordinate the location and timing of new development with the availability of adequate water supply, sewage treatment, drainage, transportation and public safety facilities.

Comment: The proposed project will require private construction of on-site septic systems or cesspools in accordance with Department of Health regulations, to accommodate the expected waste water generated. The Board of Water Supply is presently developing new sources of water to serve the area and the developer proposes to assist in that development, as well as develop its own irrigation water supplies.

Existing and proposed drainage structures and on-site retention of runoff will adequately manage both on-site and off-site flows. No new expenditures of public funds will be required. Transportation facilities and systems have been designed to accommodate future population growth in the area and increased traffic levels that may be generated by the proposed golf course. Existing public facilities (police and fire stations) are adequate to serve the forecasted population growth for the area.

Physical Development and Urban Design, Objective A, Policy 4: Require new developments to provide or pay the cost of all essential community services, including

roads, utilities, schools, parks and emergency facilities that are intended to directly serve the development.

Comment: The applicant will continue to comply as applicable to this policy.

Culture and Recreation, Objective D - To provide a wide range of recreational facilities and services that are readily available to all residents of Oahu.

Policy 7: Provide for recreation programs which serve a broad spectrum of the population.

Policy 10: Encourage the private provision of recreation and leisure-time facilities and services.

Comment: The proposed Waianae Kai project meets the above policies inasmuch as a private entity will provide a recreational facility which has the potential to service a wide population base.

## 5.5 CITY AND COUNTY OF HONOLULU LAND USE ORDINANCE

The Land Use Ordinance (LUO) of the City and County of Honolulu is intended to regulate the use of land in a manner that will encourage orderly development in accordance with adopted land use policies. Permitted land uses are classified as "Principal", "Special Accessory" and "Conditional" which restrict the various uses for the existing zoning classification. The corresponding Zoning Map Number 15 Lualualei to Makaha designates one zoning district on the entire project site; Agriculture (Ag-2). Figure 5 shows County zoning.

However, due to the recently adopted Ordinance 19-50, golf courses are no longer a conditional use within the AG-2 zoning district. As such, a zoning amendment will be submitted at the appropriate time to reclassify the property from AG-2 to P-2.

In addition, Chapter 21A-5,10-2 Revised Ordinances of Honolulu was amended in 1989 to allow for approval of requests for golf courses based on the following criteria:

- C.1 *Encouraging the use of non-potable water for irrigation subject to the approval of a proposed irrigation plans the State Department of Health and Land and Natural Resources and the City Board of Water Supply and Department of Public Works;*
- C.2 *Provisions to enhance public play for Hawaii residents;*
- C.3 *Programs to minimize and monitor the environmentally detrimental effects of the application of fertilizers, pesticides and herbicides;*

- C.4 Programs to address any displacement of existing uses and residents;*
- C.5 The compatibility of the proposed golf course with both existing and planned surrounding uses;*
- C.6 Preservation or enhancement of greenbelts or open space, historic and natural resources, and public views; and,*
- C.7 Any other impacts which may substantially affect surrounding uses and residents.*

**Comment:** The Waianae Kai Proposed golf course meets all criteria defined by Ordinance 21A-5.10-2, as evidenced by the material contained in this report. Non-potable water will be used, opportunities for public play will be enhanced and guaranteed, fertilizers, pesticides and herbicides will be monitored in accordance with DOH regulations, existing uses (i.e. the dairy) will be relocated, the golf course will serve as a buffer between agricultural and residential land uses, open space and public views are enhanced as compared to the current condition, and other miscellaneous mitigation measures will be implemented to reduce other impacts. Adequate groundwater for irrigation purposes is available through wells developed on site.

## **5.6 WAIANAE DEVELOPMENT PLAN**

According to the City Charter, Development Plans (comprised of a text and maps) are relatively detailed guidelines that establish the physical development of the island as implemented by the objectives of the General Plan. The Development Plan contains two portions: Common Provisions that are common to all eight Oahu development plans and Special Provisions that address specific planning area descriptions, urban design principles, and controls and development priorities for each planning area. There are also two map elements of the DP's: 1) Land Use Maps which define the DP area and distribute the various DP land uses consistent with General Plan objectives and policies; and 2) Public Facilities Maps that identify planned public and private facilities and associated infrastructure. The Waianae Neighborhood Board voted to recommend approval of the Waianae Golf Course Development Plan Amendment at their meeting of April 11, 1991.

### **5.6.1 Common Provisions**

#### **Section 4. General Urban Design Principles and Controls**

##### **1. Public Views**

**Comment:** The proposed Waianae Kai project will not affect public views of the Waianae Range, Kamaileunu ridgeline or Paheehee ridgeline from outside the project boundaries or from within the project boundaries. Similarly, views of the ocean and Waianae coastline that are available from within the project boundaries will be retained

and enhanced. The applicant will comply with appropriate Land Use Ordinance (LUO) provisions to ensure that the above noted view planes are maintained. Further, overhead electrical transmission and communication lines will be placed underground to maintain and enhance existing view planes.

## 2. Open Space

Comment: The Waianae Kai project will establish well managed and maintained open space corridors that will serve two purposes. First, maintenance of existing open spaces will assist in preserving view planes. Secondly, the project will also function as a physical separation between residential land uses and existing agricultural activities.

## 3. Vehicular and Pedestrian Routes

Comment: In compliance with the DP Common Provisions, the proposed project will include landscaping along the major access roadway within the project boundaries; include appropriate signing, lighting, sidewalks and pedestrian corridors to enhance the safety and convenience of pedestrians, and to minimize conflicts between pedestrian and vehicular movements.

## 4. General Height Controls

Comment: All structures within the Waianae Kai project will conform to maximum allowable heights as defined in the Special Provisions and LUO.

## Section 5. General Principles and Controls for Parks, Recreation and Preservation Areas

### 1. Parks and Recreation Areas

Comment: The proposed Waianae Kai project focuses development entirely on a 27-hole golf course that will be designed and located to ensure compatibility with Waianae and surrounding neighborhoods. The primary adjoining land uses include the City and County of Honolulu land fill, vacant lands owned by the State of Hawaii, Waianae Agricultural Park, residential, and crop farming. All of these adjoining land uses will benefit by development of the golf course due to the buffering provided between the residential and agricultural land uses, and the maintenance of open space – accessible to the neighboring community – as opposed to the present agricultural and vacant condition.

### 2. Preservation Areas

Comment: There are no designated Preservation areas on or adjacent to the project area.

## Section 10. Social Impact of Development

## 1. Social Impact Factors

**Comment:** The potential social impacts that could result from the proposed Waianae Kai project are expected to be generally positive. The compatibility of a golf course adjacent to residential and agricultural land uses, job creation, preservation of open space, and mitigation of perceived environmental concerns, will enhance the overall socio/economic opportunities and aesthetic character of the community.

### 5.6.2 Special Provisions

#### Section 1. Area Description

The Special Provisions of the Waianae Development Plan note that physical growth and development in the urban-fringe area should be managed so that:

- a. An undesirable spreading of development is prevented, and;
- b. The proportion of the island-wide resident population remains unchanged.

Further, the Special Provisions note that "It is the intent of the Waianae Development Plan, that the pattern of the urban development in Waianae generally remain linear along Farrington Highway, with relatively low building heights. The overall agricultural and open space setting is to be retained."

**Comment:** The proposed project will not establish tall structures, will maintain linear growth patterns in compliance with the DP population projections, and not reduce opportunities for affordable housing. The property is designated by the State as Agriculture of which golf courses are a permitted use for the "C", "d", and "E" soils present. Similarly, the site is not designated for residential development by the City's Waianae Development Plan or Land Use Ordinance.

#### Section 2. Urban Design Principles and Controls for Waianae

##### 1. Specific Urban Design Considerations

###### a. Open Space

**Comment:** In compliance with this Section of the Special Provisions, the visibility, preservation, enhancement and accessibility of open space areas, as defined in Section 4 of the Common Provisions, have been given high priority in the design of the Waianae Kai project. Specifically, views of Kamaileunu ridgeline, Paheehce ridgeline and the Waianae Range will be retained.

###### b. Public Views

Comment: As noted previously view planes of the Waianae Range, Kamaileunu ridgeline and Paheehē ridgeline from both outside and within the project boundaries will be retained.

c. Height Controls

Comment: The general height limits of all structures within the project will be in compliance with the Special and Common Provisions of the Development Plan, and applicable provisions of the Land Use Ordinance.

Section 3. Development Priorities

Comment: There are no specific development priorities listed for Waianae. However, planning for the proposed Waianae Kai project has been performed in consonance with the policies set forth in Section 9 of the DP Common Provisions.

c. Land Use Map

Comment: The Waianae Development Plan Land Use Map will be unaffected by the proposed Waianae Kai Project, however, the map must be amended to permit the proposed project to proceed.

d. Public Facilities Map

The Waianae Development Plan Public Facilities Map will be unaffected by the proposed Waianae Kai project. No significant improvements of public facilities, funded by the City or State, will be required to support the proposed golf course. All improvements to transportation systems, water, and waste water facilities required for the project will be funded by the developer.

5.7 COASTAL ZONE MANAGEMENT ACT

The proposed Waianae Kai project is located outside City and County of Honolulu's Special Management Area. Similarly, the site is not subject to programs and regulations administered by the State's Coastal Zone Management Program. Surface runoff will be retained on-site to the greatest extent possible to reduce the potential for sediment discharge into the ocean.

5.8 ENVIRONMENTAL IMPACT STATEMENTS (CHAPTER 343, HRS)

An Environmental Assessment Negative Declaration was previously prepared and reviewed by the City and County of Honolulu Department of Land Utilization and accepted as part of a

previously submitted Conditional Use Permit Application for the same project as stated in their correspondence of December 16, 1988, (See Appendix F of the subject Development Plan Amendment).

In accordance with of Chapter 343 Hawaii Revised Statutes and Title II, Department of Health, Chapter 200, Environmental Impact Statement Rules, Sections 11-200-9 through 11-200-13, this same Environmental Assessment Negative Declaration was submitted in support of a Development Plan Amendment Application for the proposed golf course development. However, according to Rule 8.2 (e) of the "Procedures for Amending Development Plans", the Chief Planning Officer shall determine within 30 days of the receipt of an Application, if the proposed action is subject to HRS, Chapter 343, whether or not the project is exempt, and whether or not an Environmental Impact Statement (EIS) is required."

In accordance with Rule 8.2 (e), the Chief Planning Officer determined on February 4, 1991, that the December 16, 1988 Environmental Assessment was no longer acceptable and that an Environmental Impact Statement would be required to support the 1991 Development Plan Amendment for the Waianae Kai Golf Course. Accordingly, the Environmental Impact Statement Preparation Notice was published in the February 23, 1991 OEQC Bulletin with a deadline date for comments of March 25, 1991. No comments regarding the proposed golf course were received as requested in the published Preparation Notice (see Section 7.2).

The Draft Environmental Impact Statement and comments regarding the response to the February 23, 1991 Preparation Notice, was prepared and hand-delivered to the Department of General Planning on April 12, 1991 and to OEQC on the following week. The OEQC Bulletin published the notice requesting comments for the Draft Environmental Impact Statement on April 23, 1991. All agency comments received as of the publication date for the Final Environmental Impact Statement are contained in Section 7.3.

## Chapter VI



## CHAPTER VI

### **6.0 TOPICAL ISSUES**

#### **6.1 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES**

As with all new construction, development of the subject property would result in irretrievable resource commitments of water, land, energy, capital and construction materials. Implementation of the project would also generate increased income for the State and County, but most importantly the project would provide open space recreation for Waianae residents and expanded employment opportunities. Additionally, the proposed community benefits package will provide continued benefits in the years to come. These positive aspects should be weighed against the commitment of resources required to realize the development. Consideration should also be given to the socio-economic benefits of the property as compared to continuance of the site as vacant relatively open space.

During and after construction, extensive measures are proposed to manage fertilizer and pesticide applications and storage. Erosion control measures and the establishment of new plant materials will mitigate the loss of soils and facilitate high levels of water quality. All waste water collection, treatment, and disposal requirements of the State Department of Health will be followed. As such, the possibility of environmental accidents or other significant environmental damage resulting from any phase of the action is considered very unlikely.

#### **6.2 CONSIDERATION OF OFFSETTING GOVERNMENTAL POLICIES**

The proposed project has been generally demonstrated to be consistent with Hawaii's existing land use policies, plans, goals, objectives and other land use controls. Chapter 5 furnished an in-depth evaluation of the project and these land use management tools. There are, however, inherent contradictions and conflicts within the system which cannot be avoided. Providing homes and services for the growing population, and safeguarding the large service sector economy in the State are goals which are not entirely compatible with preservation of open space and protection of the State's agricultural industry, or expansion of recreational opportunities for residents and visitors. Protection of air and water quality, and minimization of noise impacts cannot easily be resolved with the need for more efficient transportation and continued population growth.

The Waianae Golf Course project addresses these conflicts by utilizing the planning and regulatory processes to develop beneficial social and economic benefits while minimizing adverse environmental impacts through formation of mitigation measures and a community benefits package.

#### **6.3 UNRESOLVED ISSUES**

The existing and proposed resort, commercial and residential development along the South

Leeward Coast will result in expansion of the population and economy of the area. The development of regional plans by the State and County have been initiated in an effort to guide this growth.

The cumulative impact of public projects, such as the residential project at Kapolei, and other private projects such as Ewa By Gentry, Maili Kai, and West Beach is an uncertainty. The effect of these developments on the phasing and timing of new, as well as existing, infrastructure, must be addressed on a regional basis, through existing State and County regulatory systems, and guided by regional plans. The phasing and situation of public facilities, development of water sources and location of a new residential areas are all crucial elements in the future of the Leeward Coast. The publication of this environmental impact statement and the accompanying public review process will contribute to resolving the issues discussed above.

#### **6.4 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY**

The proposed golf course would comply with all State Department of Health guidelines for groundwater monitoring and effective golf course management. The project is designed to preserve significant view planes, maximize natural drainage features, and serve as a buffer separating agricultural land uses from existing and potential residential areas. Water conservation would be promoted by the use of on-site irrigation wells and landscaping employing indigenous flora.

If feasible, the applicant will work with the County to use effluent for irrigation purposes. In addition, the applicant intends to assist with waste water improvements as required by the Department of Public Works to the extent that impacts are generated by the project.

The design of the golf course will maximize the use of natural drainage to recharge the aquifer and to alleviate the need for stream channelization and other formal drainage systems in nearby areas. No existing wetlands or wildlife habitats exist on the subject property. To reduce the quantities of non-potable irrigation water required, natural vegetation will be preserved to the greatest extent practicable and landscaping with indigenous flora appropriate to the setting and in recognition of water conservation principles will be utilized.

Management and maintenance of the project will provide for the employment of a well-qualified golf Course superintendent to be responsible for sound management practices with regard to fertilizer and pesticide application. Monitoring programs and contingency plans to rectify potentially harmful occurrences due to accidents, injudicious use or other management failures will be developed.

The applicant has completed a traffic impact study and will provide for mitigation measures as necessary for the project.

## Chapter VII

## CHAPTER VII

### 7.0 REFERENCES

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## 7.1 LIST OF FINAL EIS PREPARERS

This Environmental Impact Assessment was prepared for Herbert K. Horita Investments by PBR HAWAII with additional reports furnished by subconsultants. Those involved were:

### PBR HAWAII

Frank Brandt	President
David Hulse	Associate/Author of EIS
Ramona Mattix	Project Planner/Author of EIS
Laura Paulson	Printing and Graphic Coordinator
Lisa Yamamoto	Cartologist and Graphic Designer

Subconsultants	
Agricultural Significance	Chapman Consulting
Archaeology	Paul Rosendahl, Inc.
Flora	Char and Associates
Water Resources	Community Planning, Inc.
Golf Course Study	Chapman Consulting
Traffic Impact	Parsons Brinkerhoff Quades and Douglas
Engineering Analysis	Community Planning, Inc.

**7.2 COMMENTS RECEIVED DURING THE EIS PREPARATION NOTICE COMMENT PERIOD AND RESPONSES**

The Environmental Impact Statement Preparation notice (EISPN) requesting an environmental assessment determination for an amendment to the Waianae Development Plan to permit a golf course, was issued and published on February 23, 1991. The following were requested to review and comment on the proposed action:

**1. STATE AGENCIES**

Department of Business and Economic Development (DBED)  
Department of Health (DOH)  
Department of Land and Natural Resources  
Office of Hawaii Affairs  
University of Hawaii Environmental Center  
Office of State Planning  
State Parks and Recreation

**2. PRIVATE ORGANIZATIONS**

Sierra Club Hawaii Chapter  
The Outdoor Circle  
The Nature Conservancy of Hawaii

**3. COMMUNITY ORGANIZATIONS**

Waianae Coast Neighborhood Board No. 24

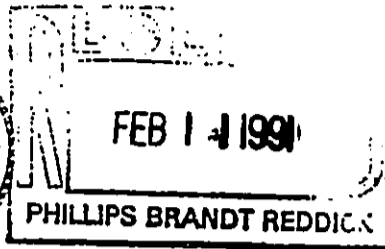
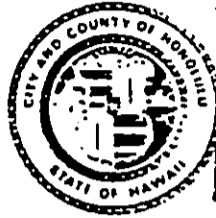
**4. ALL ADJACENT LAND OWNERS**

**5. AGENCIES OR ORGANIZATIONS THAT RESPONDED TO THE EIS PREPARATION NOTICE**

NONE

DEPARTMENT OF GENERAL PLANNING  
**CITY AND COUNTY OF HONOLULU**

650 SOUTH KING STREET  
HONOLULU, HAWAII 96813



BENJAMIN B LEE  
- PLANNING OFFICER  
EDWARD LIBBY JR  
- PLANNING OFFICER

WM

February 4, 1991

Mr. Herbert K. Horita  
Herbert K. Horita, Investments, Inc.  
c/o PBR Hawaii  
1042 Fort Street Mall, Suite 300  
Honolulu, Hawaii 96813

Dear Mr. Horita:

Waianae Development Plan Amendment Application  
from Agriculture to Park (Golf Course) at Waianae, Oahu  
Tax Map Keys 8-5-03: 9, 10, 29, 31, 32 and 43;  
8-5-04: 28; 8-5-19: 33, 35, 36 and 37, Folder No. 91/W-5

We have reviewed your Development Plan Amendment Application and Environmental Assessment submitted on December 31, 1990, and have determined that an environmental impact statement (EIS) is required. Due to the late submission of the application, we recommend that the EIS be started immediately and remind you that the Final EIS must be accepted by May 15, 1991 before the Department of General Planning can complete the processing of your application and make our recommendation to the Planning Commission and City Council.

We have also reviewed the application material and find the application does not adequately address all the community benefits as outlined in our June 20, 1990 guidelines. The following areas should be addressed in order that we may comprehensively review your application in the 1991 Annual Amendment Review:

1. Provision of affordable housing or an equivalent cash contribution.
2. Criteria related to water facilities development.
3. Contributions to wastewater system improvements based on the example provided within the guidelines.



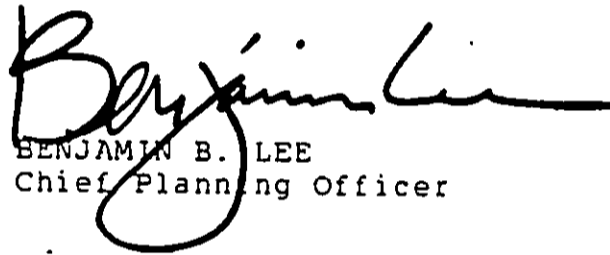
Mr. Herbert K. Horita  
Herbert K. Horita, Investments, Inc.  
February 4, 1991  
Page 2

4. Contributions to traffic system improvements.
5. The provision of land for public parks.
6. Commitments to Oahu residents in general or for any other public needs (such as child care centers, park and rides, community centers, etc.).

As announced by the Mayor, the Governor and the City Council Chairman, community benefits from golf courses are intended to provide affordable rental housing. Your proposal to provide only \$900,000 over a 25-year period to the Department of Hawaiian Home Lands would subsidize only 30 units (without accounting for inflation) at \$30,000 per unit at a rate of approximately 1 unit per year and falls far short in meeting our guidelines.

Should you have any questions, please contact Bill Medeiros at 527-6089.

Sincerely,



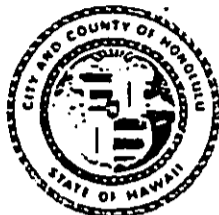
BENJAMIN B. LEE  
Chief Planning Officer

BBL:lh

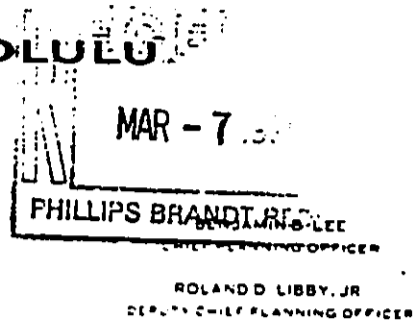
cc: Mr. William Frank Brandt, PBR Hawaii  
Mr. David Hulse, PBR Hawaii  
Mr. Ron Watase, Horita Realty

DEPARTMENT OF GENERAL PLANNING  
CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET  
HONOLULU, HAWAII 96813



FRANK F. FASI  
MAYOR



WM

March 4, 1991

Mr. Herbert K. Horita  
Herbert K. Horita Investments, Inc.  
c/o PBR Hawaii  
1042 Fort Street Mall, Suite 300  
Honolulu, Hawaii 96813

Dear Mr. Horita:

Development Plan Land Use Map Amendment  
for the Proposed Waianae Kai Golf Course  
TMKs: 8-5-03: 9, 10, 29, 31, 32, and 43;  
8-5-04: 28; 8-5-19: 33, 35, 36 and 37  
Waianae, Oahu--91/W-5

We have accepted your application for processing in the 1991 Development Plan Annual Amendment Review. Acceptance of your application should in no way infer a favorable recommendation or approval of the request by the Department of General Planning.

Should you have any questions, please contact Bill Medeiros of our staff at 527-6089.

Sincerely,

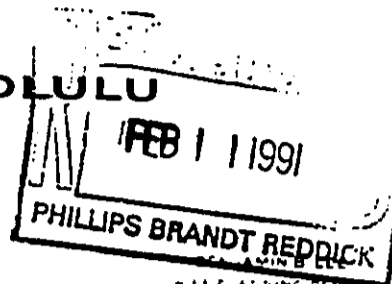
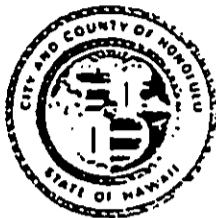
A handwritten signature in cursive script that reads "Benjamin B. Lee".  
BENJAMIN B. LEE  
Chief Planning Officer

BBL:js.

cc: Mr. William Frank Brandt, PBR Hawaii  
✓ Mr. David Hulse, PBR Hawaii  
Mr. Ron Watase, Horita Realty

DEPARTMENT OF GENERAL PLANNING  
CITY AND COUNTY OF HONOLULU

630 SOUTH KING STREET  
HONOLULU, HAWAII 96813



EDWARD D. LIBBY JR.  
DEPARTMENT OF GENERAL PLANNING OFFICER

WM

February 4, 1991

Honorable Bruce Anderson, Acting Director  
Office of Environmental Quality Control  
State of Hawaii  
465 South King Street, Room 104  
Honolulu, Hawaii 96813

Dear Mr. Anderson:

Chapter 343, HRS  
Environmental Impact Statement (EIS) Preparation Notice  
for Amendment Applications from Agriculture to  
Park (Golf Course) for the Proposed Waianae Kai  
Golf Course at Waianae, Oahu  
Tax Map Keys 8-5-03: 9, 10, 29, 31, 32 and 43;  
8-5-04: 28; 8-5-19: 33, 35, 36 and 37, Folder No. 91/W-5

The Department of General Planning has determined that the subject applicant action requires an EIS pursuant to Chapter 343, HRS, because the proposal, which involves an application for a Development Plan amendment, may have a significant impact on the environment. This letter, together with the enclosed EIS Preparation Notice should be published in the OEOC Bulletin under the "Register of Chapter 343, HRS Documents."


The contact person for this EIS will be:

Mr. David Hulse  
PBR Hawaii  
1042 Fort Street Mall, Suite 300  
Honolulu, Hawaii 96813

Honorable Bruce Anderson, Acting Director  
Office of Environmental Quality Control  
February 4, 1991  
Page 2

If there are any questions, please contact Bill Medeiros of  
our staff at 527-6089.

Sincerely,



BENJAMIN B. LEE  
Chief Planning Officer

BBL:lh

Encl.

cc: Mr. Herbert K. Horita  
Mr. William Frank Brandt, PBR Hawaii  
Mr. Ron Watase, Horita Realty

ment for the new school is 900 students (approximately 40 classrooms in about 50,000 square feet of buildings and approximately 24,000 square feet of parking and roadway area; one to two stories in height and housing a staff of approximately 43 persons). The target date for the completion of the school is 1994-95. Selection of a site-priority to direct acquisition will result from this phase of the action.

The new school is required to 1) relieve the over-capacity enrollment at Kihei Elementary School (the only existing elementary school in the subject school service area) and, 2) to provide adequate school facilities for the increasing population growth in the school service area (Maalaea-Kihei-Kamaole-Wailea-Makena).

Following acceptance of the EIS site acquisition will occur, resulting in the removal of 8-10 acres (minimum) from the private land acquisition. Following acquisition and facility design, site preparation, installation of supporting infrastructure and building construction will occur.

---

**OAHU**

**WAIMALU HEIGHTS GOLF COURSE**

Location: Ewa, Oahu  
TMK: 9-8-02:02

Please send your comments to:

Approving Authority: Department of Land and Natural Resources  
Office of Conservation and Environmental Affairs  
Kalanimoku Building,  
Room 131  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

with a copy of your comments to the following:

Applicant: Daitoh (Hawaii), Inc.  
c/o Dennis M. Lombardi, Esq.  
Case & Lynch, Attorneys at Law  
737 Bishop Street, Suite 2600  
Honolulu, Hawaii 96813

Consultant: Jeffrey H. Overton, AICP  
c/o Group 70 Limited  
924 Bethel Street  
Honolulu, Hawaii 96813

and a copy to OEQC.

Deadline: March 25, 1991

The applicant plans to develop an 18-hole golf course on approximately 443 acres located mauka of Pearl City and Waimalu, in the Ewa District, Oahu, Hawaii. The intent of the project is to provide a semi-private 18-hole golf course where private memberships would be sold and play would be restricted during certain periods of the week. The course would also have provisions for public play at kamaaina rates.

The Waimalu Heights Golf Course will include an 18-hole golf course, a golf driving range and a clubhouse including tennis courts and a swimming pool. Other components of the project will include: access roadway; maintenance building; potable and non-potable (irrigation) water systems; drainage facilities with retention and detention ponds; a wastewater collection system; and electrical, telephone and cable television services.

Completion and full operation of the proposed golf course could occur by 1994. At full operation, the Waimalu Heights Golf Course could be anticipated to accommodate between 45,000 to 55,000 rounds of golf annually.

---

**HALE O MALIA LIFECARE COMMUNITY**

Location: Waialae-Kahala, Oahu  
TMK: 3-5-17:02

Please send your comments to:

Approving Agency: City and County of Honolulu  
Department of General Planning  
Attn: Verne Winquist  
650 South King Street  
Honolulu, Hawaii 96813

with a copy of your comments to:

Applicant: Episcopal Homes Foundation of Hawaii, Inc.  
c/o Mr. John Whalen  
Lacayo Planning, Inc.  
737 Bishop Street, Suite 1550  
Honolulu, Hawaii 96813

Deadline: March 10, 1991

A "lifecare" facility for the elderly is proposed for a portion of the existing Star of the Sea School/Church campus.

The proposed lifecare program is based generally on the model as operated by the

Episcopal Homes Foundation of Northern California, with adaptations for the Hawaii market. The program is predicated upon a contract wherein qualified residents (65 years of age or more) are guaranteed living quarters, full health care, two meals a day, housekeeping services and other amenities and services in exchange for an initial accommodation fee and monthly maintenance fees. The lifecare contract extends for the life of the residents, regardless of changed conditions in their health or financial condition.

Three levels of living area offered within the contract: residential apartments (300 units), personal care units (20 beds), and a skilled nursing facility (60 beds). The apartments are one- and two-bedroom units similar to quality condominium units, except the kitchens. Meals will be served in a main dining room. The personal care units serve residents who, either permanently or temporarily, require a moderate level of assistance with activities of daily living, but do not require continuous nursing supervision. The skilled nursing facility serves residents who require permanent or temporary 24-hour nursing care. The entire lifecare facility will be licensed by the State of Hawaii, Department of Health, and be housed in a complex of multi-story buildings with a total floor area of about 425,000 square feet and maximum height of 60 feet.

---

**WAIANAE KAI GOLF COURSE**

Location: Waianae, Oahu  
TMK: 8-6-03:09, 10, 29, 31, 32, 43  
8-6-04:28  
8-5-19:33, 35, 36, 37

Please send your comments to:

Approving Authority: City & County of Honolulu  
Department of General Planning  
Attn: Benjamin Lee  
650 South King Street  
Honolulu, Hawaii 96813

with a copy of your comments to:

Applicant: Herbert K. Horita Realty  
2024 North King Street  
Honolulu, Hawaii 96819

and a copy to:

Consultant: David Hulse  
c/o PBR HAWAII  
1042 Fort Street Mall,  
Suite 300  
Honolulu, Hawaii 96813

Deadline: March 25, 1991

The proposed project involves the development of a 27-hole golf course, encompassing approximately 246 acres of a 252 acre site situated about one mile northeast of Waianae town between Puu Paheehoe and Puu Kamaileunu. Planned accessory uses include a clubhouse, 20 tee stall driving range, parking and a maintenance facility.

The proposed layout consists of three nine-hole courses each averaging par 36 and 3,458 yards. Extensive landscaping will provide buffering between the golf course and adjacent properties. Access to the golf course will be accommodated by a private right-of-way extending approximately 2,350 feet from the Waianae Valley Road and terminating at the clubhouse. This right-of-way will establish the only ingress-egress for the project.

The clubhouse is situated centrally to the site and is expected to range in size from 20,000 to 30,000 square feet. Features within the clubhouse include men's and women's locker rooms, a pro shop, club storage, a kitchen, snack bar and dining/lounge area. Parking adjacent to the clubhouse is expected to accommodate 266 to 294 cars, based upon a daily service of 400 to 600 people.

In addition to the proposed golf course, a small parcel will be established for productive agricultural uses to be utilized for foliage production.

#### DRAFT ENVIRONMENTAL IMPACT STATEMENTS

A 45-day review period commences with the initial publication of these projects in the bulletin (see deadline dates). EIS's listed in this section are available for review at the following repositories:

- o Office of Environmental Quality Control
- o Legislative Reference Bureau
- o Municipal Reference and Records Center (Oahu EISs)

- o University of Hawaii Hamilton Library
- o State Main Library
- o Kaimuki Regional Library
- o Kaneohe Regional Library
- o Pearl City Regional Library
- o Hilo Regional Library
- o Wailuku Regional Library
- o Lihue Regional Library
- o Branch library in closest proximity to the project

Please send your comments to the accepting authority with a copy to the applicant or proposing agency (see listed contacts). OEQC would also appreciate a copy of your comments.

#### OAHU

##### EWA MARINA, PHASE II

Location: Ewa, Oahu  
TMK: 9-1-12:05 and 06

Please send your comments to:

Accepting Authority: Department of General Planning  
Attn: William Medeiros  
650 South King Street,  
8th Floor  
Honolulu, Hawaii 96813

with a copy to:

Applicant: Haseko (Hawaii), Inc.  
Attn: Nelson Lee,  
Development Director  
820 Mililani Street, Suite 820  
Honolulu, Hawaii 96813

and a copy to:

Consultant: Tyrone Kusao, Inc.  
1188 Bishop Street,  
Suite 2507  
Honolulu, Hawaii 96813

and a copy to OEQC.

Deadline: March 25, 1991

The Ewa Marina Community Development Project has two phases of which the subject Phase II project is the second phase. Phase I, containing approximately 707 acres of land, is already classified for urban use. It will contain 4,850 dwelling units in a wide variety of homes, including affordable mid-rise apartments, townhouses, moderately priced single family homes as well as luxury homes fronting the ocean and a man-made 140 acre marina.

Phase II is part of an Ewa Marina Master Plan encompassing both Phases. Phase I will be a master-planned, recreation-oriented residential community containing 4,850 housing units which will be build around a major, man-made, 140-acre marina containing 1,600 boat slips.

The Phase II project will be commercial-industrial, employment and recreation center containing uses supportive of recreational marine activities, such as hoists launching ramps, wash racks, ice and cold storage facilities, boat storage facilities, and businesses involved in the sale or repair of boats and boating accessories. It will also contain a clubhouse, visitor accommodation units, a conference center, a health center, a 27-hole golf course and a tennis complex. Phase II, will be constructed on 403 acres of land mostly used for sugar cane production at the present time. Both phases will be harmoniously integrated into a residential/recreational/commercial community with a greenbelt pathway system extending throughout the community and connecting these various community elements.

#### MAKAIWA HILLS

Location: Ewa, Oahu  
TMK: 9-1-15:05, 11, 17  
9-1-16:09  
9-2-03:02

Please send your comments to:

Accepting Authority: City and County of Honolulu  
Department of General Planning  
Attn: Bill Medeiros  
650 South King Street,  
8th Floor  
Honolulu, Hawaii 96813

with a copy to:

Applicant: The Estate of James Campbell  
c/o William E. Wanket  
William E. Wanket, Inc  
Pacific Tower 660  
1001 Bishop Street  
Honolulu, Hawaii 96813

and a copy to OEQC.

Deadline: April 9, 1991

Makaiwa Hills is a proposed planned community of approximately 1,915 acres. It is part of the larger Kapolei Planned Community encompassing some 32,000 acres. Makaiwa Hills will consist of approximately

**7.3 COMMENTS RECEIVED DURING THE DRAFT EIS COMMENT PERIOD AND RESPONSES**

The Draft Environmental Impact Statement (DEIS) notice was published in the OEQC Bulletin on April 23, 1991. Sixty one copies of the DEIS were distributed to State Agencies, University of Hawaii, agencies of the Federal government, the news media, the City and County of Honolulu (including the Department of General Planning which is the accepting agency), non-governmental agencies, and public libraries. Comments received and responses regarding the DEIS are as follows.

changed conditions in their health or financial condition.

Three levels of living area offered within the contract: residential apartments (300 units), personal care units (20 beds), and a skilled nursing facility (60 beds). The apartments are one- and two-bedroom units similar to quality condominium units, except the kitchens. Meals will be served in a main dining room. The personal care units serve residents who, either permanently or temporarily, require a moderate level of assistance with activities of daily living, but do not require continuous nursing supervision. The skilled nursing facility serves residents who require permanent or temporary 24-hour nursing care. The entire lifecare facility will be licensed by the State of Hawaii, Department of Health, and be housed in a complex of multi-story buildings with a total floor area of about 425,000 square feet and maximum height of 60 feet.

stall driving range, parking and a maintenance facility.

The proposed layout consists of three nine-hole courses each averaging par 36 and 3,458 yards. Extensive landscaping will provide buffering between the golf course and adjacent properties. Access to the golf course will be accommodated by a private right-of-way extending approximately 2,350 feet from the Waianae Valley Road and terminating at the clubhouse. This right-of-way will establish the only ingress-egress for the project.

The clubhouse is situated centrally to the site and is expected to range in size from 20,000 to 30,000 square feet. Features within the clubhouse include men's and women's locker rooms, a pro shop, club storage, a kitchen, snack bar and dining/lounge area. Parking adjacent to the clubhouse is expected to accommodate 266 to 294 cars, based upon a daily service of 400 to 600 people.

In addition to the proposed golf course, a small parcel will be established for productive agricultural uses to be utilized for foliage production.

The Office of Housing and Community Development of the County of Hawaii is proposing an affordable residential development at Waikoloa Village, in the South Kohala district of West Hawaii. This master planned development is proposed to contain approximately 1,200 single- and multi-family housing units all of which will be available for rent or sale in the affordable price ranges, as defined by federal, state and county standards.

The project site is currently undeveloped and is located at the north end of the existing Waikoloa Village. Ownership of 279 acres of the 340-acre site is being conveyed from the present land owner, Waikoloa Land Company to the County of Hawaii through an agreement between the two parties.

Envisioned is an approximately 1,200 dwelling unit mix of single family and multi-family units on finished lots. This project will also include an 8.6 acre parcel for churches and a small commercial area near the Paniolo Drive entrance. A community park of approximately 9 acres will be located next to the commercial/church area at the entrance to the development at Paniolo Drive. A 36-acre school is planned for conveyance to the State Department of Education by the Waikoloa Land Company at the southeastern edge of the project site near the Ho'oko and Paniolo Drive intersection.

The major roadway network consists of 50-foot and 60-foot rights-of-way, with curbs, gutters and sidewalks, and dry wells for drainage. Roadway grades were maintained at a maximum slope of eight-percent, with a few exceptions where ten to twelve-percent was used because of the steep character of the area.

**WAIANAE KAI GOLF COURSE**

Location: Waianae, Oahu  
TMK: 8-5-03:09, 10, 29, 31, 32, 43  
8-5-04:28  
8-5-19:33, 35, 36, 37

Please send your comments to:

Approving Authority: City & County of Honolulu  
Department of General Planning  
Attn: Benjamin Lee  
650 South King Street  
Honolulu, Hawaii 96813

with a copy of your comments to the following:

Applicant: Herbert K. Horita Realty  
Attn: Ron Watase  
2024 North King Street  
Honolulu, Hawaii 96819

Consultant: David Hulse  
c/o PBR HAWAII  
1042 Fort Street Mall,  
Suite 300  
Honolulu, Hawaii 96813

Deadline: June 7, 1991

The proposed project involves the development of a 27-hole golf course, encompassing approximately 246 acres of a 252 acre site situated about one mile northeast of Waianae town between Puu Paheehē and Puu Kamaileunu. Planned accessory uses include a clubhouse, 20 tee

**FINAL ENVIRONMENTAL IMPACT STATEMENTS**

The following EIS's have been submitted for acceptance. All comments received by the applicant or proposing agency, and corresponding responses, should be contained within the Final EIS. Those who wish to contest the acceptance of an EIS have a 60-day period in which to initiate litigation. The 60-day litigation period starts from the date of publication of an EIS's acceptance.

**HAWAII**

**WAIKOLOA AFFORDABLE HOUSING MASTER PLAN**

Location: South Kohala, Hawaii  
TMK: 6-8-02:31, 26

Accepting Authority: County of Hawaii  
Department of Planning

Proposing Agency: County of Hawaii  
Office of Housing and Community Development

Status: Currently being processed by the County of Hawaii, Department of Planning.

**KAUAI**

**UPPER MAKALEHA SPRINGS WATER RESOURCE DEVELOPMENT**

Location: Kapaa, Kauai  
TMK: 4-6-01:01

Accepting Authority: Governor, State of Hawaii

Proposing Agency: Department of Land and Natural Resources

Status: Currently being reviewed by the Office of Environmental Quality Control.



APR 26 1991  
PHILIP...  
OFFICE

(P)1451.1

APR 25 1991

City and County of Honolulu  
Department of General Planning  
650 South King Street  
Honolulu, Hawaii 96813

Attention: Mr. Benjamin Lee

Gentlemen:

Subject: Waianae Kai Golf Course  
Waianae, Oahu  
Draft EIS

87

Thank you for the opportunity to review the subject document. We have no comments to offer.

Should there be any questions, please have your staff contact Mr. Ralph Yukumoto of the Planning Branch at 548-7192.

Very truly yours, .

*J. Tominga*  
TEUANE TOMINGA  
Slate Public Works Engineer

RY:jk  
cc: Herbert K. Horita Realty  
PBR Hawaii  
Office of Environmental Quality Control



1000 KULIANI DRIVE  
HONOLULU, HAWAII 96813  
TELEPHONE: 533-2100

May 6, 1991

Mr. Teuane Tominga  
Slate Public Works Engineer  
P.O. Box 119  
Honolulu, Hawaii 96810

SUBJECT: WAIANAIE KAI DRAFT EIS

Dear Mr. Teuane Tominga:

This is to acknowledge receipt of your letter of April 25, 1991 regarding the subject project. Thank you for participating in the Draft EIS review process. Your letter and this response will be appended to the Final EIS.

Sincerely,

PBR HAWAII

*David Hulise*

David Hulise, ASLA  
Associate

cc: Earl Kitagawa, Honia Investment

3007\_9\_051

100 KULIANI STREET, SUITE 100, HONOLULU, HAWAII 96813  
PHONE: 533-2100 FAX: 533-2102

RECEIVED  
APR 29 1991  
HERBERT K. MURAKA  
DIRECTOR AND BUILDING SUPERINTENDENT



April 25, 1991

PB 91-517

MEMO TO: BENJAMIN LEE, CHIEF PLANNING OFFICER  
DEPARTMENT OF GENERAL PLANNING

FROM: HERBERT K. MURAKA  
DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: WAIANA'E KAI GOLF COURSE  
DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)

We have reviewed the DEIS for the subject project and have no comments to offer.

*Herbert K. Muraka*  
HERBERT K. MURAKA  
Director and Building Superintendent

JH:jo  
cc: J. Harada  
Herbert K. Horita Realty (R. Katase)  
PBR Hawaii (David Hulsey)  
Office of Environmental Quality Control

May 6, 1991

Mr. Herbert K. Muraka  
Director and Building Superintendent  
650 S. King Street, 2nd Floor  
Honolulu, Hawaii 96813

SUBJECT: WAIANA'E KAI DRAFT EIS

Dear Mr. Herbert K. Muraka:

This is to acknowledge receipt of your letter of April 25, 1991 regarding the subject project. Thank you for participating in the Draft EIS review process. Your letter and this response will be appended to the Final EIS.

Sincerely,

PBR HAWAII

*David Hulsey*

David Hulsey, ASLA  
Associate

cc: Earl Kitagawa, Honia Investment

3007\_0\_w31

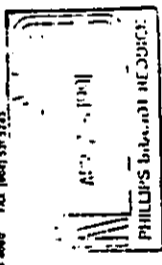
1027 FORT STREET MAIL SUITE 400 HONOLULU HAWAII 96813 TEL: (808) 551-1100 FAX: (808) 551-1102



DEPARTMENT OF BUSINESS,  
ECONOMIC DEVELOPMENT & TOURISM

JOHN WARD  
GOVERNOR  
MURRAY LOWE  
DEPUTY GOVERNOR  
BARBARA HANSEN  
COMMISSIONER  
PHILIPPS BARNARD  
DIRECTOR

PHONE (808) 548-4000 FAX (808) 531-3322



April 24, 1991

Department of General Planning  
City & County of Honolulu  
Municipal Office Building, 8th Floor  
650 South King Street  
Honolulu, Hawaii 96813

Attention: Benjamin Lee

Dear Sir:

Subject: Waianae Kai Golf Course  
Waianae, Oahu  
THK: 8-5-03:9,10,29,31,32 & 43;  
8-5-04:28; 8-5-19:33,35,35 & 37

We wish to inform you that we have no comments to offer on the subject environmental impact statement.

Thank you for the opportunity to review the document.

Sincerely,

*Maurice H. Kaya*  
Maurice H. Kaya  
Energy Program Administrator

MIK:hke1s31

cc: Herbert K. Horita Realty  
PBR Hawaii  
Office of Environmental Quality Control



PLANNING  
PROGRAM  
BUREAU

May 6, 1991

Mr. Maurice H. Kaya  
Energy Program Administrator  
335 Merchant St., Rm. 110  
Honolulu, Hawaii 96813

SUBJECT: WAIANAIE KAI DRAFT EIS

Dear Mr. Maurice H. Kaya:

This is to acknowledge receipt of your letter of April 24, 1991 regarding the subject project. Thank you for participating in the Draft EIS review process. Your letter and this response will be appended to the Final EIS.

Sincerely,

PBR HAWAII

*David Hulse*

David Hulse, ASLA  
Associate

cc: Earl Kitagawa, Horita Investment

3002\_9\_051

1017 EUREKA STREET, SUITE 200, HONOLULU, HAWAII 96813 TELEPHONE (808) 531-3431 FAX (808) 531-1802  
PBR HAWAII, INC. IS AN EQUAL OPPORTUNITY EMPLOYER



1000 W. KALANANĪHUI BLVD.  
SUITE 200  
HONOLULU, HAWAII 96813



STATE OF HAWAII  
DEPARTMENT OF DEFENSE  
OFFICE OF THE ADJUTANT GENERAL  
410 HANAUKAHEA ROAD, HONOLULU, HAWAII 96813

MAY - 1991  
PHILLIPS BRANDT RECORDS

EDWARD V. MCDONALDSON  
ADJUTANT GENERAL  
MILES M. HAKAITSU  
CRS  
1000 W. KALANANĪHUI BLVD.

Engineering Office

Department of General Planning  
City & County of Honolulu  
Municipal Office Building  
650 South King Street, 8th Floor  
Honolulu, Hawaii 96813

Gentlemen:

Waianae Kai Golf Course

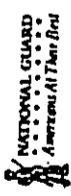
8 Thank you for providing us the opportunity to review the above subject project.

We have no comments to offer at this time regarding this project.

Sincerely,

*Jerry M. Matase*  
Jerry M. Matase  
Lieutenant Colonel  
Hawaii Air National Guard  
Contracting & Engineering Officer

cc: Mr. Ron Matase  
Herbert K. Horita Realty  
Mr. David Hulsc  
PBR Hawaii  
OEQC w/EIS



May 6, 1991

Mr. Jerry M. Maisuda  
Department of Defense  
Office of the Adjutant General  
3949 Diamond Head Road  
Honolulu, Hawaii 96816

SUBJECT: WAIANAĒ KAI DRAFT EIS

Dear Mr. Jerry M. Maisuda:

This is to acknowledge receipt of your letter of April 30, 1991 regarding the subject project. Thank you for participating in the Draft EIS review process. Your letter and this response will be appended to the Final EIS.

Sincerely,

PBR HAWAII

*David Hulsc*

David Hulsc, ASLA  
Associate

cc: Earl Kitagawa, Horita Investment

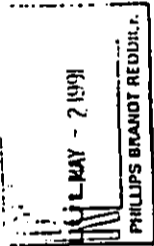
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POSTAGE WILL BE PAID BY ADDRESSEE  
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FIRE DEPARTMENT  
CITY AND COUNTY OF HONOLULU  
1445 KUMUHEPAIWA STREET HONOLULU, HI 96813  
HONOLULU HAWAII



April 30, 1991



LIONEL E. CAMARA  
FIRE CHIEF  
DONALD S. W. CHANG  
DEPUTY FIRE CHIEF

TO: BENJAMIN B. LEE, CHIEF PLANNING OFFICER  
DEPARTMENT OF GENERAL PLANNING

FROM: LIONEL E. CAMARA, FIRE CHIEF

SUBJECT: WAIANA KAI GOLF COURSE  
WAIANA KAI, OAHU  
TKK: 8-5-03:9,10,29,31,32 & 8-5-04:28;  
8-5-19:33,35 & 37

We have reviewed the subject material provided and have no additional comments at this time.

Should you have any questions, please contact Acting Assistant Chief Attilio Leonard of our Administrative Services Bureau at 943-3838.

*Lionel E. Camara*  
LIONEL E. CAMARA  
Fire Chief

AKL:ny  
Copy to: Herbert Horita Realty (Ron Watase)  
PBR Hawaii (David Hulse)  
OECC (EIS Report attached)



May 6, 1991

Lionel E. Camara, Fire Chief  
City & County of Honolulu  
1455 S. Beretania Street, Rm. 305  
Honolulu, Hawaii 96814

SUBJECT: WAIANA KAI DRAFT EIS

Dear Mr. Lionel E. Camara:

This is to acknowledge receipt of your letter of April 30, 1991 regarding the subject project. Thank you for participating in the Draft EIS review process. Your letter and this response will be appended to the Final EIS.

Sincerely,

PBR HAWAII

*David Hulse*

David Hulse, ASLA  
Associate

cc: Earl Kitagawa, Honia Investment

1001\_9\_051

1001\_9\_051

DEPARTMENT OF PARKS AND RECREATION  
CITY AND COUNTY OF HONOLULU  
MANAGEMENT SERVICES  
HONOLULU, HAWAII



WALTER M. OZAWA  
DIRECTOR  
MAY - 8 1991  
PHILLIPS BRAHDT REDDICK  
ARCHITECTS

May 3, 1991

TO: BENJAMIN B. LEE, CHIEF PLANNING OFFICER  
DEPARTMENT OF GENERAL PLANNING

FROM: WALTER M. OZAWA, DIRECTOR

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT (EIS)  
WAIANA'E KAI GOLF COURSE  
LOCATION: WAIANA'E, OAHU  
TAX MAP KEY: 8-5-03:9, 10, 29, 31, 32 & 43  
8-5-04:28; 8-5-19:33, 35 & 37

We have reviewed the EIS for the proposed Waianae Kai Golf Course and have no comment to offer.

Thank you for the opportunity to review the EIS.

Should you have any questions, please contact Lester Lai of our Advance Planning Branch at extension 4696.

*Walter M. Ozawa*  
WALTER M. OZAWA, Director

WMO:el

cc: Herbert K. Horita Realty  
/PBR Hawaii  
OEQC



May 6, 1991

Walter M. Ozawa, Director  
City and County of Honolulu  
Department of General Planning  
650 South King Street  
Honolulu, Hawaii 96813

SUBJECT: WAIANA'E KAI DRAFT EIS

Dear Mr. Walter M. Ozawa:

This is to acknowledge receipt of your letter of May 3, 1991 regarding the subject project. Thank you for participating in the Draft EIS review process. Your letter and this response will be appended to the Final EIS.

Sincerely,

PBR HAWAII

*David Hulise*

David Hulise, ASLA  
Associate

cc: Earl Kitagawa, Horita Investment

JMOT\_jmwsj

THIS DOCUMENT IS UNCLASSIFIED EXCEPT WHERE SHOWN OTHERWISE BY THE MARKING AND CONTROLS



LANDSCAPE ARCHITECTURE  
PLANNING  
ENVIRONMENTAL STUDIES

RECEIVED

'91 12 12 PM 2:33

LETTER OF TRANSMITTAL

TO: City and County of Honolulu  
Department of General Planning  
650 South King Street  
Honolulu, Hawaii 96813

GENERAL PLANNING  
& COMMUNITY DEVELOPMENT

ATTN: Mr. Ben Lee, Director  
DATE: April 12, 1991  
PROJECT: Waianae Kai Golf Course DEIS  
PROJECT NO.: 350.01

WE TRANSMIT:  Attached  Under Separate Cover  
VIA:  Mail  Delivery  Pick-up  Fax No. \_\_\_\_\_

Prints  Presentation Boards  Samples  
 Originals  Photographs  Product Literature  
 Reproducibles  Report(s)  Change Order  
 Specifications  Copy of Letter

TRANSMITTAL ACTION:

As Requested  Action Indicated On Item Transmitted  
 For Your Use  For Signature and Return  
 For Review and Comment  For Signature as Noted Below  
 For Approval

COPIES	SETS	DATE	DESCRIPTION
3	1	4/12/91	Draft Environmental Impact Statement - Waianae Kai Golf Course

REMARKS:

Please find attached three advance copies of the Draft Environmental Impact Statement for the Waianae Kai Golf Course. As we discussed in our meeting of April 10, 1991, we are providing the subject Draft EIS in support of the pending Waianae Development Plan Amendment (DGP Ref. Nos.: 91/W-5 and 91/W-6) for the Waianae Kai Golf Course. You will find the Community Benefit package as discussed during our meeting as a component of the Social Impact Section of the DEIS.

Thank you in advance for your prompt review of the DEIS.

COPY TO:

SIGNED: Ramona Mattix  
Ramona Mattix  
TITLE: Project Planner

DEPARTMENT OF PUBLIC WORKS  
CITY AND COUNTY OF HONOLULU  
430 SOUTH KING STREET  
HONOLULU, HAWAII 96813



PHILLIPS BRANDT REDDICK  
SAM CALLEJO  
C MICHAEL STREET  
HONOLULU, HAWAII 96813

In reply refer to:  
ENV 91-101(449)

May 7, 1991

MEMORANDUM

TO: BENJAMIN B. LEE, CHIEF PLANNING OFFICER  
DEPARTMENT OF GENERAL PLANNING

FROM: SAM CALLEJO, DIRECTOR AND CHIEF ENGINEER

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)

WAIANA'E KAI GOLF COURSE  
THK: 8-5-03: 9, 10, 29, 31, 32 AND 43  
8-5-04: 28  
8-5-19: 33, 35, 36 AND 37

We have reviewed the subject DEIS and have the following comments:

1. There are no municipal sewers in the area and the City has no plans to extend the system into the area.
2. A driveway must be provided where the project's access road meets Wai'anae Valley Road.
3. We do not have drainage comments at this time.

*Sam Callejo*  
SAM CALLEJO  
Director and Chief Engineer

cc: Herbert K. Horita Realty  
PBR Hawaii  
OEOC



PHILLIPS BRANDT REDDICK  
ENVIRONMENTAL STUDIOS

May 20, 1991

Mr. Sam Callejo, Director and Chief Engineer  
Department of Public Works  
City and County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

SUBJECT: AGENCY COMMENTS REGARDING DRAFT ENVIRONMENTAL  
IMPACT STATEMENT - WAIANA'E KAI GOLF COURSE, WAIANA'E,  
OAHU

Dear Mr. Callejo:

In response to your comments of May 7, 1991 regarding the Wai'anae Kai Golf Course Draft Environmental Impact Statement (DEIS), we concur that no municipal sewer line currently serves the subject property. As stated on page 54 of the DEIS, sewage from the clubhouse will be disposed of into a series of underground cesspools or septic systems located totally within the proposed golf course boundaries. These facilities would be located near the clubhouse and comply with all applicable regulations established by the State Department of Health and Board of Water Supply.

We also concur that a driveway will be provided where the project access road meets the Wai'anae Valley Road, and that all applicable driveway permits will be obtained at the appropriate time prior to construction.

Thank you for your participation in the DEIS review process. In response to your comments to the DEIS, this letter will be included in the Final EIS.

Sincerely,  
PBR HAWAII  
*David Hulise*

David Hulise  
Project Planner

CC: Herbert K. Horita Investments

759BL\_1\_911





DEPARTMENT OF THE NAVY  
 COMMANDER  
 NAVAL BASE PEARL HARBOR  
 BOX 110  
 PEARL HARBOR HAWAII HANOI 5020

MAY 15 1991  
 PHILLIPS BRADY HODDICK  
 Ser 00FZ(238)/0992  
 14 MAY 1991

Mr. Benjamin Lee  
 Chief Planning Officer  
 Department of General Planning  
 650 South King Street  
 Honolulu, HI 96813

Dear Mr. Lee:

**DRAFT ENVIRONMENTAL IMPACT STATEMENT  
 (DEIS) FOR THE WAIANAIE KAI GOLF COURSE**

We have reviewed the subject DEIS and have no comments to offer. Since we have no further use for the DEIS, it is being returned to the Office of Environmental Quality Control.

85

Thank you for the opportunity to review the draft.

Sincerely,

W. K. LIU  
 Assistant Base Civil Engineer  
 By direction of  
 the Commander

Copy to:  
 Herbert K. Horita Realty  
 (Mr. R. Matase)  
 PBR Hawaii (Mr. D. Hulse) ←  
 Office of Environmental  
 Quality Control



PEARL HARBOR  
 ENVIRONMENTAL STUDIES

May 20, 1991

Mr. W.K. Liu, Assistant Base Civil Engineer  
 Department of the Navy  
 Commander  
 Naval Base Pearl Harbor  
 P.O. Box 110  
 Pearl Harbor, Hawaii 96860-5020

SUBJECT: WAIANAIE KAI DRAFT EIS

Dear Mr. W.K. Liu:

This is to acknowledge receipt of your letter of May 15, 1991 regarding the subject project. Thank you for participating in the Draft EIS review process. Your letter and this response will be appended to the Final EIS.

Sincerely,

PBR HAWAII

David Hulse, ASLA  
 Associate

cc: Earl Kitagawa, Florita Investment

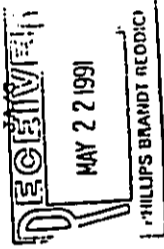
300T\_11-91

Hawaiian Electric Company, Inc. - PO Box 2750 - Honolulu HI 96813 (900)



William A. Bonnet  
Manager  
Environmental Department

ENV 2-1  
EIS



May 20, 1991

Mr. Ben Lee  
Department of General Planning  
Municipal Office Building  
650 South King St., 8th Floor  
Honolulu, Hawaii 96813

Dear Mr. Lee:

Subject: Draft Environmental Impact Statement (DEIS) for  
Waiaanae Kai Golf Course

We have reviewed the subject DEIS, and have no comments on the proposed project at this time. HECCO shall reserve comment pertaining to the protection of existing power lines bordering the project area until construction plans are finalized.

Sincerely,

cc: Ron Watase, Herbert K. Horita Realty  
David Hulse, PBR Hawaii

An HEI Company



May 6, 1991

Mr. William A. Bonnet, Manager  
Hawaiian Electric Company, Inc.  
P.O. Box 2750  
Honolulu, Hawaii 96840

SUBJECT: WAIAANA KAI DRAFT EIS

Dear Mr. William Bonnet:

This is to acknowledge receipt of your letter of May 20, 1991 regarding the subject project. Thank you for participating in the Draft EIS review process. Your letter and this response will be appended to the Final EIS.

Sincerely,

PBR HAWAII

David Hulse, ASLA  
Associate

cc: Earl Kitagawa, Honita Investment

3507L\_3\_91

1042 FORT STREET MALL, SUITE 300 HONOLULU, HAWAII 96813 TELEPHONE: (808) 571-5631 FAX: (808) 573-1407  
TELETYPE: (808) 571-5631 TELEFAX: (808) 573-1407



DEPARTMENT OF THE ARMY  
U.S. ARMY ENGINEER DISTRICT, HONOLULU  
HONOLULU, HAWAII 96860-230  
FT. SHAFTER, HAWAII 96858-5440

REPLY TO  
ATTENTION OF

May 24, 1991

Planning Division

Mr. Benjamin B. Lee  
Chief Planning Officer  
Department of General Planning  
City and County of Honolulu  
650 South King Street, 8th Floor  
Honolulu, Hawaii 96813

Dear Mr. Lee:

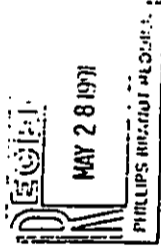
We have reviewed the Draft Environmental Impact Statement for the proposed Waianae Kai Golf Course, Waianae, Oahu. The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act, the Rivers and Harbors Act of 1899, and the Marine Protection, Research and Sanctuaries Act.

a. A DA permit would be required for any placement of fill material into Kawiwi Stream. For more information on the DA regulatory program, please contact Mr. Benton Ching of the Operations Division at 438-9258 and refer to file number PO 91-35.

b. According to the Federal Emergency Management Agency's Flood Insurance Rate Map (FIRM; Map Index dated September 28, 1990), the project parcel is in zone D (areas in which flood hazards are undetermined). The flood zone information on page 37 of the DEIS should be updated to cite the 1990 FIRM.

Sincerely,

*Benjamin B. Lee*  
Kisuk Cheung  
Director of Engineering



PLANNING DIVISION  
June 7, 1991

Mr. Kisuk Cheung  
Director of Engineering  
Department of the Army  
U.S. Army Engineer District, Honolulu  
Building 230  
Ft. Shafter, Hawaii 96858-5440

Dear Mr. Cheung:

Thank you for your comments of May 24, 1991 regarding the Waianae Kai Draft Environmental Impact Statement.

We concur that a DA permit will be required for any placement of fill material into Kawiwi Stream. All appropriate permits will be obtained prior to construction.

The Final Environmental Impact Statement will be updated to cite the 1990 Flood Insurance Rate Map (FIRM). We note, however, that the project parcel is located in Zone D (areas in which flood hazards are undetermined) by both the 1990 FIRM and the 1987 FIRM cited in the Draft EIS. As such, the flood hazard for the parcel remains as Flood Zone D.

Your comments and this response will appear in the Final EIS.

Sincerely,

PBR HAWAII  
*David Hulse*  
David Hulse

cc: Eric Kitagawa, Honita Investments

350FL\_15\_W51

JOHN WAIHEE  
GOVERNOR



PHILLIPS RINANDI REDDICK  
MAY 30 1991

State of Hawaii  
DEPARTMENT OF AGRICULTURE  
1428 So. King Street  
Honolulu, Hawaii 96814-2512

YUKIO KITAGAWA  
CHAIRPERSON, BOARD OF AGRICULTURE  
ILIMA A. PIANAINA  
DEPUTY TO THE CHAIRPERSON  
FAX: 548-6100

Mailing Address:  
P. O. Box 22159  
Honolulu, Hawaii 96823-2159

May 28, 1991

COPY

Mr. Benjamin B. Lee  
Chief Planning Officer  
Department of General Planning  
City and County of Honolulu  
650 South King Street  
Honolulu, HI 96813

Dear Mr. Lee:

Subject: Draft Environmental Impact Statement (DEIS) for  
Waianae Kai Golf Course  
Herbert K. Horita Realty  
THK: 8-5-03: 9, 10, 29, 31, 32, 43  
8-5-04: 28  
8-5-19: 33, 35, 36, 37  
Area: 252.88 acres

The Department of Agriculture has reviewed the subject document and offers the following comments.

The DEIS was written on behalf of a proposed Waianae Development Plan amendment from "Agriculture" to "Parks and Recreation."

On October 24, 1988, we reviewed an application for a Conditional Use Permit (Type 1) for a golf course on the same property (minus THK: 8-5-19: 33) (copy attached). Insofar as two studies listed in the subject document's appendix have not changed since our earlier review, our comments on the impact of golf course pesticide applications and dairy relocation remain largely applicable.

Regarding the relocation of Mountain View Dairy, the DEIS states that "The dairy is presently working with the Department of Agriculture to relocate to its proposed Livestock Agricultural Park" (page 46). For the record, the agricultural park has not been advertised to the public for lease applications, and no agreement has been reached with Mountain View Dairy or any other operator regarding tenure there. All Oahu dairies and other livestock operations will have an opportunity to relocate to the Oahu Livestock Agriculture Park (OLAP). Priority will likely be given to those livestock operations that are most threatened by

Mr. Benjamin B. Lee  
May 28, 1991  
Page -2-

uncertain land tenure beyond their control. The Department of Agriculture will implement a program whereby the proposed OLAP will be a shared-cost facility and tenants would buy in to a share of the infrastructure improvements to be provided by the State.

According to the project schedule for the proposed golf course, construction is expected to commence in early 1993 (DEIS, page 21). The current estimated ground breaking date for construction of the OLAP infrastructure is Fall, 1993. Thereafter, selected tenants will be able to develop their farm-specific facilities. The likelihood of OLAP construction being completed before late 1994 is highly unlikely. Therefore, contingency planning by the Mountain View Dairy is critical in the event that: (1) the Dairy is not selected to move into the OLAP, or (2) is selected to move to the OLAP, but is not able to construct new facilities on a timely basis so as not to upset the milk supply situation. These scenarios and appropriate mitigative actions should be included in the Final EIS.

In section 4.1.2.2 of the DEIS (page 33) the point is made that higher intensity (i.e., urban) land uses drive up the general market value of land, "...thereby making the need for higher returns from agricultural production of greater importance." Under this assumption, it is apparent that the proposed golf course promises higher monetary returns than the dairy, which is situated on about a fourth of the subject property. It is this expectation of higher returns from conversion of agricultural lands to urban uses that makes agriculture, at best, a temporary land use when uses with greater income potential are sought. This is doubly unfortunate in the subject case since Mountain View Dairy is already considered by industry experts to be among the most efficient dairy operations in the State.

The DEIS (page 63) states that the proposed golf course will serve as a buffer between agricultural land and residential land uses. The document goes on to say that the project would promote the Right-to-Farm Act by providing a transitional area from agricultural to residential land use. This reflects a misunderstanding of Chapter 165, HRS, which protects farmers from nuisance complaints due to encroachment of non-agricultural use into agriculturally zoned areas. Notwithstanding the "residential" use of some of the parcels in the vicinity of the subject property, the entire site and most of the surrounding area is zoned AG-2 or Country (DEIS, Figure 5). We do not believe, as the DEIS implies, that the intent of Chapter 165 is to protect agricultural activities within agriculturally zoned areas from the residential component of these areas. Rather, the intent is to protect agricultural uses from non-agricultural uses in adjacent urban-zoned areas. Furthermore, the reference to



Mr. Benjamin B. Lee  
May 28, 1991  
Page -3-

Chapter 165, HRS, should be updated to reflect the amendments made to it in 1986.

Thank you for the opportunity to comment.

Sincerely,

*Yukio Kitagawa*  
YUKIO KITAGAWA  
Chairperson, Board of Agriculture

Attachment

c: OEQC  
PBR Hawaii  
Herbert K. Hority Realty  
David Wong, Jr.

00

Page -1-

October 24, 1988

MEMORANDUM

To: Mr. John P. Whalen, Director  
Department of Land Utilization  
City and County of Honolulu

Subject: Conditional Use Permit (Type 1) Application  
Waianae Kai Golf Course  
Herbert K. Horita Investments, Inc.  
THK: 8-5-03: 9, 10, 29, 31, 32, 43  
8-5-04: 28  
8-5-19: 35, 36, 37 Waianae, Oahu  
Area: 250.062 acres

The Department of Agriculture has reviewed the subject application, including the reports on "Potential Environmental Impacts On Groundwater Supplies Resulting From The Application Of Fertilizers And Biocides On The Proposed Waianae Kai Golf Course" and "Preliminary Hydrogeologic Summary Of Proposed Irrigation Source For The Waianae Kai Golf Course." We have the following comments to offer in addition to the concerns expressed in our June 21, 1988, response to the draft application.

Pesticide Impact

Regarding the first of the above-cited reports, section 4.4 on page 19 suggests that pesticides will be applied in accordance with a schedule. Applying pesticides in accordance with a schedule, without first confirming the presence of a target pest at or exceeding a number of pests that will cause economic damage, invites pest resistance and may result in the use of more frequent use of pesticides at higher doses. The use of a schedule is strongly discouraged.

Table/on page 20 indicates that Diazinon AG500 will be applied for the control of insects. Diazinon has been banned from use on golf courses and turfgrass because of hazards to avian species. The toxicity of some insecticides to birds, considered with the project plan to have ponds as a part of the water management plan (see page 7 of the document), may create an environment to entice, then poison, avian species. The

Potential of the use of insecticides and their effect on non-target species should be more fully evaluated.

The last paragraph on page 22 suggests that nutrients which might enter coastal receiving water in quantities that might be detectable would serve as food. The possibility of toxic algal blooms from increased nutrients, such as the "red tide", should be discussed.

The discussion on the Administrative Rules established pursuant to Chapter 149A, on page 25, is inaccurate. Pesticides but are candidates for restriction (see Title 4, Chapter 66, Section 32(b)).

The report does not address the disposal of tank rinses from cleaning equipment used to apply pesticides. This is especially important since rinses from the use of MSHA (Weed Hoe) may contain hazardous amounts of arsenic (see 40 CFR 261.24(d), which establishes a maximum contaminant for arsenic contamination at 5 milligrams per liter).

Dairy Relocation

Our primary concern regarding the subject application remains the displacement of the Mountain View Dairy by the proposed golf course, and the possible loss of its milk production to the Oahu market. Matthew Grady's letter of July 20, 1988, states that Mountain View Dairy "has given assurance as to continued milk production for the Oahu Milkshed," and has tentatively identified two relocation sites. However, David Wong's letter of June 30, 1988, to Mr. Grady actually states that the overriding intent of the dairy "is that the [sales] transaction qualify as a tax-free exchange," failing which Mountain View "will close the dairy operations, and sell the dairy cows to another dairy which will continue milk production."

There are problems both with the relocation of the dairy and with the sale of its herd (and production quota) to another dairy. At recent meetings with State officials and in the Dairy Industry Analysis meeting held on September 30, 1988, industry representatives have stated that previous approaches to acquire Campbell Estate lands near Kunia Road have been unsuccessful, and that Meadow Gold Dairy itself must relocate in the near future from its Bishop Estate lands near Kawaiaouli. The relocation of Mountain View Dairy to one of these two sites therefore does not appear promising in the near future. The dairy industry representatives are in fact looking to the State to help solve their land problems with development of an agricultural park and funding to underwrite the capital costs of their relocation.

Furthermore, the sale of Mountain View's herd and quota (15.1 percent of the Oahu total) to another Oahu dairy would require special consideration. The other three largest Oahu dairies are all near their legal limit of 20 percent of the total island quota, and the remaining dairies are much smaller and unprepared to absorb such a large increase in size of operation. Distribution of Mountain View's quota among the other larger dairies would need the Board of Agriculture to waive the requirements of Section 157-34(f), Hawaii Revised Statutes.

The Department of Agriculture has no intrinsic objection to the development of a golf course on the subject property. However, in view of the above facts which have arisen since our June 21 comments, we ask that approval of the conditional use permit for the golf course be deferred until the relocation of Mountain View Dairy or the distribution of its herd and quota to other Oahu dairies can in fact take place. Under the law, our Department is required to ensure the availability of an adequate supply of milk to the consuming public within the Oahu milkshed and to promote the stability of the dairy industry within the milkshed.

Thank you for the opportunity to comment.

*Yuki's signature*  
YUKIO KITAGAWA  
Chairperson, Board of Agriculture

cc: Mr. Matthew E. Grady, Project Manager  
PBR Hawaii

bcc: Plant Industry/Pesticides  
Marketing/Milk Control  
PS



1000 KEELE STREET  
HONOLULU, HAWAII 96813  
PLANNING  
ENVIRONMENTAL SERVICES

June 7, 1991

Mr. Yukio Kitagawa, Chairperson  
Department of Agriculture  
1428 South King Street  
Honolulu, Hawaii 96814-2512

**SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) FOR  
WAIANAЕ KAI GOLF COURSE**

Mr. Yukio Kitagawa:

Thank you for your comments regarding the Draft Environmental Impact Statement for the Waianae Kai Golf Course. In response to your concerns, we offer the following comments.

Regarding the relocation of the Mountain View Dairy, you state that the ground breaking date for construction of Oahu Livestock Agriculture Park (OLAP) is scheduled for the Fall of 1993, while construction of the proposed golf course is scheduled for early 1993. Consequently, there may be a period of approximately one year where the OLAP site will not be available for the relocation of the Mountain View Dairy. In addition, you indicate that there is no guarantee that the Dairy will be selected to move into the OLAP. Based on these concerns, we offer the following comments and mitigation measures.

- o The Dairy cattle can be relocated into one or more alternative facilities on Oahu as an interim measure prior to completion of the OLAP.
- o If the Mountain View Dairy is not selected by the DOA for relocation into the OLAP, we assume that decision is based on DOA selection criteria and that the other dairy operations selected would have a higher priority for relocation.
- o On page 2 of your comments, you indicate that it is "unfortunate" that market forces will ultimately determine land values. However, we continue to maintain that agricultural operations (including golf courses which are a permitted use in the State Agricultural District on this site) must compete economically with all types of land uses.
- o We concur that the subject property is surrounded by AG-2 and Country zoning; however, the open space provided by the proposed golf course will form a physical buffer between areas higher density agricultural uses and agricultural operations that may contain odor and vector nuisances.

1043 FORT STREET MALL, SUITE 300 HONOLULU, HAWAII 96813 TELEPHONE: (808) 531-5631 FAX: (808) 523-1402  
REPRINTED FROM THE HONOLULU STAR-BULLETIN, 1991

Mr. Yukio Kitagawa  
**SUBJECT: WAIANAЕ KAI DRAFT EIS COMMENTS**  
Page 2  
June 7, 1991

Your comments and this response will be included in the Final Environmental Impact Statement for the Waianae Kai Golf Course. Thank you once again for participating in the EIS review process.

Sincerely,

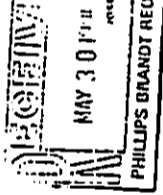
PBR HAWAII

David Hulse  
Project Planner

cc: Eric Kitagawa, Honia Investment  
350LT\_6\_W51

DEPARTMENT OF TRANSPORTATION SERVICES  
**CITY AND COUNTY OF HONOLULU**

100 SOUTH KING STREET  
HONOLULU, HAWAII 96813



Donald A. Clegg  
Page 2  
May 29, 1991

- The driveway grade should not exceed 5 percent for a minimum distance of 35 feet from the future curb line, and adequate sight distance to pedestrians and other vehicles should be provided and maintained.
- Construction plans for off-site work within the City's right-of-way should be reviewed by our department.
- The neighborhood board should be informed of the planned golf course development.

Should you have any questions, please contact Lance Watanabe of my staff at 523-4199.

JOSEPH H. MAGALDI, JR.

cc: Herbert K. Hoita Realty  
PDR Hawaii  
Office of Environmental Quality Control

TE-2236  
PL91.1.144

May 29, 1991

**MEMORANDUM**

**TO:** DONALD A. CLEGG, DIRECTOR  
DEPARTMENT OF LAND UTILIZATION

**FROM:** JOSEPH H. MAGALDI, JR., DIRECTOR

**SUBJECT:** WAIANAE KAI GOLF COURSE  
DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)  
TAX MAP KEY: 8-5-03: 9, 10, 29, 31, 32 AND 43;  
8-5-04: 28; 8-5-19: 33, 35-37

102

This is in response to the DEIS submitted for our review on April 22, 1991 by the Office of Environmental Quality Control.

Based on our review, we have the following comments:

- As shown on the Waianae Development Plan Public Facilities Map and the M-2 Planning Area Map, Waianae Valley Road is a proposed 60-foot roadway. Setbacks for road widening affect all parcels (including THK: 8-5-04: 28; 8-5-19: 33, 35-37) fronting Waianae Valley Road. Full frontage improvements should be provided.
- To mitigate any traffic created by the subject project a separate left turn lane in, and right acceleration lane out of the project entrance should be provided on Waianae Valley Road as part of the frontage improvements.
- Adequate pavement width for two-way traffic should be provided on all access roads from the proposed development to Farrington Highway.
- A standard dropped curb should be constructed along the access driveway and a "Private Road" sign installed at the entrance to the project.





PLANNING  
 HONOLULU, HAWAII  
 JUNE 6, 1991

Mr. Joseph M. Magaldi, Jr., Director  
 City and County of Honolulu  
 Department of Transportation Services  
 650 South King Street  
 Honolulu, Hawaii 96813

**SUBJECT: WAIANAЕ KAI GOLF COURSE DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) - COMMENTS DATED MAY 29, 1991**

Dear Mr. Magaldi:

Thank you for your comments regarding the Draft Environmental Impact Statement for the Waianac Kai Golf Course. Your correspondence and this response will be included in the Final EIS. In reference to your comments, we offer the following:

1. We acknowledge that Waianac Valley Road improvements are shown on the Waianac Development Plan Public Facilities Map and the W-2 Planning Area Map. However, at this time, we are not aware that the final design, alignment, or construction plans for the improvements have been completed. Once these plans are available, the land area required for that portion of the roadway fronting the subject properties will be provided in accordance with the design requirements of the roadway.
2. A separate left turn lane in, and right acceleration lane out of the project entrance, will be provided on Waianac Valley Road as part of the frontage improvements.
3. Pavement width for two-way traffic will be provided on all interior access roads connecting to Waianac Valley Road from the clubhouse area. With the 60-foot roadway improvement project planned for the Waianac Valley Road (indicated on the Public Facilities Map), the pavement width for two-way traffic to Farrington Highway will be adequate.
4. A standard dropped curb will be constructed along the access driveway and a "Private Road" sign installed at the entrance to the project.
5. The driveway grade will not exceed 5 percent for a minimum distance of 35 feet from the future curb line, and adequate sight distance to pedestrians and other vehicles will be provided and maintained.

Mr. Joseph M. Magaldi, Jr., Director  
**SUBJECT: WAIANAЕ KAI DRAFT EIS COMMENTS**  
 June 6, 1991  
 Page 2

6. Construction plans for off-site work within the city's right-of-way will be submitted to your department for appropriate review.
7. The Waianac Neighborhood Board has met regarding the proposed golf course and voted to recommend approval during their meeting of April 11, 1991.

Thank you for participating in the EIS process. Your comments and this response will be included in the Final EIS.

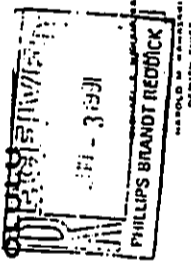
Sincerely,

PBR HAWAII

David Hulsc  
 Project Planner

350LT\_4\_WS1

POLICE DEPARTMENT  
CITY AND COUNTY OF HONOLULU  
1455 SOUTH BERETANIA STREET  
HONOLULU, HAWAII 96814



OUR REFERENCE KN-LK

May 29, 1991

TO: BENJAMIN B. LEE, CHIEF PLANNING OFFICER  
DEPARTMENT OF GENERAL PLANNING

FROM: MICHAEL S. NAKAMURA, CHIEF OF POLICE  
HONOLULU POLICE DEPARTMENT

SUBJECT: WAIANAЕ KAI GOLF COURSE, WAIANAЕ, OAHU

We have reviewed the draft environmental impact statement for the proposed project and find that our department will be able to adequately service the Waianae Kai Golf Course.

Thank you for the opportunity to comment.

MICHAEL S. NAKAMURA  
Chief of Police

By *D. Ajiu*  
for CHESTER E. HUGHES  
Assistant Chief of Police  
Support Services Bureau

cc: Herbert K. Horita Realty  
PBR Hawaii  
OEQC

June 7, 1991

Mr. Michael S. Nakamura, Chief of Police  
Honolulu Police Department  
1455 South Beretania Street  
Honolulu, Hawaii 96814

SUBJECT: WAIANAЕ KAI DRAFT EIS  
Dear Mr. Nakamura:

This is to acknowledge receipt of your letter of May 29, 1991 regarding the subject project. Thank you for participating in the Draft EIS review process. Your letter and this response will be appended to the Final EIS.

Sincerely,

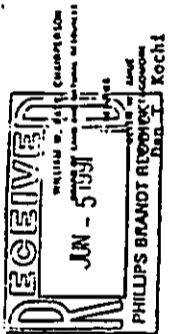
PBR HAWAII

*David Hulise*  
David Hulise  
Project Planner

cc: Eric Kitagawa, Honia Investment  
3307L\_12W11



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
P. O. BOX 51  
HONOLULU, HAWAII 96809



Honorable Benjamin Lee -2- Doc. No.: 0833E

Thank you for your cooperation in this matter. Please feel free to call me or Roy Schaefer at our Office of Conservation and Environmental Affairs, at 548-7837, if you have questions.

Very truly yours,

William W. Paty

cc: Herbert K. Horita Realty  
PBR Hawaii  
OEQC

REP:OCEA:JN

JUN 4 1991

File No.: 91-440  
Doc. No.: 0833E

The Honorable Benjamin B. Lee  
Chief Planning Officer  
Department of General Planning  
City and County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

Dear Mr. Lee:

Subject: Draft EIS for Waianae Kai Golf Course at Waianae, Oahu

105

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.

Our Department's Aquatic Resources Division comments that the Kawiwi Stream runs through the center of the project area, but it is intermittent, generally dry, and does not support any native aquatic species. The project will have no impact on stream habitats and should have no direct effect on nearshore marine waters. Therefore, we have no objection to the proposal from the aquatic resources standpoint.

The Division of Water Resource Management states that the Developer is reminded that any construction work within streams or stream alteration will require appropriate permits from the Commission on Water Resource Management.

The Division of Land Management comments that we do not see any adverse effects the development would have on State lands in this area. The State owns the Waianae Agricultural Park north of the site located on THK: 8-5-34.

We do recommend that the public be allowed to play during the week days at a cost of fifty percent of the weekly fees and be also allowed to play on the weekends at current municipal green fees.



1047 FORT STREET, SUITE 300  
HONOLULU, HAWAII 96813  
TELEPHONE: (808) 521-5031 FAX: (808) 523-1402  
WWW.PBRHAWAII.COM

Mr. William W. Paty  
Department of Land and Natural Resources  
P.O. Box 621  
Honolulu, Hawaii 96809

**SUBJECT: DRAFT EIS FOR WAIANA KAI GOLF COURSE AT WAIANA, OAHU**

Dear Mr. Paty:

Thank you for your comments of June 4, 1991 regarding the Waiana Kai Draft Environmental Impact Statement. We offer the following comments.

1. We concur that the Kawiwi Stream is intermittent, generally dry, and does not support any native aquatic species and that the project will have no impact on stream habitats and will not effect nearshore marine waters.
2. Should any construction work become necessary within the stream, the appropriate permits from the Commission on Water Resource Management will be obtained prior to construction.
3. We agree that the project will not impact the Waiana Agricultural Park north of the project site.
4. The following will apply toward providing opportunities for public play.
  - o Public play at the golf course will be provided for residents of the State of Hawaii.
  - o A minimum of 3.5 days per week, or a minimum of 50 percent of available tee times per week of an 18-hole golf course, shall be made available for public play for Hawaii State residents. Of these public play times, a minimum of one day shall be provided on weekend days.
  - o Green fees will be comparable to other private golf courses which provide public play, such as Pearl, Hawaii Kai, Mililani, and Olomana golf courses.

A full community benefits package will be included in the Final EIS.

1047 FORT STREET, SUITE 300 HONOLULU, HAWAII 96813 TELEPHONE: (808) 521-5031 FAX: (808) 523-1402  
WWW.PBRHAWAII.COM

Mr. William W. Paty  
SUBJECT: COMMENTS REGARDING DRAFT EIS FOR WAIANA KAI GOLF COURSE  
June 5, 1991  
Page 2

Thank you for participating in the EIS process. Your comments and this response will be included in the Final EIS.

Sincerely,

PBR HAWAII

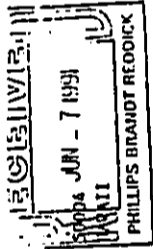
*David Hulse*  
David Hulse  
Project Planner

350LT\_5\_W51

UNITED STATES  
DEPARTMENT OF  
AGRICULTURE

SOIL  
CONSERVATION  
SERVICE

P. O. BOX  
HONOLULU,  
96850



June 4, 1991

Mr. Benjamin Lee  
Department of General Planning  
City & County of Honolulu  
650 S. King Street  
Honolulu, Hawaii 96813

Dear Mr. Lee:

Subject: Draft Environmental Impact Statement (DEIS) -  
Waianae Kai Golf Course, Waianae, Hawaii

We have reviewed the Waianae Kai Golf Course DEIS and have no comments to offer at this time.

We would appreciate the opportunity to review the Final EIS when it is completed.

Sincerely,

  
WARREN H. LEE  
State Conservationist

cc: Mr. Ron Wetase, Herbert K. Horits Realty, 2024 North King Street,  
Honolulu, Hawaii 96819  
Mr. David Hulse, PBR Hawaii, 1042 Fort Street Mall, Suite 300,  
Honolulu, Hawaii 96813  
Office of Environmental Quality Control, 220 South King Street,  
Fourth Floor, Honolulu, Hawaii 96813



PHILIPPS  
BRADY  
REDDICK  
ENVIRONMENTALISTS

June 7, 1991

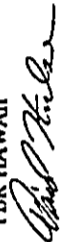
Mr. Warren M. Lee  
State Conservationist  
U.S.D.A. Soil Conservation Service  
P.O. Box 50004  
Honolulu, Hawaii 96850

SUBJECT: WAIANAЕ KAI DRAFT EIS REVIEW COMMENTS

Dear Mr. Lee:

This is to acknowledge receipt of your letter of June 7, 1991 regarding the subject project. Thank you for participating in the Draft EIS review process. Your letter and this response will be appended to the Final EIS.

Sincerely,

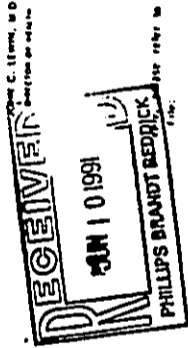
PBR HAWAII  
  
David Hulse, ASLA  
Project Planner

cc: Eric Kilgawa, Honia Investment

3X07L\_16 W31



STATE OF HAWAII  
DEPARTMENT OF HEALTH  
P. O. BOX 2319  
HONOLULU, HAWAII 96811  
June 3, 1991



91-2-121x

Mr. Benjamin Lee  
Department of General Planning  
City and County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

Dear Mr. Lee:

Subject: Draft Environmental Impact Statement  
Waianae Kai Golf Course  
Waianae, Oahu  
THK: 8-5-03: 9, 10, 29, 31, 32 & 43  
8-5-04: 28  
8-5-19: 33, 35, 36 & 37

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

Sanitation Branch

1. Our only comment is that the applicant should render the old cesspools safe.  
If you should have any questions, please contact Mr. Kelvin Sunada at 548-3225.

Wastewater Branch

1. We have reviewed the material on the subject project submitted by your office. It is above the UIC line and in most areas, in the "pass" zone. It is also located in the proposed critical wastewater disposal areas as determined by the Oahu Wastewater Advisory Committee. No new cesspools will be allowed as a means of wastewater disposal.
2. According to the plan, there is an existing municipal wastewater system serving the lower Waianae area with its nearest collection pipeline being approximately 4,000 feet from the access road to the proposed golf course. At this time, wastewater treatment and disposal has not been adequately addressed.

Mr. Benjamin Lee  
Page 2  
June 3, 1991

3. Due to the estimated volume of wastewater being generated, the use of septic tanks and cesspools will not be allowed. Use of a central collection and wastewater treatment works is allowed provided that connection to the public sewer system cannot be made. However, the Department of Health recommends that the golf course and clubhouse approval be conditioned upon connection to the municipal sewer service system. This recommendation is made as municipal wastewater collection and treatment, is a preferred alternative to private collection and treatment and the possibility that the project will have an impact on the surrounding area. Should this impact to the surrounding area take place, infrastructure needs, such as sewers, will have to be provided. It is further recommended that the developers of the project coordinate with the City to provide such future sewer infrastructure needs. All wastewater treatment and disposal alternative must meet the applicable requirements of the Department of Health's Administrative Rules Chapter 11-62, "Wastewater Systems". We do reserve the right to review the detailed wastewater plans for conformance to applicable rules.

Should you have any further questions, please contact Harold Yee of the Wastewater Branch at 543-8287.

Safe Drinking Water Branch

1. The DEIS indicates that the proposed project will obtain its potable water from the Board of Water Supply. It also states that the developer plans to use the existing on-site wells and develop additional on-site wells to irrigate the golf course. Thus, the Department's Administrative Rules, Title 11, Chapter 20, "Potable Water Systems," are not applicable. In the event that the proposed use of the on-site wells were to change, the Safe Drinking Water Branch must be notified.
2. The proposed project is situated above the Department's Underground Injection Control (UIC) line. Land areas above the UIC line are generally considered to contain underground sources of drinking water. These areas should therefore be protected against all sources of groundwater contamination.
3. It is essential that all wells in the project area be designed and constructed to prevent the possibility of groundwater contamination. For example, each well should have a concrete well pad and full grouting to prevent seepage or floodwaters from migrating down the well shaft.

Mr. Benjamin Lee  
Page 3  
June 3, 1991

4. The operation of the golf course irrigation wells must not adversely affect the water quality of existing wells in the area.
5. The standard conditions for all golf course developments should apply to this project. A copy of the eight (8) conditions (version 3) is enclosed.
6. If the irrigation system is supplemented with potable water, adequate measures must be taken to eliminate cross-connections and backflow conditions. The potable and non-potable water systems should be clearly labeled and physically separated by an air gap or an approved backflow preventor to avoid contaminating the potable water supply.

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If you should have any questions, please contact the Safe Drinking Water Branch at 543-8258.

Environmental Planning Office

1. The DEIS mentions constructing sediment control structures to reduce the storm runoff impacts of the golf course but does not address the issue of nutrients and pesticides in the runoff. It is very important that any mitigating measures planned take into consideration the fact that any runoff coming off of the proposed golf course will be carried directly into the ocean by the channelized streams.
2. The use of nutrients and pesticides on the proposed golf course should follow approved nutrient and pesticide management plans. The Hawaii Department of Agriculture and the University of Hawaii, Cooperative Extension Service would provide assistance in developing such plans.

If you should have any questions, please contact  
Mr. Lawrence Yamamoto at 543-8345.

Very truly yours,

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



STATE OF HAWAII  
DEPARTMENT OF HEALTH

April, 1990 (Version 3)

EIGHT (8) CONDITIONS APPLICABLE TO THIS NEW GOLF COURSE DEVELOPMENT

1. The owner/developer and all subsequent owners shall establish a groundwater monitoring plan and system which shall be presented to the State Department of Health for its approval. The groundwater monitoring plan and system shall minimally describe the following components:
  - a. A monitoring system tailored to fit site conditions and circumstances. The system shall include, and not be limited to, the use of monitoring wells, lysimeters and vadose zone monitoring technologies. If monitoring wells are used, the monitoring wells shall generally extend 10 to 15 feet below the water table.
  - b. A routine groundwater monitoring schedule of at least once every six (6) months and more frequently, as required by the State Department of Health, in the event that the monitoring data indicates a need for more frequent monitoring.
  - c. A list of compounds which shall be tested for as agreed to by the State Department of Health. This list may include, but not be limited to the following: total dissolved solids; chlorides; PII; nitrogen; phosphorus; or any other compounds associated with fertilizers, biocides or effluent irrigation.
2. Baseline groundwater/vadose zone water data shall be established as described in this paragraph. Once the monitoring system and list of compounds to be monitored for have been determined and approved by the State Department of Health, the owner/developer shall contract with an independent third-party professional (approved by the State Department of Health) to establish the baseline groundwater/vadose zone water quality and report the findings to the State Department of Health. Testing of the analyses of the groundwater shall be done by a certified laboratory.
3. If the data from the monitoring system indicate the presence of the measured compound and/or the increased level of such compound, the State Department of Health can require the owner/developer or subsequent owner to take immediate mitigating action to stop the cause of the contamination. Subsequently, the developer/owner or subsequent owner shall mitigate any adverse effects caused by the contamination.

4. Owner/developer shall provide sewage disposal by means of connection to the public sewer system; or by means of a wastewater treatment works providing treatment to a secondary level with chlorination. Effluent from this wastewater treatment works may be used for golf course irrigation, subject to Condition #3. The entire system shall be approved by the State Department of Health in conformance with Administrative Rules Title 11, Chapter 62, Wastewater Treatment Systems, effective December 10, 1988.
5. If a wastewater treatment works with effluent reuse becomes the choice of wastewater disposal, then the owner/developer and all subsequent owners shall develop and adhere to a Wastewater Reuse Plan which shall address as a minimum, the following items:
  - a. Management Responsibility. The managers of the irrigation system using reclaiming wastewater shall be aware of the possible hazards and shall evaluate their system for public health, safety, and efficiency. They must recognize that contact with the reclaimed wastewater from treated domestic sewage poses potential exposure to pathogenic organisms which commonly cause infections (bacteria, viruses, protozoa, and helminths or worms).
  - b. General Recommendations
    - 1) Irrigated areas should be no closer than 500 feet from potable water wells and reservoirs.
    - 2) Irrigated areas should be no closer than 200 feet from any private residence.
    - 3) Application rates should be controlled to minimize ponding. Excess irrigation tailwater in the reclaimed wastewater irrigation area shall be contained and properly disposed. An assessment should be made of the acceptable time and rate of application based on factors such as type of vegetation, soil, topography, climate and seasonal variations.
    - 4) Effluent holding/mixing ponds shall be designed to prevent the infiltration of the wastewater into the subsurface. The holding/mixing ponds shall be made impervious.
    - 5) Irrigation shall be scheduled such that the public is not in the vicinity and the soil is sufficiently dry to accept the irrigation water.
    - 6) Permanent fencing or barriers shall be erected around polishing or holding ponds to prevent public entry or stray feral and tame animals from gaining access to the ponds.

- 7) Adequate irrigation records shall be maintained. Records should include dates when the fields are irrigated, rate of application, total application and climatic conditions. Records should also include any operational problems, diversions to emergency storage or safe disposal and corrective or preventive action taken.
- 8) The holding/mixing ponds shall be periodically monitored for the purpose of detecting leakage into the subsurface. If leakage is detected, corrective action shall be immediately taken.
- c. Adequate Notice. Appropriate means of notification shall be provided to inform the employees and public that reclaimed wastewater is being used for irrigation on the site.
  - 1) Posting of conspicuous signs with sufficient letter size for clear visibility with proper wording should be distributed around the use areas.
  - 2) Signs shall be securely fastened. Periodic surveillance shall be conducted to assure permanent posting at all times. Immediate replacements shall be made when necessitated by deterioration, vandalism or misuse.
- d. Adequate Employee Education. Employees or users should be cautioned and warned of the potential health hazards associated with the ingestion of reclaimed wastewater being used at the site.
  - 1) Employees should be warned that the ingestion of reclaimed wastewater is unsafe.
  - 2) Employees should be protected from direct contact of the reclaimed wastewater. If necessary, protective clothing should be provided.
  - 3) Employees should be informed of the following:
    - The irrigation water is unsafe for drinking or washing.
    - Avoid contact of the water or soil with any open cuts or wounds.
    - Avoid touching the mouth, nose, ear or eyes with soiled hands, clothes or any other contaminated objects.
    - Be aware that inanimate objects such as clothes or tools can transport pathogenic organisms.
    - Always wear shoes or boots to protect feet from the pathogenic organisms in the soil or irrigation water.



6. Releases from underground storage tanks (USTs) used to store petroleum products for fueling golf carts, maintenance vehicles, and emergency power generators pose potential risks to groundwater.

Should the owner/developer/operator plan to install USTs that contain petroleum or other regulated substances, the owner/developer/operator must comply with the federal UST technical and financial responsibility requirements set forth in Title 40 of the Code of Federal Regulations Part 280. These federal rules require, among other things, owners and operators of USTs to meet specific requirements in the detection, release response and corrective action. Also, the owner/developer/operator must comply with all State UST rules and regulations pursuant to Chapter 342-L, "Underground Storage Tanks" of the Hawaii Revised Statutes.

In consideration of the above-mentioned remarks, the Department of Health recommends that the owner/developer/operator implement facility plan alternatives that exclude the installation and operation of UST systems (e.g., the preferential use of electric golf carts, use of above-ground storage of fuel oil for emergency power generators, etc.), or, if USTs are utilized, that secondary containment be considered.

7. Buildings designated to house the fertilizer and biocides shall be bermed to a height sufficient to contain a catastrophic leak of all fluid containers. It is also recommended that the floor of this room be made waterproof so that all leaks can be contained within the structure for cleanup.
8. A golf course maintenance plan and program will be established based on "Best Management Practices (BMP)" in regards to utilization of fertilizers and biocides as well as the irrigation schedule. BMP's will be revised as an ongoing measure. The golf course maintenance plan will be reviewed by the State Department of Health prior to implementation.

If there are any questions regarding the eight (8) conditions mentioned here, please contact Mr. James K. Ikeda at 543-8304. We ask you cooperation in the protection of Hawaii's valuable groundwater resource.



June 11, 1991

Dr. John Lewin M.D., Director  
State of Hawaii  
Department of Health  
P.O. Box 3378  
Honolulu, Hawaii 96801

**1-12 SUBJECT: COMMENTS REGARDING DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR WAIANAЕ KAI GOLF COURSE**

Dear Dr. Lewin:

Thank you for your comments of June 3, 1991. Although your comments were received after the Office of Environmental Quality Control review period deadline of June 7, 1991, we offer the following comments.

Sanitation Branch

Upon development of the proposed golf course, the existing cesspool will be destroyed and its use discontinued.

Wastewater Branch

At this time in the design and development process, the specific requirements of the wastewater collection, treatment, and disposal system have not been identified. Upon design of the proposed clubhouse, plans for an on-site "state-of-the-art" septic system will be designed for review by your department. If after review of the proposed septic system plans the DOH still requires connection to the municipal system, the developer will comply in accordance with Chapter 11-62, "Wastewater Systems". This connection (if required) will also be coordinated with the City and County of Honolulu.

Safe Drinking Water Branch

As stated in the DEIS, only potable water from the Board of Water Supply System will be utilized. All irrigation water will be provided from on-site non-potable brackish wells. As such, each system will be totally separate to ensure that no cross-connections or backflow

1042 FORESBITH MALL, SUITE 300 HONOLULU, HAWAII 96813 TELEPHONE: (808) 571-5400 FAX: (808) 571-1872  
HAWAIIAN ENVIRONMENTAL SERVICES, INC. 1042 FORESBITH MALL, SUITE 300 HONOLULU, HAWAII 96813 FAX: (808) 571-1872

conditions are allowed to occur. Each system will be clearly labeled and physically separated by an air gap or an approved backflow preventor as appropriate to avoid contaminating the potable water supply. Each well will have a concrete well pad and full grouting to prevent seepage or floodwaters from migrating down the well shaft. All brackish wells are located down-gradient of potable wells to ensure that the water quality of existing wells in the area are not adversely affected.

Environmental Planning Office

As discussed in Appendix D - "Potential Environmental Impact on Groundwater Supplies Resulting from the Application of Fertilizers and Biocides on the Proposed Waianae Kai Golf Course", the likelihood that any nutrients and pesticides in runoff will reach the ocean is extremely slight. As stated on pages 28 and 29,

"there appears to be little likelihood of contamination of the groundwater supplies or nearshore coastal water below or downgradient of the project site as a result of the application of the fertilizers and biocides on the Waianae Kai Golf Course. As noted, the design of the golf course is such that a portion of the golf course will drain into the lined ponds that will be created as part of the irrigation system. As such, should runoff occur, that runoff would, for the most part, be retained in the golf course ponds and reapplied during the normal irrigation schedule. As noted and implied above, for the fertilizers and biocides to be an environmental problem downgradient from the project site, those chemicals would have to be soluble in water and leach into the groundwater supplies or enter rainwater runoff streams. Given the low rainfall, limited quantities of chemicals to be applied, the insolubility of the chemicals and the high evapotranspiration rate, it does not appear likely that leaching into the groundwaters would occur nor would the chemical enter rainwater runoff streams, thereby negating any potential adverse environmental effects."

In cooperation with the University of Hawaii, Cooperative Extension Service, the use of nutrients and pesticides on the proposed golf course will follow approved nutrient and pesticide management plans. In addition, all "Eight (8) Conditions Applicable to this New Golf Course Development", State of Hawaii Department of Health, April, 1990 (Version 3)" as provided in your comments will be implemented.

Sincerely,

PBR-HAWAII  
*David Hulse*  
David Hulse  
Project Planner

350ML\_15.W51



June 11, 1991

Mr. Brian J. Choy, Director  
Office of Environmental Quality Control  
220 South King Street  
Fourth Floor  
Honolulu, Hawaii 96813

**SUBJECT: COMMENTS REGARDING THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE WAIANAE KAI GOLF COURSE**

Dear Mr. Choy:

Thank you for your comments of June 7, 1991. We offer the following for your consideration.

1. A disclosure statement will be included in the final EIS project description (Chapter II) denying the use of public funds or lands for the proposed action.
2. A description of the status of each permit or approval required will be included on page 16 of the final EIS.
3. A discussion will be provided under 6.1 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES considering the possibility of environmental accidents resulting from any phase of the action.

Your comments and this response will also be included in the final EIS.

Sincerely,

PBR HAWAII

*David Hulise*  
David Hulise  
Project Planner

cc: Erle Kijagawa, Honita Investments

350DL\_18.W51

1042 FORT STREET MAIL SUITE 300 HONOLULU HAWAII 96813 TELEPHONE (808) 521-5611 FAX (808) 521-1897

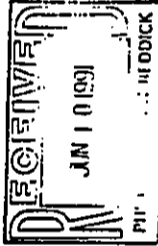


STATE OF HAWAII

BRIAN J. CHOY  
Director

OFFICE OF ENVIRONMENTAL QUALITY CONTROL  
220 SOUTH KING STREET  
FOURTH FLOOR  
HONOLULU HAWAII 96813

June 7, 1991



Mr. Benjamin Lee  
Department of General Planning  
City & County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

Dear Mr. Lee:

110

This is written in reference to the Draft Environmental Impact Statement for the Waianae Kai Golf Course. The Office of Environmental Quality Control (OEQC) offers the following comments for your earnest consideration:

1. Pursuant to §11-200-17(e) of the Hawaii Administrative Rules (HAR), a disclosure statement in the project description (Chapter II) affirming/denying the use of public funds or lands for the action should be provided.
2. On page 16, permits/approvals and issuing authorities are presented. In addition, pursuant to HAR §11-200-17(h), a description of the status of each permit or approval should also be included.
3. Pursuant to HAR §11-200-17(k), on page 72, under 6.1 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES, the discussion should also consider the possibility of environmental accidents resulting from any phase of the action.

Thank you for the opportunity to comment. If you have any questions, please contact Mr. Leslie Segumko at 548-6915.

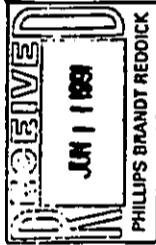
Very truly yours,

*Brian J. Choy*  
for BRIAN J. CHOY, Director

cc: Herbert K. Honita Realty  
PBR Hawaii



COPY



June 6, 1991



COPY

Mr. Benjamin B. Lee  
Page 2  
June 6, 1991

TO: BENJAMIN B. LEE, CHIEF PLANNING OFFICER  
DEPARTMENT OF GENERAL PLANNING

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER  
BOARD OF WATER SUPPLY

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) REGARDING  
THE PROPOSED WAIANAE KAI GOLF COURSE, TMK: 8-5-03: 9, 10, 29,  
31, 32 AND 43; 8-5-04: 28; 8-5-19: 33, 35-37, WAIANAE VALLEY  
ROAD

114

We have the following comments on the DEIS for the proposed Waianae Kai golf course:

1. Any reduction in the sustainable yield of our water sources in that area due to the golf course on-site wells should be corrected by the reduction of pumpages from the golf course wells.
2. The development of additional on-site wells to irrigate the golf courses should be coordinated with the State Department of Land and Natural Resources.
3. The availability of domestic water will be confirmed when the building permit is submitted for our review and approval. When water is made available, the developer will be required to pay our Water System Facilities Charges for source-transmission and daily storage.
4. The discussion on Page 3, Appendix A, should state the project's potable water requirements of 24,000 gallons per day can be served by the Board of Water Supply's (BWS) "242" water system instead of the "390" system. The service limit for the area is the 142-foot elevation.
5. The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

6. If a three-inch or larger meter is required, the construction drawings showing the installation of the meter should be submitted for our review and approval.

7. A BWS approved reduced pressure principle backflow prevention device will be required immediately after the domestic water meter.

If you have any questions, please contact Bert Kuiuoka at 527-5235.

cc: Herbert K. Horita Realty  
1818 Hawaii  
OFQC



PLANNING  
BOARD  
REGULATIONS

June 11, 1991

Mr. Kazu Hayashida, Manager and Chief Engineer  
Board of Water Supply  
City and County of Honolulu  
630 South Beretania  
Honolulu, Hawaii 96813

**SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) COMMENTS  
REGARDING THE PROPOSED WAIANAE KAI GOLF COURSE**

Dear Mr. Hayashida:

Thank you for your comments of June 6, 1991 regarding the proposed Waianae Kai Golf Course. We offer the following in response.

1. Should any reduction in the sustainable yield of the Board of Water Supply (BWS) sources occur in the area of the subject property due to the golf course on-site wells, the pumpage rates will be reduced as appropriate. However, the location of the on-site brackish wells down gradient of the BWS wells, should mitigate the potential for reduction of the sustainable yield of potable water (DEIS, Appendix E).
2. Development of additional on-site irrigation wells will be coordinated with the Department of Land and Natural Resources as recommended in your comments.
3. The developer will pay the required Water System Facilities Charges for source-transmission and daily storage. It is acknowledged that the availability of domestic water will be confirmed when the building permit is submitted to the BWS for review and comment.
4. We concur that the potable water requirements of 24,000 gallons per day can be served by the Board of Water Supply's "242" water system instead of the "390" system as stated on Page 3, Appendix A. It is acknowledged that the service limit for the area is the 142-foot elevation.
5. Location and design of the on-site fire protection requirement will be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

Mr. Kazu Hayashida  
**SUBJECT: WAIANAE KAI GOLF COURSE DEIS COMMENTS**  
June 11, 1991  
Page 2

6. If a three-inch or larger meter is required, the construction drawings showing the installation of the meter will be submitted for your review and approval.
7. A BWS approved reduced pressure principle backflow prevention device will be placed immediately after the domestic water meter in accordance with BWS requirements.

Thank again for participating in the EIS review process. Your letter and this response will be included in the final EIS.

Sincerely,  
PBR HAWAII

David Hulse  
Project Planner

cc: Eric Kitagawa, Honia Investments

350BL\_16.W51

DEPARTMENT OF LAND UTILIZATION  
**CITY AND COUNTY OF HONOLULU**

810 SOUTH KING STREET  
HONOLULU HAWAII 96813 • (808) 525-6532



FRANK PEARSON  
DIRECTOR

JUN 11 1991

PHILLIPS BRANDT REDDICK  
CORPORATE COUNSEL  
ATTORNEYS-AT-LAW

DONALD A. CLEGG  
DIRECTOR

LU 04/91-2376 (JSH)

June 7, 1991

**MEMORANDUM**

**TO:** BEJAMIN B. LEE, CHIEF PLANNING OFFICER  
DEPARTMENT OF GENERAL PLANNING

**FROM:** DONALD A. CLEGG, DIRECTOR

**SUBJECT:** DRAFT ENVIRONMENTAL IMPACT STATEMENT  
WAIANA'E KAI GOLF COURSE

The Environmental Affairs Branch of the Department of Land Utilization has reviewed the Draft Environmental Impact Statement (DEIS) for the proposed Waianae Kai Golf Course Development.

Relocation of Mountain View Dairy

The DEIS provides only a brief discussion relating to the proposed project's potential impact on the existing agricultural operation. In light of the current decline of dairy enterprises on the island of Oahu, the successful relocation of the Mountain View Dairy will be an important issue. The DEIS relies heavily on the assumption that the Mountain View Dairy will be successful in its efforts to relocate to the new agricultural park in the area. Although the DEIS refers to the relocation of the dairy to the new agricultural park as if it were an accomplished fact, this may presume too much. In light of the fact that the agricultural park is not yet in existence, the DEIS should provide a more complete discussion of the issues involved in the relocation, including an examination of the alternatives available to the dairy. It seems premature to dismiss the impacts of this project on the dairy, based solely on the assumption that the dairy will be able to successfully relocate into the new agricultural park.

Benjamin B. Lee, Chief Planning Officer  
Page 2  
June 7, 1991

Residential Displacement

Another issue that is not addressed in the DEIS is the housing that will be displaced by the new development. Buried within the closing pages of the DEIS in Appendix H, page c-15, there is a reference to "one family and six employee houses" located on the dairy property. Although these dwellings represent a relatively small number of homes, their displacement is a significant impact of this project. In addition, their displacement is a significant impact in the body of the DEIS. As no mention is made of these dwellings, it is not possible to determine if they are to remain as part of the proposed golf course operation. No actions are discussed for their relocation, or for any other type of mitigation. These issues need to be addressed within the body of the EIS.

Fauna

The fauna study for this DEIS is insufficient. There is no information provided describing how the conclusions of the study were reached. No information is provided describing the field surveys or other research methods that were utilized in preparing the DEIS. Without this information, it is difficult to evaluate the merits of the conclusions reached in the DEIS.

*Donald A. Clegg*

DONALD A. CLEGG  
Director of Land Utilization

DAC:lg

cc: Ron Watase, Herbert K. Morita Realty  
David Hulse, PDR Hawaii



PLANNING  
ENVIRONMENTAL SERVICES

June 11, 1991

Mr. Donald A. Clegg, Director  
Department of Land Utilization  
City and County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

**SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT COMMENTS FOR  
WAIANAЕ KAI GOLF COURSE**

Dear Mr. Clegg:

Thank you for your comments regarding the proposed Waianae Kai Golf Course. In response to your concerns, we offer the following comments.

Relocation of Mountain View Dairy

Your concerns regarding the relocation of the Mountain View Dairy were also expressed by the State Department of Agriculture (DOA). In subsequent discussions with DOA officials regarding this issue, the possible relocation of dairy cattle to other dairies as an interim measure was considered. However, it appears that distribution of the dairy herd to other dairies may face problems related to capacity limitations and health related concerns associated with mixing herds. Although this option has not been eliminated, the preferred alternative would be to relocate the entire herd permanently to the proposed Oahu Livestock Agriculture Park (OLAP).

The selection of dairies that may be relocated to OLAP facility has not been completed, nor has the selection criteria been officially adopted by DOA. However, if the Mountain View Dairy is not selected by the DOA for relocation into the OLAP, we assume that decision is based on DOA selection criteria and that the other dairy operations selected would have a higher priority of relocation.

Therefore, the preferred alternative is to schedule (to the extent possible) development of the proposed golf course with the OLAP and work with DOA to meet their selection criteria.

1042 FORT STREET MAIL, SUITE 300 HONOLULU, HAWAII 96813 TELEPHONE (808) 521-5411 FAX: (808) 521-1402  
PACIFIC BUREAU HONOLULU OFFICE 141 ALI'IPANUI STREET, SUITE 101 HONOLULU, HAWAII 96813 TELEPHONE (808) 521-1402 FAX: (808) 521-1402

Mr. Donald Clegg, Director  
**SUBJECT: WAIANAЕ KAI GOLF COURSE DEIS REVIEW COMMENTS**  
June 11, 1991  
Page 2

Residential Displacement

The residences currently located on the subject property were established to provide housing for a portion of the Mountain View Dairy Employees and are depicted in Figure 6 of the EIS. Inasmuch as these units are associated with the dairy operation, they will be removed and the tenants relocated along with the dairy operation. The specific location of replacement units has not been determined at this time, however, the developer will work closely with the tenants and owners of Mountain View Dairy, well before golf course construction commences, to relocate the occupants of these units.

Fauna

Due to the highly developed nature of the dairy operation and the presence of habitat similar to the subject property throughout much of Waianae, the subject property is not considered as a unique habitat. As such, a formal fauna study has not been conducted for the subject property at this time. However, should it be determined that the study is necessary, the developer will provide a fauna study prior to the zoning amendment review process.

Thank you for participating in the EIS review process. Your letter and this response will be included in the final EIS.

Sincerely,

PBR HAWAII

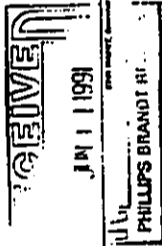
David Hulse  
Project Planner

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**OFFICE OF STATE PLANNING**

Office of the Governor  
STATE CAPITAL, HONOLULU, HAWAII 96813 TELEPHONE: 535-3000



June 7, 1991

The Honorable Benjamin B. Lee  
Chief Planning Officer  
Department of General Planning  
City and County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

Dear Mr. Lee:

Subject: Comments on Draft Environmental Impact Statement  
for the Proposed Maianae Kai Golf Course  
Maianae, Oahu

We have reviewed the Draft Environmental Impact Statement (DEIS) for the proposed Maianae Kai Golf Course to be located in Maianae Valley, approximately one mile mauka of Farrington Highway in Maianae. The project site is bounded by the State's Maianae Agricultural Park to the north, the City and County landfill to the southwest, several crop farming activities to the south, and residential units to the east of the proposed project. The project site consists of approximately 253 acres and is identified as Tax Map Key Nos.: 8-5-03: 9, 10, 29, 31, 32, and 43; 8-5-04: 28; 8-5-19: 33, 35, 36, and 37.

According to the DEIS, the proposed project will consist of three nine-hole courses, a clubhouse, a driving range with 20 tee stalls, parking, and a maintenance facility. The DEIS also indicates that the proposed golf course would be privately owned and operated. Use of the course and facilities will be available to members. Public play is also indicated, however, no commitment has been made as to the affordability of the rates and the number of tee times reserved for the public.

According to the DEIS, the proposed project site is owned in fee by three owners: Makaha Valley, Inc., Mountain View Dairy Inc., and Herbert K. Horita Investments, Inc., with the latter two owning nearly 99% of the subject properties. The properties are in the State Land Use Agricultural District and are designated by the Maianae Development Plan Land Use Map as Agriculture.

The DEIS indicates that a zoning amendment for the proposed use will be proposed to reclassify the subject property to P-2 Preservation and that the proposed use will require a "Plan Review Use (PRU)".

The following comments are provided for your consideration.

Mr. Benjamin B. Lee  
Page 2  
June 7, 1991

While the DEIS provided raw data on water needs, wastewater, traffic, and other subjects, it fails to address some real issues associated with the proposed project. The final EIS should provide additional information on:

- (1) The availability of sufficient potable and non-potable water to serve the proposed project and its impact to the region's water supply;
- (2) The provision of a wastewater system acceptable to the State Department of Health (DOH);
- (3) Impacts on adjacent land uses;
- (4) The need for the proposed project;
- (5) The compatibility with Maianae's rural character;
- (6) Impacts to neighboring residents as a result of increased total volume of traffic and sufficiency of existing roads to accommodate this increased traffic;
- (7) The size and function of the proposed clubhouse and its anticipated patterns of uses, including, but not limited to, its associated patterns of roadway use and traffic volumes;
- (8) The impacts to the region's coastal and groundwater quality as a result of pesticides, herbicides, and other chemicals associated with the proposed golf course; and
- (9) Accommodation of public play at affordable rates.

In addition, no plans or proposals were identified for Tax Map Key: 8-5-19: 33. More information about this should be discussed in the final EIS.

According to the DEIS, Mountain View Dairy, Inc., proposes to relocate its dairy operations to the State Department of Agriculture's (DOA) proposed livestock agricultural park. According to correspondence from DOA regarding this matter, priority will likely be given to those livestock operations that are most threatened by uncertain land tenure beyond their control. It appears that this is not the case with Mountain View Dairy, Inc., which is considered by industry experts to be among the most efficient dairy operations in the State of Hawaii.

After reviewing the DEIS, we are deeply concerned about the possibility that the proposed project may function as a catalyst for increased development

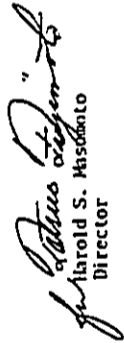


Mr. Benjamin B. Lee  
Page 3  
June 7, 1991

in the Maianae Valley region. Projects oriented to an upscale, high-end market, such as this one, may lead to the eventual long-term displacement of current residents and may adversely affect Maianae's rural character.

Thank you for the opportunity to comment. Should you have any questions, please call the Land Use Division at 548-2066.

Sincerely,

  
Harold S. Masumoto  
Director

cc: Herbert K. Horita Realty  
(Attn: Mr. Ron Matase)  
PBR Hawaii  
(Attn: Mr. David Hulse)  
OEPC  
IWA, Planning and Development Office

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June 11, 1991

Mr. Harold Masumoto, Director  
Office of State Planning  
State Capitol  
Honolulu, Hawaii 96813

SUBJECT: RESPONSE TO WAIANAE KAI DRAFT ENVIRONMENTAL IMPACT STATEMENT REVIEW COMMENTS

Dear Mr. Masumoto:

Thank you for your comments of today's date. Although your comments were received after the Office of Environmental Quality Control (OEQC) review period deadline of June 7, 1991, we offer the following for your consideration.

Availability of Potable and Non-potable Water Resources

As indicated in Appendix E, pages 6 and 7, three existing "dug wells" with chlorides of between 333 and 440 mg/l, are recommended to provide the primary non-potable source for golf course irrigation. These wells and additional drilled wells (if required), will be incorporated into a source development program to maintain a combined water source for all irrigation requirements. The combined chloride level from these sources is expected to range from 400 to 500 mg/l. When combined with the proposed storage ponds, additional wells proximate to Well #2, and the management flexibility afforded by using several well locations, the combined installed capacity will be approximately 1.175 gpm, well above the quantities required. The chloride levels are well within acceptable levels for the irrigation of turf grasses and other selected plant materials. As such, the higher than expected chloride level from test well #2 is not significant.

As stated in Appendix E, page 6, the proposed wells cannot influence up gradient water developments such as those for the State Agricultural Park or the Honolulu Board of Water Supply wells.

In accordance with Board of Water supply policy, the availability of domestic water will be confirmed when the building permit is submitted to the BWS for review and comment. However, the BSW has indicated in their DEIS comments that the BWS "242" system can provide the required 24,000 gpd of potable water.

Mr. Harold Masumoto, Director  
SUBJECT: WAIANA'E KAI DEIS REVIEW COMMENTS  
June 11, 1991  
Page 2

Waste Water Disposal

The waste water disposal system will be designed during the appropriate phase of the clubhouse architectural design. Although the precise location of the septic system filter/disposal field is not known at the present time, it will be designed to meet or exceed the Department of Health rules applicable to the project. Should the Department of Health reject the proposed septic system design and require a connection to the municipal waste water collection pipeline (approximately 4,000 feet from the property), the necessary connection and improvements will be made in accordance with all State and County requirements.

Impacts on Adjacent Land Uses, Project Need, and Compatibility with Waiana'e Rural Character

Numerous meetings with community groups and individuals have continued since the golf course was originally proposed in 1988. All adjoining property owners have been notified of the proposed golf course. In support of the proposed project, the Waiana'e Neighborhood Board voted to recommend approval of the project during their meeting of April 11, 1991.

As stated on pages 5 and 6 of the DEIS, the proposed golf course will provide recreational, economic (i.e. employment), and open space benefits to the community. Whether these impacts constitute a something that is "needed" or desirable will be determined by the community's support or opposition to the project, and the final action to be taken by the City Council. To determine how golf course entitlements will be processed in the future, the City and County of Honolulu is currently developing a golf course policy. Therefore, the appropriateness of this project will be evaluated in comparison with the relative costs and benefits of all planned golf facilities at the appropriate time in the City's review process.

Regarding the rural character of the area, the proposed golf course and the open space qualities it will provide, would be similar to many other golf courses located throughout the State located in rural areas. As a permitted use in the State Agricultural District and within an area surrounded by small agricultural and residential parcels, the project will establish an open space recreational use for the property with densities much lower than currently permitted by the Agricultural (AG-2) zoning which would allow 2-acre agricultural lots. By maintaining open space within an agricultural/rural area such as this, the distances established between potential conflicting land uses will create a physical buffer.

A complete community benefits package will be included in the final EIS to mitigate potential socio-economic impacts of the project. This package will include provisions for establishment and funding (\$2,000,000) of a non-profit community foundation to review, fund and administer benefits affecting the Waiana'e community. The foundation will consist of scholarships, facility improvements for Waiana'e area schools, youth-related activities, health programs, and cultural programs or facilities in Waiana'e to promote cultural education. Foundation members will consist of representatives from community organizations, the district council person, state legislators, and the developer's representative. The foundation will be established as a permanent vehicle for charitable giving and engage the services of an established trust company to oversee

Mr. Harold Masumoto, Director  
SUBJECT: WAIANA'E KAI DEIS REVIEW COMMENTS  
June 11, 1991  
Page 3

the administration and the funding. Other community programs will include a Waiana'e Valley Maintenance Program, Plantation Road landscaping, support of the Waiana'e High School Golf Team, and expansion of employment opportunities.

In addition to the above, \$23,000,000 will be deposited into the City's general fund to be allocated as determined appropriate by the City and County of Honolulu. Further details of the community benefits package will be provided in the final EIS and during the zoning amendment process.

Impacts Associated with the Proposed Clubhouse and Traffic Volume in the Region

As stated on page 20 of the DEIS, the proposed clubhouse will range in size from 20,000 to 30,000 square feet and include men's and women's locker rooms, a pro shop, club storage, a kitchen, snack bar and dining/lounge area. Parking adjacent to the clubhouse is expected to accommodate 266 to 294 cars, based upon a daily service of 400 to 600 people.

In addition, Appendix B - "Traffic Impact Study", provides a detailed analysis of traffic related impacts in terms of sufficiency of existing roads, traffic volume, and projected traffic volumes after project buildout. As illustrated in Appendix B, Page 11, Table 2, all projected levels of service (LOS) for two "worst-case" peak period traffic assignments are projected at LOS A, B, or C. Only the westbound approach from Farrington Highway to Waiana'e Valley Road is projected to have an LOS of E which is considered as adequate capacity. Traffic volumes on Waiana'e Valley Road and on Plantation Road will continue to operate at LOS A. The only improvement which may be required would be the modification of the signal timing at the Farrington Highway/Waiana'e Valley Road intersection.

To ensure adequate traffic capacity along Waiana'e Valley Road, a separate left turn lane in, and right acceleration lane out of the project entrance will be provided as required by the City and County of Honolulu Department of Transportation Services.

Impacts Relating to the Region's Coastal and Groundwater Quality

A groundwater mitigation and monitoring plan will be formulated in accordance with the Department of Health regulations for monitoring, the management of golf course irrigation systems, and pesticide/fertilizer applications. As stated in Appendix D, page 28,

"the relatively small amounts of fertilizers and biocides that would be applied to the golf course, the low rainfall and high evapotranspiration rate of the area and the design of the golf course drainage system, there appears to be little likelihood of contamination of the groundwater supplies or near shore coastal water below or down gradient of the project site as a result of the application of the fertilizers and biocides on the Waiana'e Kai golf course."

Mr. Harold Masumoto, Director  
SUBJECT: WAIANAIE KAI DEIS REVIEW COMMENTS  
June 11, 1991  
Page 4

The mitigation measures addressed in the hydrogeologic reports (Appendices E and F) will be adhered to as stringently as possible.

Golf Play for the Residents of Hawaii at Affordable Rates

To ensure golf play for residents of Hawaii at affordable rates, the final EIS will commit to the following: (a) a minimum of 3.5 days per week, or a minimum of 50 percent of available tee times per week. Of these public play times, a minimum of one day shall be provided on weekend days; and (b) green fees comparable to other private golf courses which allow public play, such as Pearl, Hawaii Kai, Mililani, and Olomana golf courses.

This commitment to affordable play is also intended to ensure that the golf course is not targeted toward an "upscale, high-end market", but will accommodate the recreational needs of Hawaii residents.


Relocation of Mountain View Dairy

Your concerns regarding the relocation of the Mountain View Dairy were also expressed by the State Department of Agriculture (DOA). In subsequent discussions with DOA officials regarding this issue, the possible relocation of dairy cattle to other dairies as an interim measure was considered. However, it appears that distribution of the dairy herd to other dairies may face problems related to capacity limitations and health related concerns associated with mixing herds. Although this option has not been eliminated, the preferred alternative would be to relocate the entire herd permanently to the proposed Oahu Livestock Agriculture Park (OLAP).

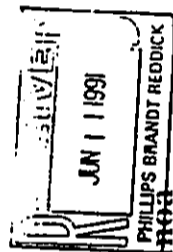
The selection of dairies that may be relocated to OLAP facility has not been completed, nor has the selection criteria been officially adopted by DOA. However, if the Mountain View Dairy is not selected by the DOA for relocation into the OLAP, we assume that decision is based on DOA selection criteria and that the other dairy operations selected would have a higher priority of relocation.

Therefore, the preferred alternative is to schedule (to the extent possible) development of the proposed golf course with the OLAP and work with DOA to meet their selection criteria.

Sincerely,

PBB HAWAII  
  
David Hulsc  
Project Planner

3081.1\_051



**University of Hawaii at Manoa**

Environmental Center  
A Unit of Water Resources Research Center  
Crawford 117 • 2550 Campus Road • Honolulu, Hawaii 96822  
Telephone: (808) 951-7311

June 7, 1991  
RE: 0583

Mr. Benjamin Lee  
Department of General Planning  
City and County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

Dear Mr. Lee:

Draft Environmental Impact Statement (EIS)  
Maiana Kai Golf Course  
Maiana, Oahu

The above referenced project proposes development of a 27-hole golf course, maintenance facilities, parking for 266 to 294 cars, a 20,000 to 30,000 square foot clubhouse, and a 20 stall driving range on 246 acres approximately one mile northeast of Maiana town. The only access for the project is a right-of-way that extends approximately 2,350 feet from Maiana Road to the clubhouse. A small parcel of land will be used to produce foliage for the golf course.

This review was prepared with the assistance of Jon Matsuoaka, School of Social Work; Paul Ekern (Emeritus), Henry Gee, and Yu-Si Fok of Water Resources Research Center; and Alex Ruttaro of the Environmental Center.

Water Resources

Our reviewers note that Section 1.4.3 should include statements on groundwater in addition to the discussion of surface water hydrology. This and following requests for additional information are justified pursuant to EIS Rules Sections 11-200-14, 11-200-16, and 11-200-17, which require the disclosure and evaluation of all relevant and feasible consequences and implications of the action.

The hydrogeologic study (Appendix F, page 4) states "the recent tests on the existing dug wells indicate that they can be pumped at a sustainable yield of 1.0 million gallons per day and, therefore, provide the required irrigation water for the proposed 27-hole golf course at acceptable chloride levels." While we understand the manner in which the need for 1.0 million

Mr. Benjamin Lee  
June 7, 1991  
Page 2

gallons was determined, we are unclear as to how the tests specifically indicated the requirements will be met. We suggest that this additional information be provided in the appropriate sections.

The preliminary hydrogeologic report indicates that the salinity expected for Test Well #2 prior to drilling was 50 mg/l (Appendix F, page 2), yet subsequent pumping from this well yielded chlorides that averaged 477 mg/l (Appendix E, page 4). Due to the fact Test Well #1 will not be used because of poor yields, is there cause for concern since Test Well #2 produced approximately 10 times the salinity originally anticipated prior to drilling? How will the developer offset the apparent lower-than-anticipated yields in quantity and quality of irrigation water?

The consultant's report (Appendix E, page 4) states that Test Well #2 will tap into the same aquifer used by the existing RMS facilities at Maiana. The Draft EIS fails to discuss the impacts of drawing low salinity water from this potable aquifer. Discussion of the sustainable yield of this aquifer, in addition to the effects of overdraw on its chloride levels, must be included in the appropriate sections of this document. If the water quality from the Maiana well changes, what alternative low-chloride water supply will be available to the RMS to meet seasonal needs for dilution of higher salinity water supplies?

Section 4.1.3.3 (page 36) needs to indicate clearly whether a groundwater contamination mitigation and monitoring plan currently exists for the project. In addition, specific details about the monitoring plan and mitigative measures as well as methods of implementation in the event of contamination should also be discussed.

Our reviewers agree that, given the peculiar wind regimes of the Maiana coast, the estimated irrigation needs appear valid. However, in view of the erratic nature of the well yields and salinities in the area, specific recommendations in the conclusions of the consultant's hydrogeologic reports (Appendices E and F) should be adhered to as stringently as possible. The Final EIS should indicate specifically what measures are being undertaken to meet these important recommendations.

There is an apparent contradiction in the statement made in Section 4.1.3.1 (page 34) that "No significant water resources are known to exist on the subject property. Groundwater is present, however, and is currently withdrawn for use in the dairy operation." Since we consider groundwater to be a significant water resource, this statement is untrue and thus should be altered or omitted from the Final EIS.

Mr. Benjamin Lee  
June 7, 1991  
Page 3

#### Wastewater Disposal

Section 4.3.3.2 (page 54) purports to describe the probable impacts of using the proposed series of underground cesspools or septic tanks, but instead merely describes what type of systems are to be used. Also, the following section which sets out to propose mitigation measures (Section 4.3.3.3, page 54), instead describes the permits and approvals which will be sought. Our reviewers note that the acquisition of permits and approvals does not constitute mitigative measures that address environmental impacts, and therefore their discussion should be removed from this section. Disclosure of environmental impacts and proposed mitigation measures for the wastewater treatment system is mandated by the EIS Rules, Section 11-200-17.

Because water is a precious commodity in the area, adequate attention should be given to the possible recovery of wastewater for use in irrigation.

#### Climate

Section 1.4.5 (page 9) should discuss the importance of land-sea breeze development along the coast, and the probable role it plays in limiting evapotranspiration. On-shore flows of cool air and light winds sharply reduce the pan evaporation in comparison to conditions on the Ewa plain. Moreover, the lighter winds reduce positive advection of heat from the dry surrounds and make the grass/pan use coefficient nearly 1, in comparison to 1.1 to 1.25 for summer at Ewa.

Our reviewers suggest that wind data derived from Mailli Beach is marginally germane to an analysis of Waianae wind regimes (Appendix D, page 13), and the partial data from June and July should be supplemented with other time periods which would appropriately indicate seasonal fluctuations. These wind fluctuations have been related to variations in advection patterns and the rates of pan evaporation, (Mullet, D. 1987. Energy Sources for Evaporation on Tropical Islands. Physical Geography 8(1): 36-45).

#### Affordable Housing

The statement is made in Section 1.4.11 (page 11), that "The availability of affordable housing will not be impacted by this project, although the value of residences in the project region may increase." This statement appears to contradict itself in stating that the project will cause the value of residences in the area to increase, yet not impact affordable housing. Our reviewers note that as land values rise, the opportunity cost of maintaining affordable housing also increases, creating a disincentive toward the maintenance of affordable housing. Additionally, how does the effect of tapping into the same aquifer by the Kamille well indirectly impact the possible future economic viability of using this potable water supply for affordable housing in the area? Our reviewers find that both these issues could indirectly impact affordable housing, and may therefore disqualify the above statement.

Mr. Benjamin Lee  
June 7, 1991  
Page 4

A 1987 study on economic development in Waianae conducted by the University of Hawaii Department of Urban and Regional Planning, entitled "Waianae: Toward a Value Based Community Development Process," found that "Despite a high vacancy rate, Waianae in general has a shortage of affordable housing and no immediate relief of this shortage is anticipated or planned," and "there is much land speculation in Waianae and increased land values, which will be affecting the cost of housing" (page 55). In light of the findings of this study, the Final EIS should more thoroughly address the primary, secondary, cumulative, and long-term impacts Waianae Kai golf course will have on affordable housing in the Waianae area.

#### Socio-Economic Impacts

Our reviewers found the information provided on socio-economic issues to be extremely terse and generally insufficient in light of the requirements of this type of document.

The controversial issues surrounding golf course development on the Islands and their relationship to this development were not addressed at all and must be sufficiently addressed in the Final EIS.

Meetings with community organizations need better documentation describing the methodology, kinds of questions asked, and significant issues raised.

Section 1.2 (page 6) states, "Membership and fee structure are undetermined at this time." Our reviewers note that determination of specific membership policies and fee structures is essential to this type of project and must be discussed in the Final EIS so as to enable decision makers to adequately assess the overall benefits and detriments of this development.

Because of the controversial nature of golf course development in the area, the unresolved issue of the community benefits package (Section 1.7, page 14) should be resolved and comprehensively explained in the Final EIS. Will the existing proposed mitigation measures (Section 4.2.4.3, page 49) in the form of the benefit package be implemented?

Section 1.4.14 (page 11) states, "The developer will continue to work with community groups and others to make the recreational opportunities of the project available to the maximum number of residents." The Final EIS should state specifically how the developer proposes to work with community groups to make the use of the golf course facilities available to the maximum number of residents, since this is a critical aspect of mitigating potential social conflicts. The specific strategy and residents to be affected are unclear in the statement's present form. Will access opportunities be maximized for Waianae residents, as working with community groups might imply, or are the residents to which the document refers understood to be residents of the State of Hawaii?

Mr. Benjamin Lee  
June 7, 1991  
Page 5

In the discussion on the character or culture of the neighborhood (Section 4.2.4.2), it is stated that "development of the golf course will ensure a rural atmosphere...and add a needed recreational facility." As discussed in the following sections, the document has neither established the need for golf courses in Waianae, nor the manner in which Waianae Kai golf course will ensure a rural atmosphere. Accordingly, this statement should be appropriately altered or struck from the document.

The Final EIS should address potential long term and cumulative impacts of displacement of the existing dairy operation upon Waianae's diversified agriculture and the community's economic orientation to it.

Section 4.2.4.2 (page 47) describing economic impacts states, "Some increase in the market value of the properties near the golf course is expected, but this is not necessarily construed as a negative impact." We concur with statement, however, this section must also address the secondary, indirect, and cumulative impacts of increased market values of the properties, and the extent to which these impacts foreclose future options with regard to affordable housing, cost of living, and resident emigration.

#### Native Hawaiians

While we understand that many unique ethnic groups and cultures are represented in the Waianae area, and recognition of cultural issues are important to all, special attention should be given to Native Hawaiians and their culture in light of their limited geographical distribution, and the fact that Waianae is one of the few areas remaining that retains a relatively large Native Hawaiian community.

The Draft EIS inadequately addresses issues surrounding Native Hawaiian population in the Waianae area. Specifically, discussion of the project's secondary, indirect, and cumulative impacts upon the Native Hawaiian culture and populace, as well as how this development may affect their future options and uses of the environment, should be included in the Final EIS pursuant to the EIS Rules Sections 11-200-17(i) and (j) respectively.

#### Need for the Project - Language and Style Resembling Project Advocacy

Our reviewers expressed serious concern about the apparent tone and style of project advocacy in this document. The following comments address what are considered to be vaguely worded and weakly supported statements which may improperly advocate the development of Waianae Kai golf course, rather than objectively disclose important information needed by decision makers.

Section 1.2 (page 5) states, "The 'public need' for golf on Oahu can be evaluated from two perspectives. The first and most obvious demand for golf is derived from the recreational opportunities golf affords." This statement assumes that merely because golf provides recreational opportunities, there is necessarily an established demand and need for golf facilities. In its present form, this argument is logically incomplete and therefore invalid, and should be omitted or restructured in the Final EIS.

Mr. Benjamin Lee  
June 7, 1991  
Page 6

Similarly, Section 1.4.11 (page 10) states, "As for the character or culture of the neighborhood, the proposed golf course will ensure a rural atmosphere...and add a needed recreational facility to the community." Our reviewers cannot understand how this golf course will ensure a rural atmosphere. Will this project guarantee that surrounding sites will not be developed in a non-rural fashion and that future residential options will not be exercised by the developer, as the unqualified use of the word "ensure" might imply? In addition, we find the need for this type of recreational facility has yet to be established. The above statement is misleading and should either be omitted or sufficiently substantiated in the Final EIS.

While the determination by the Hawaii Real Estate Research and Education Center that approximately seven new golf courses will be needed to meet local demand by the year 2000 is of interest, it is important to note that 22 other courses are currently proposed for the island of Oahu alone. Thus, the appropriateness of this project must be evaluated in comparison with the relative costs and benefits of all planned golf facilities.

The second reason given for selecting Alternative #1 (Section 1.6, page 13), "2) expected high quality visitor and resident experience resulting from development of the project," again appears to assert an unsubstantiated positive affect of this project. This reasoning must be supported if it is to appear in the Final EIS.

In Section 6.2 (page 72), the document states that the developer addresses conflicts inherent to golf course development by "utilizing the benefits while minimizing adverse environmental impacts through the formation of mitigation measures." Our reviewers note that in order for mitigation measures to minimize adverse environmental impacts, they must be implemented. Accordingly, the language used in the above statement suggests will be implemented, and we therefore assume the mitigation measures "foresee"

Section 4.1 (page 33) states, "The proposed secondary impacts of the proposed golf course project on surrounding agricultural activities is generally positive. The golf course would act as a buffer between existing agricultural activities." An assertion must be put forth as to why a golf course buffer between agricultural and residential developments is a positive secondary impact, as it stands, this statement is unsubstantiated.

Chapter 200 of Title 11 Administrative Rules (EIS Rules) specifically addresses the problem of project advocacy written into the style and tone of EIS documents. With regard to the general requirements of preparing a Draft Final EIS, Section 11-200-14 states,

"An EIS is meaningless without the conscientious application of the EIS process as a whole, and shall not merely be a self-serving recitation of benefits and a rationalization of the proposed action."

Mr. Benjamin Leo  
June 7, 1991  
Page 7

To ensure this particular document is not construed as a "self serving recitation and rationalization of the proposed action," we strongly suggest that unclear and unsubstantiated statements outlined by our reviewers, are appropriately altered or omitted in the Final EIS.

General Summary


Our reviewers expressed serious concern over the lack of adequate and appropriate information with regard to the project's impacts upon the Mahiāne area's socio-economics, Native Hawaiian population, genuine controversial issues, water resources, and the apparent style of project advocacy. The Final EIS should address these concerns pursuant to Chapter 200 of Title 11 Administrative Rules which were previously cited.

Thank you for the opportunity to comment on this document and we hope you will find our comments helpful.

125

cc: OEDC  
Herbert Horita Reality  
HER Hawaii  
Royer Fujioka, WRRC  
Jon Matsuboka  
Paul Ekern  
Yu-Si Fok  
Henry Gee  
Alex Naitaro

Sincerely,

  
John T. Harrison, Ph.D.  
Environmental Center



June 11, 1991

Dr. John Harrison  
Environmental Center  
Crawford 317  
2550 Campus Road  
Honolulu, Hawaii 96822

**SUBJECT: RESPONSE TO WAIANAE KAI DRAFT ENVIRONMENTAL IMPACT STATEMENT REVIEW COMMENTS**

Dear Dr. Harrison:

Thank you for your comments of today's date. Although your comments were received after the Office of Environmental Quality Control (OEQC) review period deadline of June 7, 1991, we offer the following for your consideration.

Water Resources

As indicated in Appendix E, pages 6 and 7, three existing "dug wells" with chlorides of between 333 and 440 mg/l, are recommended to provide the primary non-potable source for golf course irrigation. These wells and additional drilled wells (if required), will be incorporated into a source development program to maintain a combined water source for all irrigation requirements. The combined chloride level from these sources is expected to range from 400 to 500 mg/l. When combined with the proposed storage ponds, additional wells proximate to Well #2, and the management flexibility afforded by using several well locations, the combined installed capacity will be approximately 1.175 gpm, well above the quantities required. The chloride levels are well within acceptable levels for the irrigation of turf grasses and other selected plant materials. As such, the higher than expected chloride level from test well #2 is not significant.

As stated in Appendix E, page 6, the proposed wells cannot influence up gradient water developments such as those for the State Agricultural Park or the Honolulu Board of Water Supply wells.

The groundwater mitigation and monitoring plan will be formulated in accordance with the Department of Health regulations for monitoring and the management of golf course irrigation systems, and pesticide/fertilizer applications. As stated in Appendix D, page 28,

1042 KONA STREET MAIL, SUITE 500 HONOLULU, HAWAII 96813 TELEPHONE (808) 521-5621 FAX (808) 521-1402

property, the market demand for existing residences in the region would decrease making them more affordable, but less desirable. It is the policy of the City and County of Honolulu and the State of Hawaii to encourage development of new high quality housing at affordable prices. It is not their policy to influence the price of existing housing by making it less desirable from a market perspective.

In reference to your second paragraph, land use controls that do not permit the residential use of land (i.e. commercial, industrial, agricultural) inherently restrict the amount of land available for residential uses. Development of a golf course as a permitted use in the State Agricultural District will not reduce the amount of land available for residential purposes. As such, making more land available for housing in Waianae will assist in keeping the price of housing affordable by increasing the availability of land and reducing the potential for speculation.

#### Socio-Economic Impacts

A complete community benefits package will be included in the final EIS to mitigate potential socio-economic impacts of the project. This package will include provisions for establishment and funding (\$2,000,000) of a non-profit community foundation to review, fund and administer benefits affecting the Waianae community. The foundation will consist of scholarships, facility improvements for Waianae area schools, youth-related activities, health programs, and cultural programs or facilities in Waianae to promote cultural education. Foundation members will consist of representatives from community organizations, the district council person, state legislators, and the developer's representative. The foundation will be established as a permanent vehicle for charitable giving and engage the services of an established trust company to oversee the administration and the funding. Other community programs will include a Waianae Valley Maintenance Program, Plantation Road landscaping, support of the Waianae High School Golf Team, and expansion of employment opportunities.

Golf play for the residents of Hawaii will be as follows:

- o A minimum of 3.5 days per week, or a minimum of 50 percent of available tee times per week. Of these public play times, a minimum of one day shall be provided on weekend days.
- o Green fees comparable to other private golf courses which allow public play, such as Pearl, Hawaii Kai, Mililani, and Olomana golf courses.

The relatively small amounts of fertilizers and biocides that would be applied to the golf course, the low rainfall and high evapotranspiration rate of the area and the design of the golf course drainage system, there appears to be little likelihood of contamination of the groundwater supplies or near shore coastal water below or down gradient of the project site as a result of the application of the fertilizers and biocides on the Waianae Kai golf course.

The hydrogeologic reports (Appendices E and F) will be adhered to as stringently as possible. In addition, the statement made in Section 4.1.3.1 (page 34) will be deleted from the final EIS.

#### Waste Water Disposal

The waste water disposal system will be designed during the appropriate phase of the clubhouse architectural design. Although the precise location of the septic system filter/disposal field is not known at the present time, it will be designed to meet or exceed the Department of Health rules applicable to the project. Inasmuch as the waste water will be adequately treated and disposed of through on-site systems in accordance with Department of Health rules, the use of treated effluent for irrigation has not been evaluated. Should the Department of Health reject the proposed septic system design and require a connection to the municipal waste water collection pipeline (approximately 4,000 feet from the property), the necessary connection and improvements will be made in accordance with all State and County requirements.

#### Climate

The Pan Evaporation Rates listed in Appendix D, page 14, are provided to estimate the quantities of irrigation water required to efficiently manage the golf course irrigation system. Actual on-site Pan Evaporation Rates will vary from these, based on types and quantities of plant materials used, topography, location of structures and hard surfaces, and wind patterns. As such, we concur that use of Maui Beach Wind Observations (Appendix D, page 13) will not reflect actual on-site conditions. However, to derive an estimate of future irrigation requirements and recommendations for management practices, this information is valuable for comparative purposes.

#### Affordable Housing

The value of housing in the project region will be determined by market demand. If a golf course increases the market demand for existing residences, then the cost to purchase an existing residence in the area will increase. Similarly, if undesirable land uses were located in the subject



Dr. John T. Harrison  
SUBJECT: WAIANA'AE GOLF COURSE DEIS COMMENTS  
June 11, 1991  
Page 4

In addition to the above, \$23,000,000 will be deposited into the City's general fund to be allocated as determined appropriate by the City and County of Honolulu. Further details of the community benefits package will be provided in the final FIS and during the zoning amendment process.

All adjoining property owners have been notified of the proposed golf course. In support of the proposed project, the Waianae Neighborhood Board voted to recommend approval of the project during their meeting of April 11, 1991.

#### Native Hawaiians

We concur that special attention should be given to Native Hawaiians and their culture. However, the project site is not presently used to a great extent by Native Hawaiians. Indirect and cumulative impacts on Native Hawaiians may result from relocation of the dairy in terms of employment, however, no net loss of employment opportunities will result. Additionally, the Waianae Neighborhood Board which represents a cross-section of the community recommended that the project be approved. Additionally, a portion of the \$2,000,000 funding for the proposed community foundation will be utilized to establish cultural programs or facilities in Waianae that promote cultural education.

#### Need for the Project - Language and Style Resembling Project Advocacy

As stated on pages 5 and 6 of the DEIS, golf will provide recreational, economic (i.e. employment), and open space benefits to the community. Whether these impacts constitute a something that is "needed" as characterized by your comments will be determined by the community's support or opposition to the project, and the final action to be taken by the City Council. To determine how golf course entitlements will be processed in the future, the City and County of Honolulu is currently developing a golf course policy. Therefore, the appropriateness of this project will be evaluated in comparison with the relative costs and benefits of all planned golf facilities at the appropriate time in the City's review process.

Regarding the rural character of the area, the proposed golf course and the open space qualities it will provide, would be similar to many other golf courses located throughout the State located in rural areas. As a permitted use in the State Agricultural District and within an area surrounded by small agricultural and residential parcels, the project will establish an open space recreational use for the property with densities much lower than currently permitted by the Agricultural (AG-2) zoning which would allow 2-acre agricultural lots. By maintaining open space within an agricultural/rural area such as this, the distances established between potential conflicting land uses will create a physical buffer.

Dr. John T. Harrison  
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June 11, 1991  
Page 5

During the preparation of the DEIS, we have tried to address the issues involved in a balanced approach. If at times the tone of the document appeared to advocate the project, it was not intended. We will delete where appropriate unsubstantiated statements as you have recommended.

Sincerely,

PDR HAWAII



David Hulse  
Project Planner

Appendix A

PRELIMINARY ENGINEERING REPORT  
FOR  
CONDITIONAL USE PERMIT APPLICATION  
FOR  
27-HOLE WAIANAE KAI GOLF COURSE  
WAIANAE, OAHU, HAWAII

TAX MAP KEYS: 8-5-03: 9, 10, 29, 31, 32 AND 43  
8-5-04: 28  
8-5-19: 35, 36 AND 37

APRIL 1988

PREPARED BY:  
COMMUNITY PLANNING, INC.  
700 BISHOP STREET, SUITE 608  
HONOLULU, HI 96813

A-0

A. PROJECT GRADING

1. Existing Conditions

The 250-acre project site presently is undeveloped except for about 30 acres which are used for dairy operations. The existing slopes and contours are shown on EXHIBIT A, SLOPES/SURFACE DRAINAGE PLAN.

2. Proposed Improvements

All proposed grading for construction of the golf course, driving range, clubhouse, maintenance facility access road, and parking lot will maintain the present storm drainage pattern.

Grading will be done in accordance with the City's Grading Ordinance and recommendations of a soils engineer.

Erosion control measures including temporary desilting basins, berms, swales, grassing and watering will be employed during grading operations. These measures will be included in preparation of an erosion control plan which will be submitted for City review and approval.

Appropriate grading permits will be secured from the City prior to commencement of the grading operations.

B. STORM DRAINAGE SYSTEM

1. Existing Conditions

In 1972 the U. S. Department of Agriculture, Soil Conservation Service (SCS), constructed the Kaupuni and Kawiwi Stream channels from the Pacific Ocean to the southern boundary of the project site, as shown on EXHIBIT A, SLOPES/SURFACE DRAINAGE PLAN. The Kawiwi concrete lined trapezoidal channel with 30-foot bottom width was designed by SCS for a total tributary area of 1,894 acres and storm runoff of 4,170 cfs. The Kaupuni Stream channel, on the other hand, having to drain the entire 5,254-acre Waianae Valley, is much larger with an 80-foot bottom width. Also, included in the SCS drainage improvement was construction of an 1,800-linear foot dike (berm) along the project's southern boundary which dammed and directed the collected storm runoff to the channel inlet as shown on EXHIBIT A.

Upstream of the project site, approximately 1,265 acres contribute storm runoff to three major existing natural waterways which traverse the project site as shown on EXHIBIT A. The majority of these mauka tributary areas is mountainous undeveloped land with exception of the adjacent Waianae homesteads and agricultural park. The storm runoff crosses Piliuka Place in underground drain culverts.

2. Proposed Improvements

The existing Kawiwi Stream channel with SCS design freeboard of about 2.5 feet is adequate to convey storm runoff from its total tributary area including the proposed golf course to the ocean. Likewise, the Kaupuni Stream channel is similarly adequate.

The proposed improvements will include grassed swales and channels (lined where velocities are erosive) in the proposed golf course to convey storm runoff from the mauka areas, as well as golf course to the inlet of the Kawiwi Stream channel.

For temporary erosion control, appropriately sized ponding basins will be constructed on-site for desilting storm runoff from graded areas prior to discharge into the Kawiwi Stream channel.

C. WASTEWATER SYSTEM

1. Existing Conditions

The existing municipal wastewater system serves only the lower Waianae area with its nearest collection pipeline being approximately 4,000 feet from the access road to the proposed golf course as shown on EXHIBIT B, EXISTING UTILITIES. Consequently, homes beyond the sewer line system, as well as within Waianae Valley, dispose of their wastewater in underground cesspools.

2. Proposed Improvements

Until the municipal wastewater system is extended to the project site, sewage from the clubhouse will be disposed into a series of underground cesspools located in the golf course. The cesspools would be located near the clubhouse which location is makai of the no-pass line set by the Board of Water Supply (BWS) and Department of Health (DOH) as shown on EXHIBIT B. Use of the proposed clubhouse is estimated to generate 20,000 gallons per average day of wastewater based on 400 persons at a rate of 50 gallons per day.

Appropriate permits and approvals will be requested from the Department of Health and Board of Water Supply for the proposed wastewater disposal system.

D. WATER SYSTEM

1. Existing Conditions

Two municipal 12-inch water mains are located in Waianae Valley Road which provide water for domestic and agricultural use, as well as fire protection, as shown on EXHIBIT B, EXISTING UTILITIES.

Additionally, located on the project site are two private wells which are presently used for the dairy water requirements. The approximate location of these wells is also indicated on EXHIBIT B.

2. Proposed Improvements :

The present Board of Water Supply "390" system is adequate to serve the golf course clubhouse's estimated potable average water demand of 24,000 gallons per day (gpd). That demand is based on the average daily use of 400 persons at a rate of 60 gpd. For potable water, the developer proposes to request municipal service from the Board of Water Supply and pay the appropriate facility charge for source, storage and transmission.

For irrigation of the golf course, the developer proposes to use existing and develop other private on-site wells. The water would be stored and pumped into the irrigation pipe system from lined ponds located in the golf course. Based on 4,000 gallons per acre, the estimated average irrigation water demand is 1,000,000 gallons per day for the 250 acres. Although the water system will remain private, appropriate permits will be secured from the Board of Water Supply and/or State Water Commission for construction and use of the wells.

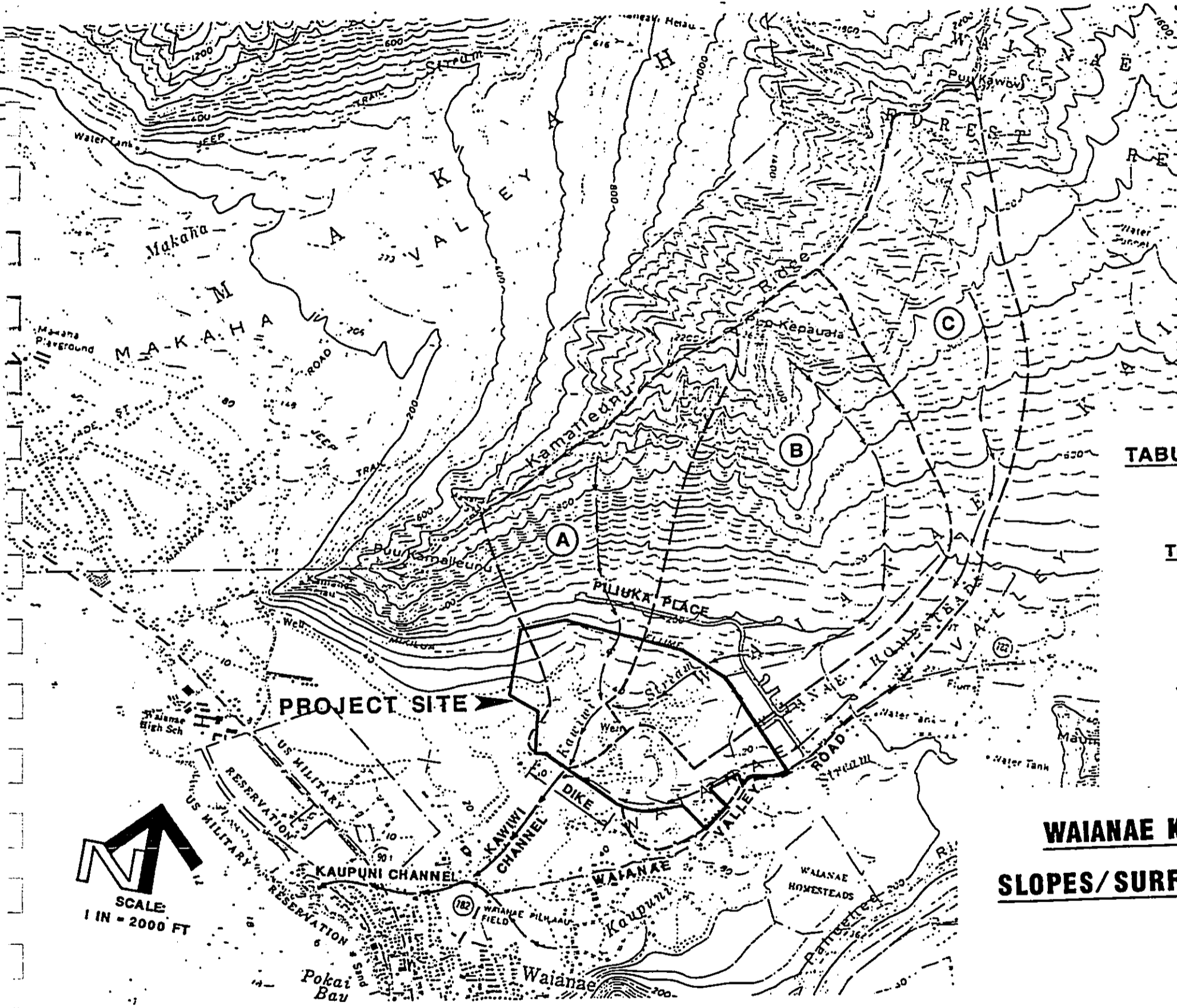
E. ELECTRIC AND TELEPHONE SYSTEM

1. Existing Conditions

Existing overhead facilities are located in Waianae Valley Road.

2. Proposed Improvements

The developer will request that Hawaiian Telephone Company and Hawaiian Electric Company provide electric and telephone service to the golf course clubhouse.

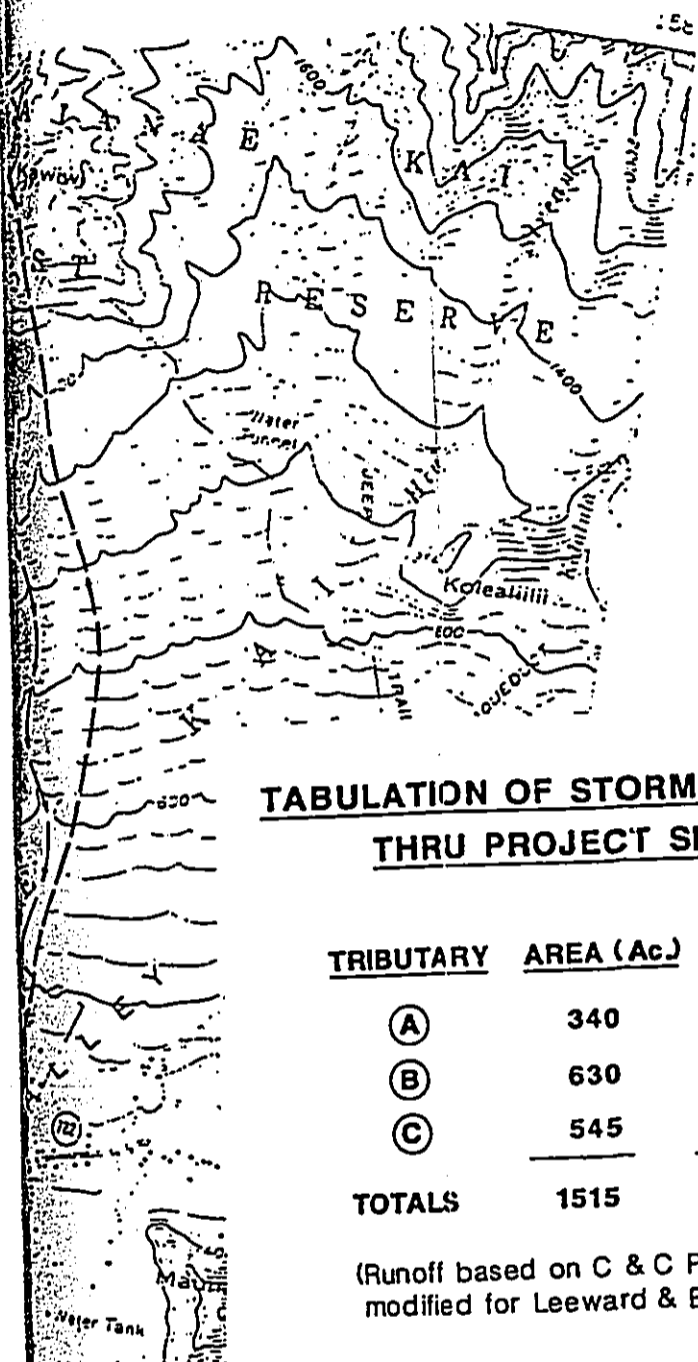


TABU

TR

**WAIANAE K**  
**SLOPES/SURFA**





**TABULATION OF STORM RUNOFF  
THRU PROJECT SITE**

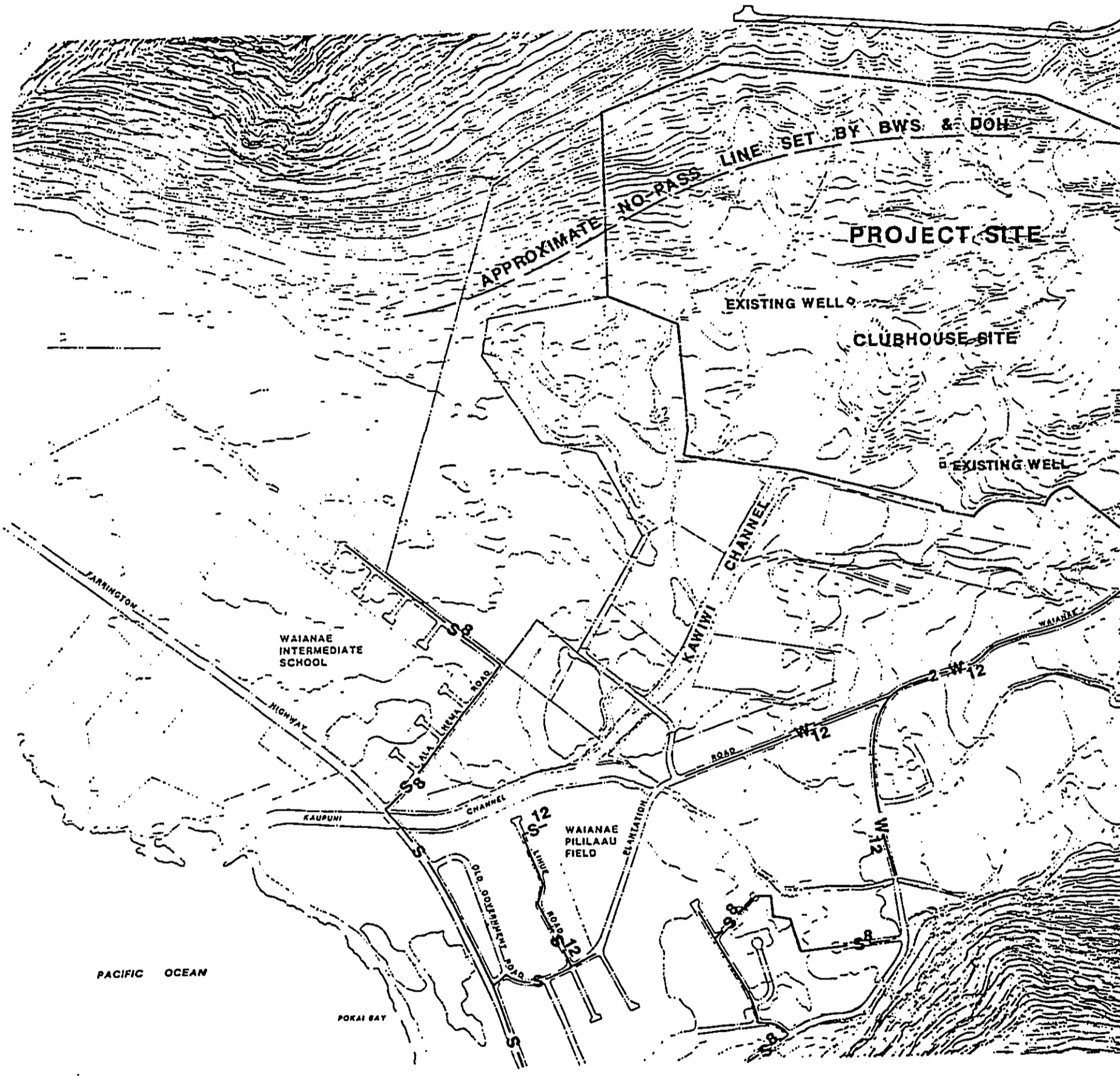
<u>TRIBUTARY</u>	<u>AREA (Ac.)</u>	<u>Q (cfs)</u>
(A)	340	
(B)	630	
(C)	545	
<b>TOTALS</b>	<b>1515</b>	<b>3800</b>

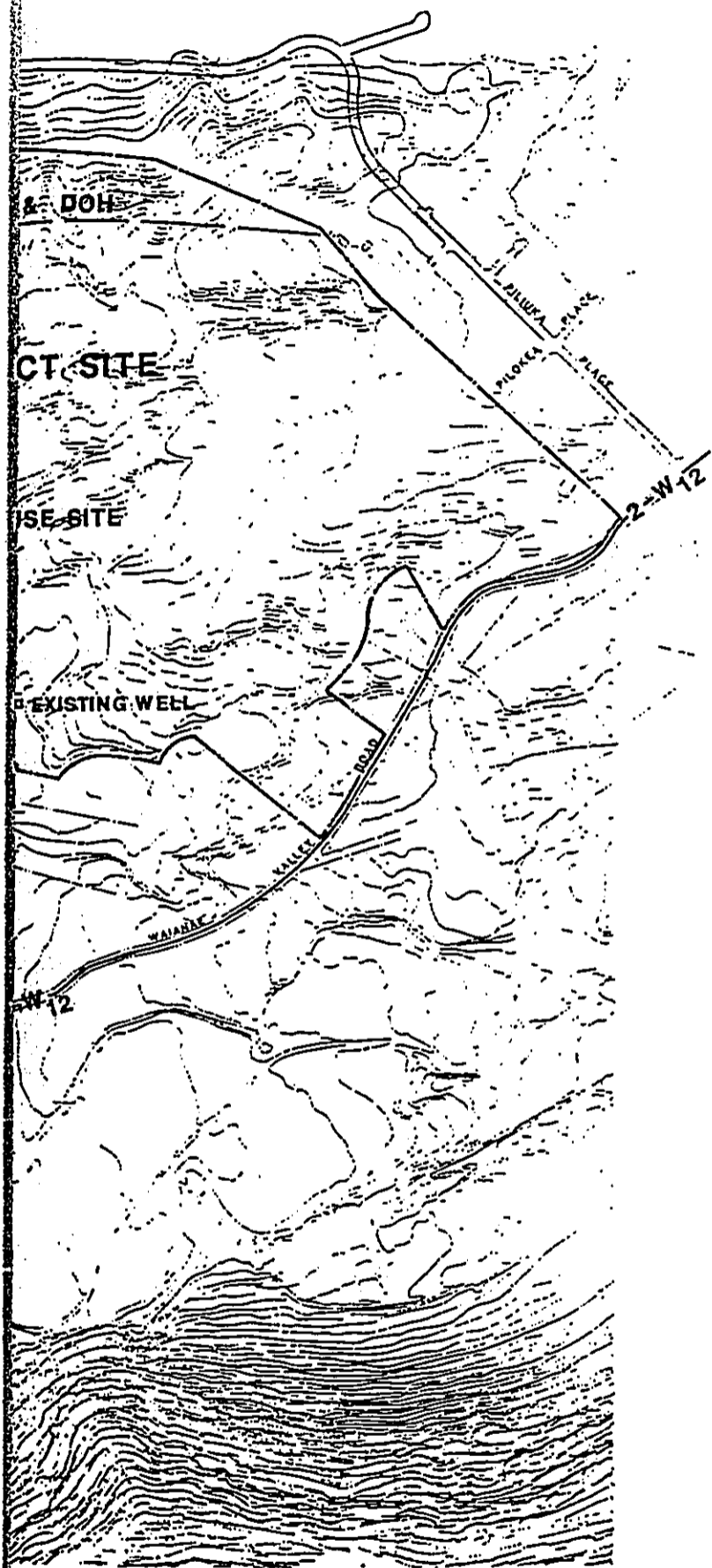
(Runoff based on C & C PLATE 6  
modified for Leeward & Ewa)

**WAIANAE KAI GOLF COURSE**

**SLOPES/SURFACE DRAINAGE PLAN**

**EXHIBIT A**





**WAIANA KAI GOLF COURSE**  
**WAIANA, OAHU**

**EXISTING UTILITIES**



**EXHIBIT B**

Transmittal Form

**COMMUNITY PLANNING, INC.**  
CONSULTANT PLANNERS • CIVIL ENGINEERS • SURVEYORS

700 BISHOP ST., SUITE 608  
HONOLULU, HAWAII 96813  
PHONE 531-4252, 521-7491

TO: PBR HAWAII

DATE: May 2, 1988

- Mail
- Deliver
- Pick-up

Attention MR. MATT GRADY

Gentlemen:

RE: ..... WAIANAE KAI GOLF COURSE  
.....

We transmit herewith

Under separate cover

As requested

No. of Copies

Description

FOR:

2

Preliminary Engineering Report,  
dated April 1988

- Approval
- Information/Use
- Review & Approval
- File

Remarks:

cc w/ attachment: Horita Realty  
(Attn: Ron Watase)

Very truly yours,

By Bernard P. Kea  
Bernard P. Kea

Appendix B

**TRAFFIC IMPACT STUDY**

**WAIANAЕ KAI GOLF COURSE**  
Waianae, Oahu, Hawaii

Prepared for:

**PBR Hawaii**

Prepared by:

**Parsons Brinckerhoff Quade and Douglas, Inc.**

Honolulu, Hawaii

May 1988

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**TRAFFIC IMPACT STUDY**  
**WAIANAЕ KAI GOLF COURSE**

May 6, 1988

**INTRODUCTION**

The proposed project is a 27-hole golf course on approximately 250 acres located in Waianae Valley. This report summarizes a study which evaluated the potential traffic impacts of the project during peak hours of a weekday and a Saturday.

**EXISTING CONDITIONS**

The proposed project is located on the Waianae coast of the island of Oahu. The project site, shown in Figure 1, includes ten separate parcels and is located north of Waianae Valley Road, approximately one mile from Farrington Highway.

Roadway System

Farrington Highway is the only improved road between the Waianae coast and the rest of Oahu. Within the town of Waianae, Farrington Highway is an undivided four-lane highway running in a north-south direction parallel to the coastline with two eleven-foot lanes in each direction. The posted speed limit is 25 miles per hour.



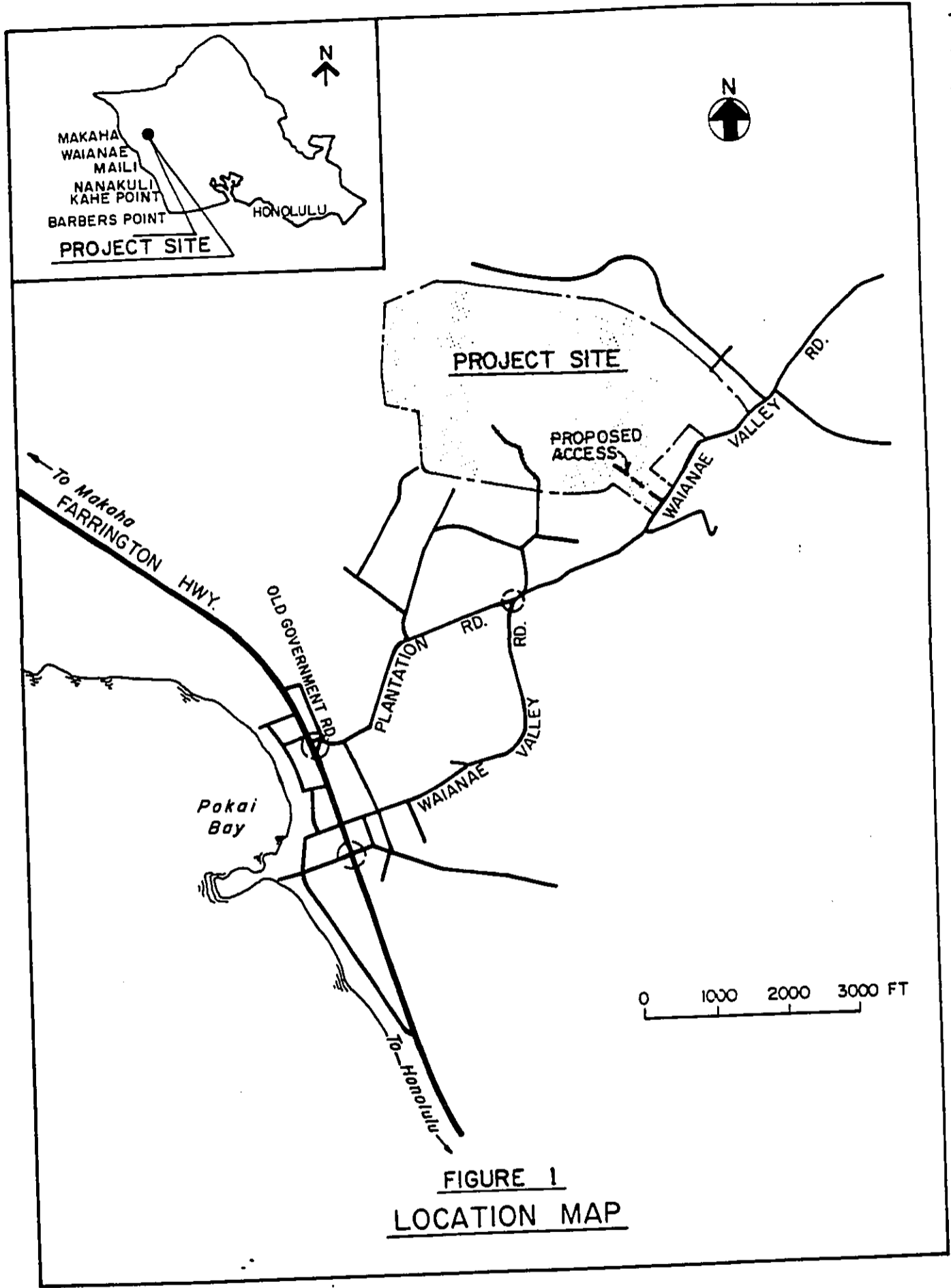


FIGURE 1  
LOCATION MAP

Access to the proposed project site is from Waianae Valley Road, a minor two-lane roadway which is situated in the east-west or mauka-makai direction. Waianae Valley Road intersects Farrington Highway at a signalized cross-intersection. Waianae Valley Road continues past Farrington Highway and serves the Pokai Bay Beach Park. The Waianae Valley Road approaches each have a single lane for all movements. Each approach on Farrington Highway includes a shared through-left turn lane and a shared through-right turn lane.

An alternative route between Farrington Highway and the project site is provided by Old Government Road and Plantation Road. Old Government Road intersects Farrington Highway at a signalized intersection. Old Government Road forms the east leg of the intersection and heads into Waianae Valley where it changes to Plantation Road.

At Farrington Highway, signals are also provided for a driveway from a commercial parking lot located directly across from Old Government Road. The northbound approach on Farrington Highway has a separate channelized right turn lane, formed by a traffic island, which begins approximately 150 feet south of the intersection; at the intersection, Farrington Highway's northbound approach has a shared through-left turn lane and a through lane. The Farrington Highway southbound approach includes a shared through-left turn lane and a shared through-right turn lane. The Old Government Road and driveway approaches each has a single lane for all movements.

Away from Farrington Highway, Plantation Road terminates at Waianae Valley Road, in an unsignalized Y-intersection with Plantation Road being the west branch at this intersection. Traffic on Plantation Road is channelized by a traffic island into an option lane for left or right turns; the approach is approximately perpendicular to Waianae Valley Road and stop

controlled. The northbound approach on Waianae Valley Road has a single lane from which through and left turn movements are made. Northbound left turns from Waianae Valley Road onto Plantation Road is controlled by a yield sign located in a second traffic island. Traffic on the westbound Waianae Valley Road approach has the right-of-way and has the option of using either the Waianae Valley Road branch or the Plantation Road branch.

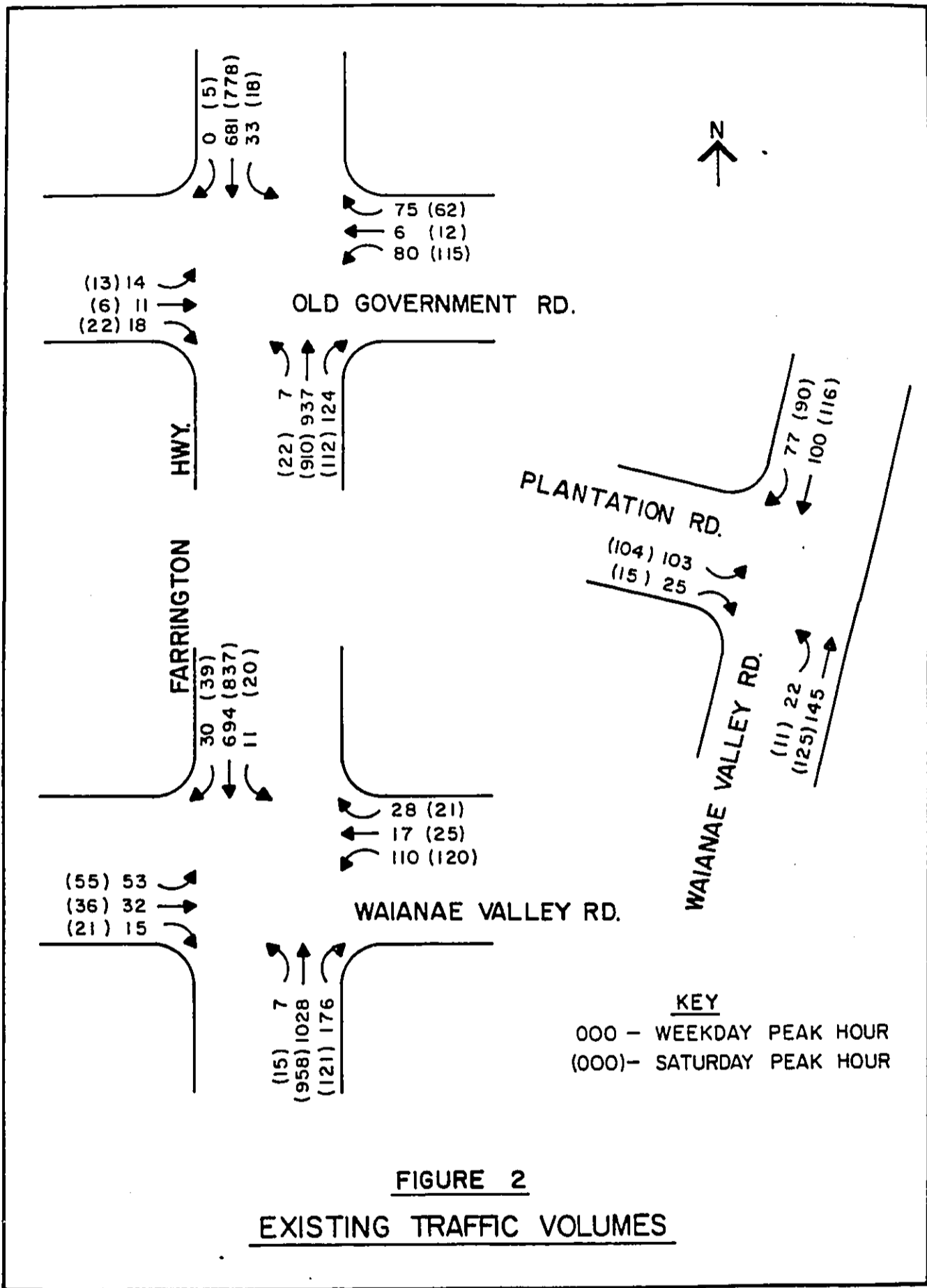
#### Traffic Conditions

The descriptions of existing traffic conditions at the Farrington Highway/Waianae Valley Road intersection, the signalized Farrington Highway/Old Government Road intersection, and the Waianae Valley Road/Plantation Road intersection are based on manual traffic counts and field observations taken on a weekday afternoon and mid-day Saturday in April 1988 (Appendix A and Figure 2). Additional traffic count data was obtained from the State of Hawaii, Department of Transportation<sup>1</sup>.

The Highway Capacity Manual<sup>2</sup> methodologies for the analysis of multilane highways, signalized intersections, and unsignalized intersections were used to evaluate traffic conditions. Levels of Service are described in Appendix B.

Existing weekday traffic volumes on the four-lane Farrington Highway near Kahe Point, located south of Waianae, shows that the northbound lanes (to Waianae) are at Level of Service (LOS) C and that the southbound lanes (to Honolulu) are at LOS B.

The analysis of existing conditions at the signalized intersection of Farrington Highway/Waianae Valley Road shows that this intersection operates at LOS B during both the weekday and Saturday peak hours. Because field observations noted that a through gutter across the westbound approach on Waianae Valley Road affected traffic flow the analysis used reduced saturation flows at this approach.



The signalized Farrington Highway/Old Government Road intersection functions as a cross-intersection with a driveway for a commercial center's parking lot forming the west leg. This intersection also operates at LOS B during both peak hours. Field observations indicated that northbound traffic on Farrington Highway using the channelized right turn lane did not affect operations at this signalized intersection.

The Waianae Valley Road/Plantation Road intersection has channelization for all turn movements and functions as a T-intersection with Plantation Road being the controlled stem. Several wrong-way movements on the westbound "right-turn" lane from Waianae Valley Road to Plantation Road were observed. Analysis of existing traffic volumes at this intersection shows that the left turn traffic off of Waianae Valley Road functions at LOS A during the weekday and Saturday peak hours. The left and right turn movements from Plantation Road also operate at LOS A during both peak hours.

## **TRAFFIC GENERATION**

The traffic generation portion of the study estimates the trip generation of the project, or the number of productions and attractions. Trip distribution, which determines the origins/destinations of the trips, and traffic assignment, which adds project traffic to the roadways are also part of this analysis.

### Trip Generation

The proposed project is a 27-hole golf course on 250 acres. The traffic generated by the project was estimated using trip rates and equations for golf courses from the Institute Transportation Engineers' informational report, Trip Generation<sup>3</sup>, Fourth Edition. Table 1 shows the trip generation rates and trip generation for the project.

TABLE 1  
TRIP GENERATION

	<u>Daily (vpd)</u>	<u>Enter (vph)</u>	<u>Exit (vph)</u>
<u>Trip Rates (per acre)</u>			
Weekday Peak Hour	8.325	0.031	0.355
Saturday Peak Hour	7.535	0.223	0.414
<u>Trip Generation (250 acres)</u>			
Weekday Peak Hour	2,080	8	89
Saturday Peak Hour	1,880	56	104

Note: vpd = vehicles per day  
vph = vehicles per hour

Trip Distribution/Traffic Assignment

Weekday traffic was estimated to be 70 percent in the Honolulu direction and 30 percent in the Makaha direction. On Saturdays, the project is estimated to have 90 percent of its traffic in the Honolulu direction with 10 percent in the Makaha direction.

The project's traffic would use Farrington Highway to travel to/from Honolulu or Makaha. Within Waianae Valley, project traffic would be expected to use either Waianae Valley Road or Plantation Road to access the project.

## PROJECT IMPACTS

Completion of the project is estimated in year 1990. A review of historic traffic data indicates that traffic volumes in the Waianae Valley area have not increased significantly in the short-term, and existing volumes were used as a baseline for future conditions.

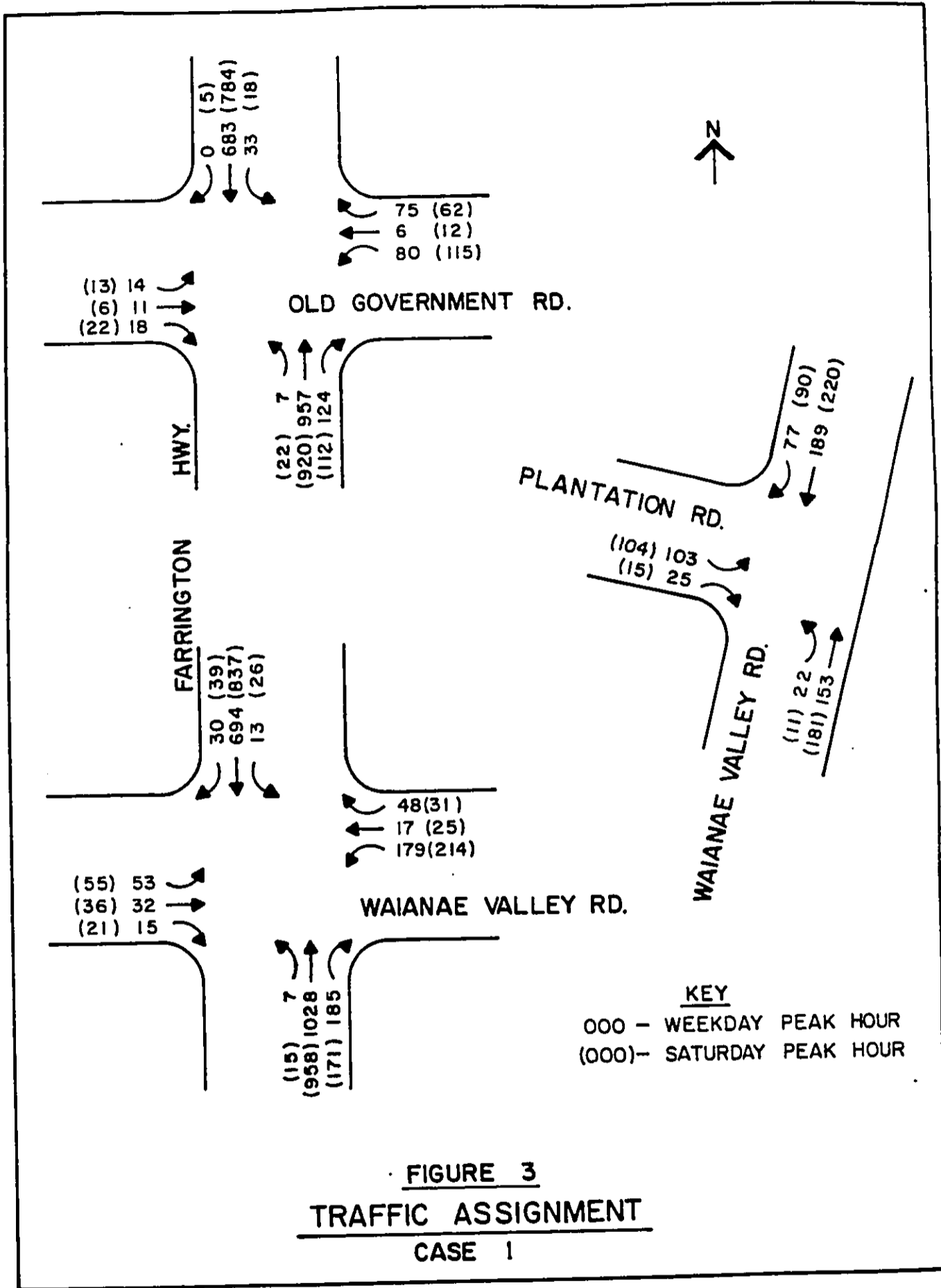
An evaluation of the new "T"-intersection at the proposed project's connection to Waianae Valley Road, with all project traffic entering as eastbound left turns from Waianae Valley Road, indicates that a separate left turn storage lane on Waianae Valley Road would not be warranted<sup>4</sup>.

An analysis of the weekday peak hour traffic volumes on the four-lane Farrington Highway at Kahe Point (south of Waianae) shows that northbound and southbound lanes would remain at LOS C and LOS B, respectively.

Although project traffic could be expected to be distributed between Waianae Valley Road and Plantation Road, the analyses of impacts within Waianae used two "worst-case" traffic assignments: Case 1 assigned all project traffic entirely onto Waianae Valley Road while Case 2 assigned all project traffic to the Plantation Road and Old Government Road corridor. Figures 3 and 4 show the traffic assignments for Case 1 and Case 2. Table 2 summarizes the LOS findings from the analyses for each case.

### Case 1

Under Case 1 conditions, with project traffic all assigned to Waianae Valley Road, there would be increases over the existing traffic volumes at the Farrington Highway/Waianae Valley Road intersection of approximately 4.4 percent during the weekday peak hour and 7.1 percent during the Saturday peak hour. The analysis of future conditions with the proposed project shows that overall





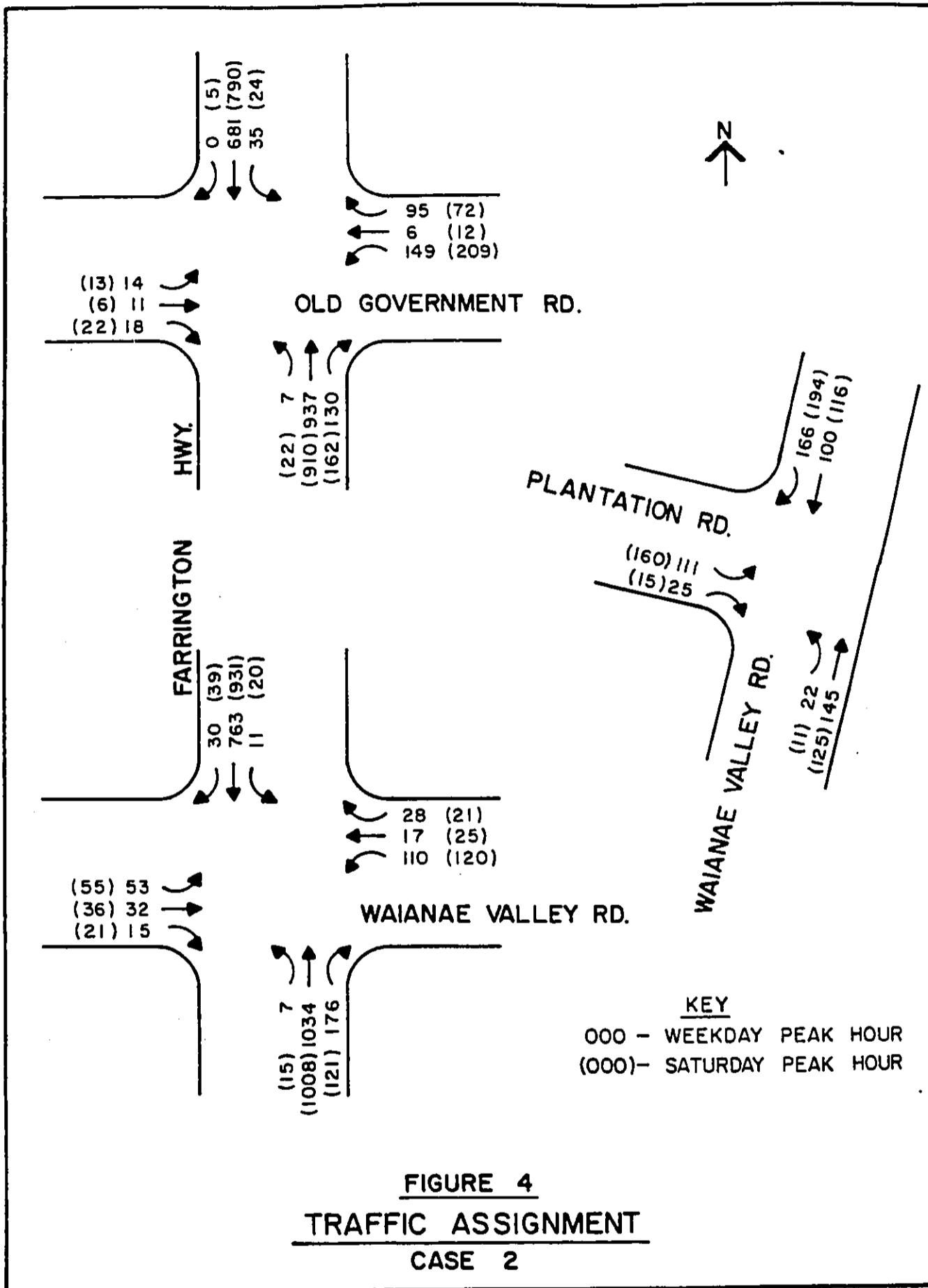


TABLE 2

LEVELS OF SERVICE

HIGHWAY	EXISTING CONDITIONS		FUTURE WITH PROJECT			
	WKDY	SAT	CASE 1 WKDY	SAT	CASE 2 WKDY	SAT
Farrington Highway	C	-	C	-	C	-
Northbound Lanes	B	-	B	-	B	-
Southbound Lanes						
<u>SIGNALIZED INTERSECTIONS</u>						
Farrington Highway/Waianae Valley Road (overall)	B	B	B	C	B	B
Eastbound Approach	B	B	B	B	B	B
Westbound Approach	C	C	D	E	C	C
Northbound Approach	B	B	B	C	B	B
Southbound Approach	B	B	B	C	B	B
Farrington Highway/Old Government Road (overall)	B	B	B	B	B	B
Eastbound Approach	B	B	B	B	B	B
Westbound Approach	B	B	B	B	B	B
Northbound Approach	B	B	B	B	B	B
Southbound Approach	B	B	B	B	B	B
<u>UNSIGNALIZED INTERSECTION</u>						
Waianae Valley Road/Plantation Road	A	A	A	A	A	A
Waianae Valley Road Left Turn	A	A	A	A	A	A
Plantation Road Left Turn	A	A	A	A	A	A
Plantation Road Right Turn	A	A	A	A	A	A

Notes: WKDY = WEEKDAY PEAK HOUR, SAT = SATURDAY PEAK HOUR

conditions at this intersection would become LOS C and LOS D during the weekday and Saturday peak hours, respectively, if no changes are made. The Waianae Valley Road westbound approach would be over-capacity with LOS F during both peak periods.

However, changes in the timing of the traffic signal would provide the needed capacity and improve the overall intersection LOS. The existing timing provides a maximum green phase for the Waianae Valley Road approaches of approximately 16 seconds in a 60-second cycle with a total of 12 seconds per cycle lost time (yellow and all-red). Retiming the signal to increase the maximum green for the Waianae Valley Road approaches to 19 seconds (weekday) and 21 seconds (Saturday) and to reduce the total lost time to 10 seconds per cycle would provide LOS B conditions in the weekday peak hour and LOS C in the Saturday peak hour.

At the signalized Farrington Highway/Old Government Road intersection, project traffic on Farrington Highway would increase volumes at this intersection by 1.1 percent during the weekday peak hour and 0.7 percent during the Saturday peak hour. The Farrington Highway/Old Government Road intersection would remain at LOS B during both peak hours.

The traffic volumes at the Waianae Valley Road/Plantation Road intersection would increase by 20.6 percent and 34.7 percent during the weekday and Saturday peak hours, respectively, over existing. Even with the large relative increase in traffic, all turn movements would remain at LOS A during both peak hours. An evaluation of turn movements to/from driveways located along Waianae Valley Road also indicates little or no delays (LOS A conditions) during both peak hours.

#### Case 2

With all of the project traffic assigned to the Farrington Highway/Old Government Road intersection, the existing traffic

volumes would be increased by approximately 4.9 percent during the weekday peak hour and 7.7 percent during the Saturday peak hour. This intersection would continue to operate at LOS B during both peak hours.

Project traffic on Farrington Highway would increase volumes at the Farrington Highway/Waianae Valley Road intersection by 3.3 percent and 6.2 percent during the weekday and Saturday peak hours, respectively. This signalized intersection would continue to function at LOS B during both peak hours.

As in Case 1, the traffic volumes at the unsignalized Waianae Valley Road/Plantation Road intersection would increase by 20.6 percent during the weekday peak hour and 34.7 percent during the Saturday peak hour. All turn movements would remain at LOS A during both peak hours. An evaluation of turn movements to/from driveways along Plantation Road shows that LOS A conditions would be expected during both peak hours.

#### **RECOMMENDATIONS AND CONCLUSIONS**

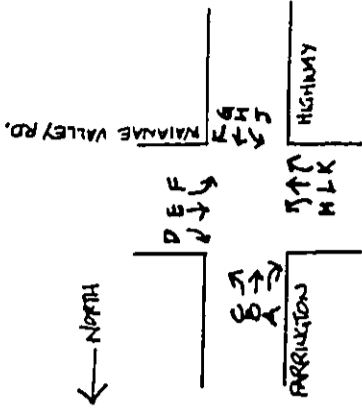
The existing roadway facilities will be able to handle the increased traffic in the area due to the project. While the increases in traffic volumes on Waianae Valley Road and on Plantation Road could be relatively large, the analysis of turn movements to/from driveways on these roadways shows that LOS A would continue to describe conditions along these roadways.

The analyses of "worst-case" conditions at the Farrington Highway intersections indicate that there would be adequate capacity at the affected intersections if all of the project traffic were assigned to either Waianae Valley Road or Plantation Road. The only improvement which may be required would be the modification of the signal timing at the Farrington Highway/Waianae Valley Road intersection.

## REFERENCES

1. State of Hawaii, Department of Transportation, Highways Division, Planning Branch, Count Stations C-10-C and 15-A.
2. Transportation Research Board, National Research Council, Highway Capacity Manual, Special Report 209, Washington, D.C., 1985.
3. Institute of Transportation Engineers, Trip Generation, Fourth Edition, Washington, D.C., 1987.
4. Harmelink, M.D., "Volume Warrants For Left Turn Storage Lanes At Unsignalized Grade Intersections," Highway Research Record No. 211, Washington D.C., 1967.

**APPENDIX A**



WAIANAЕ TRAFFIC COUNTS  
 INTERSECTION: FARRINGTON HIGHWAY AT WAIANAЕ VALLEY ROAD  
 PM COUNT TAKEN ON THURSDAY, APRIL 21, 1988 BY JN & STK

COUNT READINGS

TIME	A	B	C	D	E	F	G	H	J	K	L	M
3:30-3:45 PM	4	201	6	4	7	29	39	217	1	2	6	8
-4:00	13	380	10	14	10	58	76	468	5	5	17	19
-4:15	18	548	12	19	17	84	125	713	6	6	25	36
-4:30	27	737	15	26	20	106	175	979	8	13	35	52
-4:45	34	895	17	32	24	139	215	1245	8	17	38	61
-5:00	44	1052	23	36	31	163	236	1487	8	21	44	74
-5:15	56	1227	29	41	35	191	280	1737	11	24	50	90
-5:30 PM	64	1408	32	47	42	218	325	1981	15	26	53	102

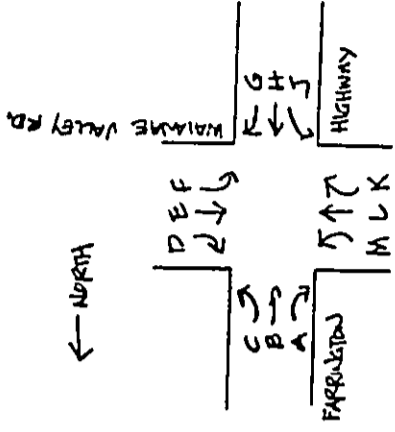
COUNT VOLUMES

TIME	A	B	C	D	E	F	G	H	J	K	L	M	TOTAL TOT4
3:30-3:45 PM	4	201	6	4	7	29	39	217	1	2	6	8	524
-4:00	9	159	4	10	3	29	37	251	4	3	11	11	531
-4:15	5	188	2	5	7	26	49	245	1	3	8	17	556
-4:30	9	189	3	7	3	22	50	266	2	5	10	16	582 2193
-4:45	7	158	2	6	4	33	40	266	0	4	3	9	532 2201
-5:00	10	157	6	4	7	24	21	242	0	4	6	13	494 2164
-5:15	12	175	6	5	4	28	44	250	3	3	6	16	552 2160
-5:30 PM	8	181	3	6	7	27	45	244	4	2	3	12	542 2120
3:30-5:30 TOTAL	64	1408	32	47	42	218	325	1981	15	26	53	102	4313
3:45-4:45 HOUR	30	694	11	28	17	110	176	1028	7	15	32	53	2201

APPROACH/DEPARTURE VOLUMES

TIME	ABC	DEF	GHJ	KLM	AEJ	BPK	CGL	DRH
3:30-3:45 PM	211	40	257	16	12	232	51	229
-4:00	172	42	292	25	16	191	52	272
-4:15	195	38	295	28	13	217	59	267
-4:30	201	32	318	31	14	216	63	289
-4:45	167	43	306	16	11	195	45	281
-5:00	173	35	263	23	17	185	33	259
-5:15	193	37	297	25	19	206	56	271
-5:30 PM	192	40	293	17	19	210	51	262
3:30-5:30 TOTAL	1504	307	2321	181	121	1652	410	2130
3:45-4:45 HOUR	735	155	1211	100	54	819	219	1109

NK:\WAIANAЕ\PH-MVR-P



WAIANA TRAFFIC COUNTS  
 INTERSECTION: FARRINGTON HIGHWAY AT WAIANA VALLEY ROAD  
 MID DAY COUNT TAKEN ON SATURDAY, APRIL 23, 1988 BY RH & STK

COUNT READINGS

TIME	A	B	C	D	E	F	G	H	J	K	L	M
11:30-11:45 AM	14	216	2	11	8	30	24	220	3	7	8	14
-12:00	20	414	8	15	13	58	47	446	3	10	17	32
-12:15	27	625	13	23	16	90	84	700	7	16	25	43
-12:30	32	814	17	28	21	125	112	919	13	19	32	53
12:45	53	1053	22	32	33	150	145	1178	18	28	44	69
-1:00	58	1224	24	39	34	173	176	1384	25	38	54	77
-1:15	71	1391	27	41	39	211	201	1586	32	43	61	94
-1:30	87	1581	28	46	46	242	224	1803	36	50	78	103
-1:45	98	1744	34	48	52	276	256	2014	37	53	77	111
-2:00	111	1930	37	54	57	301	288	2233	39	54	83	121
-2:15	122	2125	39	61	63	335	328	2431	43	56	88	138
-2:30 PM	140	2312	44	66	69	357	351	2632	45	63	94	148

COUNT VOLUMES

TIME	A	B	C	D	E	F	G	H	J	K	L	M	TOTAL TOT4
11:30-11:45 AM	14	216	2	11	8	30	24	220	3	7	8	14	557
-12:00	6	198	6	4	5	28	23	226	0	3	9	18	526
-12:15	7	211	5	8	3	32	37	254	4	6	8	11	586
-12:30	5	189	4	3	5	35	28	219	6	3	7	10	514
-12:45	21	239	5	6	12	25	33	259	5	9	12	16	642
-1:00	5	171	2	7	1	23	31	206	7	8	10	8	479
-1:15	13	167	3	2	5	38	25	204	7	7	7	17	495
-1:30	16	170	1	5	7	31	23	215	4	7	15	9	503
-1:45	11	183	6	2	6	34	32	211	1	3	1	8	498
-2:00	13	186	3	6	5	25	32	219	2	1	6	10	508
-2:15	11	195	2	7	6	34	38	198	4	2	5	17	519
-2:30 PM	18	187	5	5	6	22	25	201	2	7	6	10	494
11:30-2:30 TOTAL	140	2312	44	66	69	357	351	2632	45	63	94	148	6321
11:45-12:45 HOUR	38	837	20	21	25	120	121	958	15	21	36	55	2268

APPROACH/DEPARTURE VOLUMES

TIME	ABC	DEF	GHI	JKL	MNO	PQR	STU	VWX	YZ
11:30-11:45 AM	232	49	247	29	25	253	34	245	
-12:00	210	37	249	30	11	229	38	248	
-12:15	223	43	285	25	14	249	50	273	
-12:30	198	43	253	20	16	227	39	232	
12:45	265	43	297	37	38	273	50	281	
-1:00	178	31	244	26	13	202	43	221	
-1:15	183	45	236	31	25	212	35	223	
-1:30	187	43	242	31	27	208	39	229	
-1:45	200	42	244	12	18	220	39	221	
-2:00	202	36	253	17	20	212	41	235	
-2:15	208	47	240	24	21	231	45	222	
-2:30 PM	210	33	228	23	26	216	36	216	
11:30-2:30 TOTAL	2496	492	3028	305	254	2732	489	2846	
11:45-12:45 HOUR	896	166	1094	112	79	978	177	1034	



WAIANA'E TRAFFIC COUNTS  
 INTERSECTION: FARRINGTON HIGHWAY AT OLD GOVERNMENT ROAD  
 PM COUNT TAKEN ON THURSDAY, APRIL 21, 1988 BY KW & NK

COUNT READINGS

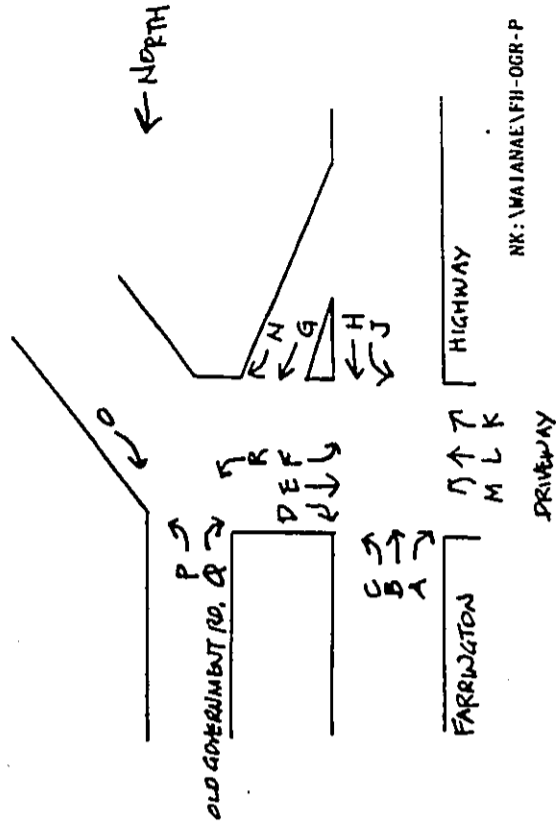
TIME	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R
3:30-3:45 PM	0	182	11	18	0	20	6	208	8	5	0	0	21	18	28	4	0
-4:00	0	359	20	37	1	37	10	432	12	5	1	5	44	35	50	16	2
-4:15	0	537	34	56	2	63	13	667	12	7	3	6	75	69	26	2	2
-4:30	0	704	41	73	2	82	18	901	13	17	7	9	102	71	100	38	3
-4:45	0	863	44	93	6	100	26	1145	16	23	11	14	125	87	132	54	3
-5:00	0	1038	46	107	6	123	30	1370	18	28	15	18	148	101	160	63	3
-5:15	1	1186	57	124	10	144	34	1620	20	33	19	20	167	117	187	74	5
-5:30 PM	1	1348	66	141	15	166	43	1852	21	37	25	27	192	135	218	88	5

COUNT VOLUMES

TIME	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	TOTAL TOT4
3:30-3:45 PM	0	182	11	18	0	20	6	208	8	5	0	0	21	18	28	4	0	50
-4:00	0	177	9	19	1	17	4	224	4	0	1	5	23	17	22	12	2	53
-4:15	0	178	14	18	1	26	3	235	0	2	2	1	31	19	19	10	0	48
-4:30	0	167	7	17	0	19	5	234	1	10	4	3	27	17	31	12	1	61
-4:45	0	159	3	20	4	16	8	244	2	6	4	5	23	16	32	16	0	64
-5:00	0	173	2	14	2	23	4	225	3	5	4	4	23	14	28	9	0	51
-5:15	1	150	11	17	2	21	4	250	2	5	4	2	19	16	27	11	2	56
-5:30 PM	0	162	9	17	5	22	9	232	1	4	6	7	25	18	31	14	0	63
3:30-5:30 TOTAL	1	1348	66	141	15	166	43	1852	21	37	25	27	192	135	218	88	5	446
3:45-4:45 HOUR	0	681	33	75	6	80	20	937	7	18	11	14	104	69	104	50	3	226

APPROACH/DEPARTURE VOLUMES

TIME	ABC	DEP	GHJN	KLM	AEJ	BPK	CGLN	DHM
3:30-3:45 PM	193	38	243	5	8	207	38	228
-4:00	186	37	255	6	5	194	37	248
-4:15	192	46	269	5	1	206	50	255
-4:30	174	36	267	17	1	196	43	254
-4:45	162	42	277	15	6	183	38	269
-5:00	175	39	255	13	5	201	33	243
-5:15	162	40	275	11	5	176	38	289
-5:30 PM	171	44	267	17	6	188	49	256
3:30-5:30 TOTAL	1415	322	2108	89	37	1551	326	2020
3:45-4:45 HOUR	714	161	1088	43	13	779	168	1026



NK: \WAIANA'E\FH-OCR-P

WAIANAЕ TRAFFIC COUNTS  
 INTERSECTION: FARRINGTON HIGHWAY AT OLD GOVERNMENT ROAD  
 MID DAY COUNT TAKEN ON SATURDAY, APRIL 23, 1988 BY KM & RU

COUNT READINGS

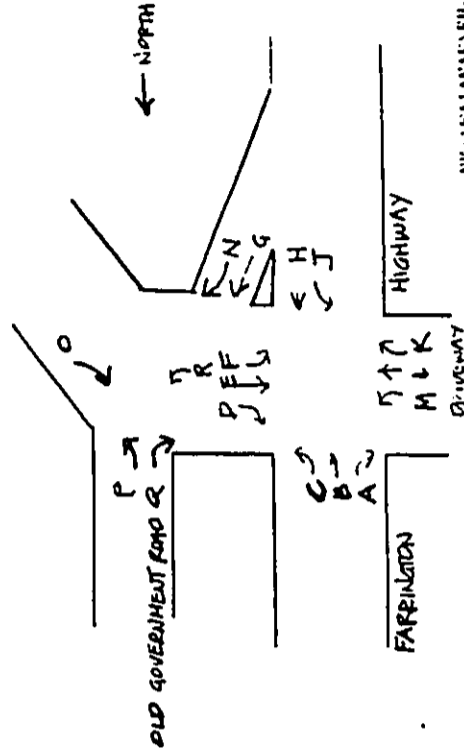
TIME	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	TOTAL
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-12:00	0	393	16	31	4	49	12	406	6	16	3	5	51	27	66	16	1	57
-12:15	0	584	22	44	6	76	19	622	12	23	6	7	75	43	96	22	2	36
-12:30	0	779	28	66	12	98	23	842	17	27	8	11	101	54	116	27	2	199
-12:45	4	991	30	83	14	123	29	1080	20	32	9	13	118	69	138	37	2	187
-1:00	5	1171	34	93	16	164	34	1316	28	38	9	18	141	83	165	46	3	178
-1:15	5	1328	41	111	16	194	43	1535	30	43	14	22	161	95	187	56	3	195
-1:30	6	1503	49	122	20	212	46	1763	32	49	17	23	177	107	217	85	5	195
-1:45	7	1678	59	145	23	238	51	1986	35	51	20	29	201	122	241	73	5	195
-2:00	7	1868	69	154	24	257	52	2196	40	59	21	33	222	134	263	80	5	182
-2:15	8	2049	73	170	26	280	55	2392	43	62	22	35	250	146	279	93	5	172
-2:30 PM	9	2248	80	180	28	302	58	2588	49	65	25	39	273	165	297	99	5	166

COUNT VOLUMES

TIME	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	TOTAL
11:30-11:45 AM	0	214	8	15	3	24	6	200	1	9	0	2	24	9	36	8	0	53
-12:00	0	179	8	16	1	25	6	206	5	7	3	3	27	18	30	8	1	53
-12:15	0	191	6	13	2	27	7	216	6	7	3	2	24	16	30	6	1	57
-12:30	0	195	6	22	6	20	4	220	5	4	2	4	26	11	20	5	0	36
-12:45	4	212	2	17	2	27	6	238	3	5	1	2	17	15	22	10	0	47
-1:00	1	180	4	10	2	41	5	236	8	6	0	5	23	14	27	9	1	51
-1:15	0	157	7	18	0	30	9	219	2	5	5	4	20	12	22	10	0	44
-1:30	1	175	8	11	4	18	3	228	2	6	3	1	16	12	30	9	2	53
-1:45	1	175	10	23	3	26	5	223	3	2	3	6	24	15	24	8	0	47
-2:00	0	190	10	9	1	19	1	210	5	8	1	4	21	12	22	7	0	41
-2:15	1	181	4	16	2	23	3	196	3	3	1	2	28	12	16	13	0	41
-2:30 PM	1	199	7	10	2	22	3	196	6	3	3	4	23	18	18	6	0	43
11:30-2:30 TOTAL	9	2248	80	180	28	302	58	2588	49	65	25	39	273	165	297	99	5	566
12:00-1:00 HOUR	5	778	18	62	12	115	22	910	22	22	6	13	80	56	99	30	2	187

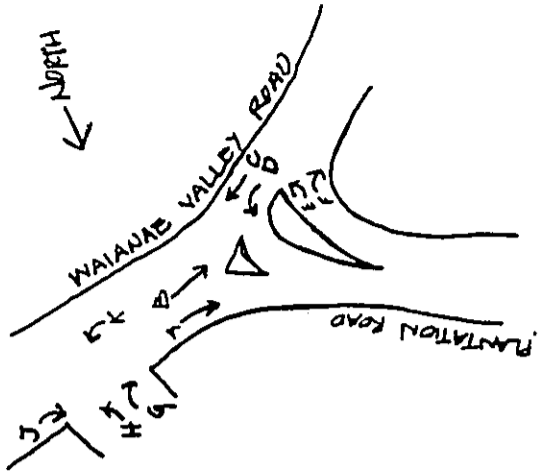
APPROACH/DEPARTURE VOLUMES

TIME	ABC	DEF	GHJN	KLM	AEJ	BFK	CGLN	DHM
11:30-11:45 AM	222	42	231	11	4	247	38	217
-12:00	187	42	244	13	6	211	44	225
-12:15	197	42	253	12	8	225	40	231
-12:30	201	48	255	10	11	219	38	246
-12:45	218	46	264	8	9	244	26	257
-1:00	185	53	272	11	11	227	32	251
-1:15	164	48	250	14	2	192	41	241
-1:30	184	33	249	10	7	199	30	240
-1:45	186	52	255	11	7	203	42	252
-2:00	200	29	237	13	6	217	33	223
-2:15	186	41	230	6	6	207	36	214
-2:30 PM	207	34	228	10	9	224	36	210
11:30-2:30 TOTAL	2337	510	2868	129	86	2615	436	2807
12:00-1:00 HOUR	801	189	1044	41	39	915	136	985



NK: WAIANAЕ VPI: OGR-S

WAIANAЕ TRAFFIC COUNTS  
 INTERSECTION: WAIANAЕ VALLEY ROAD AT PLANTATION ROAD  
 PM COUNT TAKEN ON THURSDAY, APRIL 21, 1988 BY GP & GI



COUNT READINGS

TIME	A	B	C	D	E	F	G	H	J	K
3:30-3:45 PM	17	21	41	4	27	1	0	0	0	2
-4:00	34	41	77	6	49	1	6	0	0	5
-4:15	50	65	120	10	72	6	11	0	0	10
-4:30	69	82	156	14	101	7	13	0	0	11
-4:45	86	113	197	18	132	16	15	0	0	13
-5:00	101	138	225	23	152	21	15	0	0	14
-5:15	125	155	266	28	176	27	18	0	1	16
-5:30 PM	146	182	301	36	204	32	19	0	1	17

COUNT VOLUMES

TIME	A	B	C	D	E	F	G	H	J	K	TOTAL TOT4
3:30-3:45 PM	17	21	41	4	27	1	0	0	0	2	2
-4:00	17	20	36	2	22	0	6	0	0	3	9
-4:15	16	24	43	4	23	5	5	0	0	5	10
-4:30	19	17	36	4	29	1	2	0	0	1	3
-4:45	17	31	41	4	31	9	2	0	0	2	4
-5:00	15	25	28	5	20	5	0	0	0	1	1
-5:15	24	17	41	5	24	6	3	0	1	2	6
-5:30 PM	21	27	35	6	28	5	1	0	0	1	2
3:30-5:30 TOTAL	146	182	301	36	204	32	19	0	1	17	37
4:30-5:30 HOUR	77	100	145	22	103	25	6	0	1	6	13

APPROACH/DEPARTURE VOLUMES

TIME	AB	CD	EF	AD	BF	CE
3:30-3:45 PM	38	45	28	21	22	68
-4:00	37	38	22	19	20	58
-4:15	40	47	28	20	29	66
-4:30	36	40	30	23	18	65
-4:45	48	45	40	21	40	72
-5:00	40	33	25	20	30	48
-5:15	41	46	30	29	23	65
-5:30 PM	48	43	33	29	32	63
3:30-5:30 TOTAL	328	337	236	182	214	505
4:30-5:30 HOUR	177	167	128	99	125	248

NK: WAIANAЕ\WVR-PR-P

WAIANAЕ TRAFFIC COUNTS  
 INTERSECTION: WAIANAЕ VALLEY ROAD AT PLANTATION ROAD  
 MID DAY COUNT TAKEN ON SATURDAY, APRIL 23, 1988 BY GP & KN

COUNT READINGS

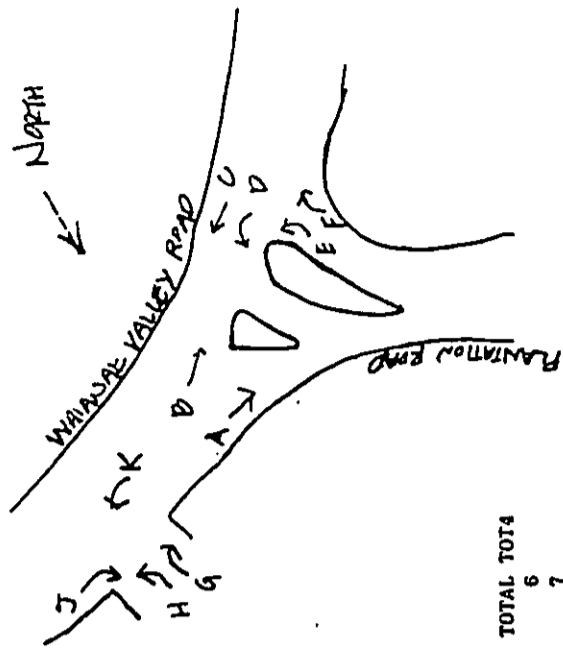
TIME	A	B	C	D	E	F	G	H	J	K
11:30-11:45 AM	15	41	23	3	30	5	2	0	0	4
-12:00	41	70	51	7	59	9	7	0	0	6
-12:15	61	91	92	9	83	14	8	0	0	8
-12:30	90	116	125	11	104	15	10	0	0	12
-12:45	111	141	148	15	119	21	13	1	0	14
-1:00	126	157	173	16	137	26	14	1	1	16
-1:15	148	186	200	19	156	31	18	1	1	17
-1:30	166	204	224	19	171	34	24	1	1	22
-1:45	181	228	252	24	193	39	24	1	1	27
-2:00	189	249	273	25	215	46	27	1	1	28
-2:15	215	283	292	28	226	47	31	1	1	31
-2:30 PM	234	312	374	33	240	49	36	2	1	36

COUNT VOLUMES

TIME	A	B	C	D	E	F	G	H	J	K	TOTAL
11:30-11:45 AM	15	41	23	3	30	5	2	0	0	4	6
-12:00	26	29	28	4	29	4	5	0	0	2	7
-12:15	20	21	41	2	24	5	1	0	0	3	4
-12:30	29	25	33	2	21	1	2	0	0	3	5
-12:45	21	25	23	4	15	6	3	1	0	2	22
-1:00	15	16	25	1	18	5	1	0	1	1	3
-1:15	22	29	27	3	19	5	4	0	0	2	20
-1:30	18	18	24	0	15	3	6	0	0	5	11
-1:45	15	24	28	5	22	5	0	0	0	5	25
-2:00	8	21	21	1	22	7	3	0	0	1	4
-2:15	26	34	19	3	11	1	4	0	0	3	7
-2:30 PM	19	29	82	5	14	2	5	1	0	5	11
11:30-2:30 TOTAL	234	312	374	33	240	49	36	2	1	36	75
11:30-12:30 HOUR	90	116	125	11	104	15	10	0	0	12	22

APPROACH/DEPARTURE VOLUMES

TIME	AB	CD	EF	AD	BF	CE
11:30-11:45 AM	56	26	35	18	46	53
-12:00	55	32	33	30	33	57
-12:15	41	43	29	22	26	65
-12:30	54	35	22	31	26	54
-12:45	46	27	21	25	31	38
-1:00	31	26	23	16	21	43
-1:15	51	30	24	25	34	46
-1:30	36	24	18	18	21	39
-1:45	39	33	27	20	29	50
-2:00	29	22	29	9	28	43
-2:15	60	22	12	29	35	30
-2:30 PM	48	87	16	24	31	96
11:30-2:30 TOTAL	546	407	289	267	361	614
11:30-12:30 HOUR	206	136	119	101	131	229



**APPENDIX B**

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## APPENDIX B

The Highway Capacity Manual defines six Levels of Service, labelled A through F, from best to worst conditions. Levels of Service for intersections are defined in terms of average user delays, which reflect driver discomfort and frustration, fuel consumption, and lost travel time.

### Unsignalized Intersections

For unsignalized intersections, the Highway Capacity Manual procedure evaluates gaps in the major street traffic flow and calculates capacities available for left turns across oncoming traffic and for left and right turns onto the highway from the minor street.

LEVEL OF SERVICE A: Little or no delay.  
LEVEL OF SERVICE B: Short traffic delays.  
LEVEL OF SERVICE C: Average traffic delays.  
LEVEL OF SERVICE D: Long traffic delays.  
LEVEL OF SERVICE E: Very long traffic delays.  
LEVEL OF SERVICE F: Demand volume exceeds capacity, resulting in extreme delays with queuing that may cause severe congestion and affect other movements at the intersection.

### Signalized Intersections

For signalized intersections, the Operational Analysis measures signal operations by two separate indicators, volume-to-capacity (v/c) ratios and Level of Service. The v/c ratios provide a comparison of the traffic demands to the theoretical capacity of the intersection while levels of service are determined from the estimated delay. These two indicators do not necessarily correlate to each other.

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

LEVEL OF SERVICE B: This level describes operations with delays in the range of 5.1 to 15.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher average delays.

LEVEL OF SERVICE C: This level describes operations with delays in the range of 15.1 to 25.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear as the number of vehicles stopping is significant; many vehicles, however, still pass through the intersection without stopping.

LEVEL OF SERVICE D: This level describes operations with delays in the range of 25.1 to 40.0 seconds per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from a combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

LEVEL OF SERVICE E: This level describes operations with delays in the range of 40.1 to 60.0 seconds per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures (queued vehicles do not clear in one cycle) are frequent occurrences.

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

#### Multilane Highways

LEVEL OF SERVICE A: This service level represents unrestricted free-flow conditions. Minor incidents or breakdowns on the highway will have little effect on the traffic at this level.

LEVEL OF SERVICE B: This service level is characterized by smooth or stable free-flow conditions. Flow deterioration due to minor incidents or breakdowns is slightly more severe than LOS A.

LEVEL OF SERVICE C: Highway flows are stable but are more sensitive to increases in traffic volumes. Restriction of maneuverability becomes noticeable at this level. Minor incidents or breakdowns may cause queues to form which will have a significant impact on traffic flow.

LEVEL OF SERVICE D: This service level borders on unstable flow on the highway. Driver maneuverability becomes very limited. Minor incidents or breakdowns can cause substantial queuing.

LEVEL OF SERVICE E: This service level describes capacity conditions. The operation of the highway becomes very unstable because usable gaps in the traffic stream are virtually non-existent. At this LOS, the traffic stream loses its ability to dissipate minor disruptions.

LEVEL OF SERVICE F: Capacity of the highway is exceeded and motorists experience forced flow conditions.

## Appendix C



BOTANICAL SURVEY  
WAI'ANAE KAI PROPERTY  
PROPOSED 27-HOLE GOLF COURSE  
WAI'ANAE DISTRICT, O'AHU

by

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CHAR & ASSOCIATES  
Botanical/Environmental Consultants  
Honolulu, Hawaii

Prepared for: PBR HAWAII

May 1988

C-1

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## SUMMARY

On 7-8 May 1988, a botanical survey, needed for preparation of a Conditional Use Permit for the subject property, was carried out on the site of a proposed 27-hole golf course in Wai'anae Kai. Unmaintained portions of the site are covered by a single vegetation type, kiawe forest, in various stages of maturity. Around the current Mountain View Dairy operations, where the forest has been removed and is more or less periodically maintained, ruderal weeds dominate. Only 78 species of vascular plants are found on the site, an extremely low number for an area of this size. Of these, 70 (90%) are exotic weeds or deliberately introduced plants, and 8 (10%) native, or presumed-native plants. None of the species found on the site are officially listed as endangered or threatened; nor are any species proposed or candidate for such status. No Exceptional Trees, which are protected by Honolulu City and County Ordinance 78-91 (see appendix), occur on the site.

## INTRODUCTION

The study site consists of approximately 250 acres located north of Wai'anae Valley Road, about 1.2 miles east of Farrington Highway. Much of the site is relatively flat with low undulations representing intermittent drainages. Elevations range from 10 to 145 feet, lowest in the west and central portions, rising both to the north and east because of the proximity of Kamaile'unu Ridge. Kawiwi Stream is the main drainage from the site.

In most of the site, the soil is a gray clay belonging to the Lualualei Series (Foote et al. 1972), with occasional boulder outcroppings, especially on the slopes of Kamaile'unu Ridge. When wet, as at the time of the survey, the clay is extremely sticky, adhering in large masses to shoes. Even a thin film on the paved dairy roads made them nearly impassable due to loss of traction. On the other hand, large cracks in the clay, two inches wide and many feet long, indicated that there is considerable shrinkage when the clay dries. There is thus a potential for high dimensional instability

(shrinkage/swelling). Throughout much of the site, large stones and boulders have been cleared and left in piles or removed.

Apart from the current dairy operations, the site is covered exclusively with kiawe forest, with a ground cover of grass. From area to area, the trees tended to be of uniform height, suggesting that different parts of the forest have been cleared at different times. Adjacent to the dairy operation, there are some flat areas covered with a dense growth of shrubs, vines, and ruderal weeds. These are clearly recently abandoned areas of operation beginning to revert to forest. Species diversity is very high in these areas. In Dairy operation areas, tree and shrub growth has been curtailed, and annual ruderal weeds predominate. The lower portion of Kawiwi Stream supports a dense growth of California grass. For the most part, the California grass has grown completely over the stream, obscuring it from view. In places, however, water can be heard flowing beneath the grass.

#### SURVEY METHODS

A walk-through method was used for this survey, with plants identified on sight. Plants that could not be positively identified were collected for later determination by comparison with known specimens in the herbarium and reference to standard taxonomic literature. Taxonomy and nomenclature of the flowering plants follows Wagner et al. (in press). Access to the site was made possible by the presence of perimeter roads on three sides: Plantation Road on the South and Ho'opuhi Road on the South and West; Wai'anae Valley Road on the Southeast and East; and the agricultural park road (extension of Piliuka Place) on the North. Within the site a series of old, abandoned roads in the East and Northwest facilitated access and served as landmarks.

Species recorded from the site in this survey are indicative of the season (wet vs. dry) as well as the environmental conditions under which this survey was made. Surveys taken at different seasons of the year, when environmental conditions are different, would probably yield slightly different

species compositions, especially among the weedy annuals. Variations in the weedy annuals on the site are also to be expected from year to year.

#### DESCRIPTION OF THE VEGETATION

##### Kiawe Forest

Vegetation on the site consists of a forest of kiawe (Prosopis pallida) in various stages of maturity, with mature forest covering most of the site. Mature forest is characterized by trees greater than 25 feet in height and more than 6 inches in diameter, measured at breast height. In low areas (gullies) trees tend to be between 35 and 40 feet in height. The canopy is closed with 60% to 80% cover. On the more exposed, adjacent high areas (low ridges), trees are only 25 to 30 feet tall, and often less than 6 inches in diameter. Canopies are open with only 30% to 40% cover. Beneath the canopy, there is an understory of koa-haole (Leucaena leucocephala) approximately 10 to 12 feet tall. Most of these are dead, and the living ones are heavily damaged by a sucking insect (Heteropsylla sp., possibly H. incisa), which attacks the tender shoot tips, preventing growth. In the more open areas, the koa-haole is reduced or absent. In most places the ground is covered with an almost uninterrupted growth of green panic grass (Panicum maximum var. trichoglume). All herbs taken together constitute less than 1% of the vegetation in these areas. In and along abandoned roads, especially in the eastern portion of the site, there are occasional small patches of buffel grass (Cenchrus ciliaris) or hurricane grass (Bothriochloa pertusa). There is no significant vine component in the forest except at the highest reaches of the site on the slopes of Kamaile'unu Ridge, where koali (Ipomoea cairica) is common.

Those areas with more open canopy and trees of lower stature appear to be of younger age, rather than stunted by harsher conditions. Many of these areas are particularly level and free of boulders, and were probably graded for agricultural use. Charred snags and fence posts indicate the area has been subject to fire in the recent past. Either one or both (agricultural use, fires) would be sufficient to account for the younger forests in these areas.

In the southeastern portion of the site, is a mature kiawe forest overgrowing what appears to be an old, abandoned dairy operation. There is a complex of concrete structures including a pool, several buildings of undetermined use, and a long parallel pair of feeding cribs. One of the buildings also contains feeding cribs along its walls. Debris in the area indicates the site has been abandoned more than 10 years. When in use, this complex would clearly not have been in forest but on cleared land. The forest has thus encroached and taken over, as it is doing along the margins of the current dairy operation.

#### Dairy Area.

In the center of the study site is the current Mountain View Dairy operation. Due to the continued disturbance by machinery and penned cattle, there is little vegetation; but ruderal weeds thrive on the roadsides and peripheral to the areas of constant disturbance. Many of these (approximately one-third of all species found on the site) are annuals and short-lived perennials, whose success is due to their ability to reproduce quickly between periods of disturbance, allowing rapid recolonization. These are not stable populations of plants. Within a few years after the last major disturbance, most of the short-lived weeds are replaced by longer-lived shrubby species. Even as these reach their full stature, saplings of trees from the surrounding forest begin to over-top them, setting the stage for the return of the forest. This progression is well-represented on the study site. Characteristic ruderals are grasses (Cenchrus echinatus, Chloris barbata, Cynodon dactylon, Eleusine indica), pigweeds and saltbush (Amaranthus spinosus, Amaranthus viridis, Atriplex semibaccata, Atriplex suberecta, Chenopodium carinatum, and Chenopodium murale), mallows (Malva parviflora, Malvastrum coromandelianum, and Sida spinosa), and composites (Sonchus oleraceus and Tridax procumbens). The presence of two ruderal species seems attributable directly to the dairy operation; oat (Avena sp.), and sheep sorrel (Rumex acetosella) would not normally have been expected to occur in this location.

Where the ruderals have been able to persist long enough to be supplanted by longer-lived shrubby species, a dense thicket of plants about 3 or 4 feet

tall has resulted. Representative species are lion's ear (Leonotis nepetifolia), tree tobacco (Nicotiana glauca), castorbean (Ricinus communis), cotton (Gossypium hirsutum), popolo (Solanum americanum), currant tomato (Lycopersicon pimpinellifolium), pluchea (Pluchea indica and symphytifolia), and golden crown beard (Verbesina encelioides). Emerging from this thicket are young kiawe trees from 6 to 12 feet tall. A number of vines scramble over the thicket and climb the young kiawe, including Glycine wightii and bindweeds and morning-glories (Ipomoea obscura and trilobata, and Merremia tuberosa). Vines persist on the kiawe until the trees reach stature of mature forest, by which time the vines are uncommon or absent.

Along the lower part of Kawiwi Stream, at the entrance to the present dairy operation, there is an area covered almost entirely with California grass (Brachiaria mutica). There are within it, however, small patches of cat-tail (Typha latifolia), and elephant grass (Pennisetum purpureum). According to the Master Plan, this area is not to be developed as golf course, but is to be retained in agricultural use as a nursery.

#### THREATENED AND ENDANGERED SPECIES

No listed, proposed, or candidate threatened and endangered species, as designated by the Federal and/or State governments (US Fish and Wildlife Service 1985; Herbst 1987) are found on the site. Because the site has long been disturbed, there are no remnant native plant communities. Only 7 native or possibly-native species are found on the site, most under circumstances suggesting recolonization rather than persistence. Native cotton (Gossypium tomentosum) occurs as a single plant in a pile of rocks removed from an abandoned road way. Pa'u-o-Hi'i'aka (Jacquemontia ovalifolium) is found in a road bed of powdered coral near the sanitary land fill. Outside the site, it is common on and along roads with coral rubble, and may have dispersed as seeds in rubble brought from other areas. 'Ilima (Sida fallax) is common on the slopes of Kamaile'unu Ridge. The remaining species are all weedy: 'uhaloa (Waltheria indica var. americana), popolo (Solanum americanum), Abutilon in-canum, and yellow wood-sorrel (Oxalis corniculata).

## RECOMMENDATIONS

There is little of botanical interest on the project site, as most of the area has been under prolonged and repeated disturbance. The proposed golf course development is not expected to have a significant impact on the total island populations of the species involved. The native species are found in similar environmental conditions throughout the islands. Where feasible, it may be desirable to landscape with native plants. Plants are readily available, or can be propagated as needed, from local nurseries specializing in native plants.

Dry forest and lowland species suited for such landscape use include the native cotton, pa'u-o-Hi'i'aka, 'ilima, 'ihi (Portulaca molokiniensis and other species), pohinahina (Vitex ovata), Achyranthes splendens, a'ali'i (Dodonaea viscosa), 'ohai (Sesbania tomentosa and other species), naio (Myoporum sandwicense), sandlewood (Santalum ellipticum), lo'ulu (Pritchardia spp.), alahe'e (Canthium odoratum), lama (Diospyros spp.), 'ohe (Reynoldsia sandwicensis), 'akia (Wikstroemia uva-ursi), wiliwili (Erythrina sandwicensis), and others. With irrigation, many more species of considerable ornamental value could be added to the list.

Kiawe trees are now common throughout the leeward areas of all the main Hawaiian Islands. Many of the larger trees now present on the site could be incorporated into the landscape plans for the golf course. Large trees with trunks over 6 inches in diameter are especially common in gully areas, where soil is deeper and there is more available moisture.



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- Herbst, D. 1987. Status of endangered Hawaiian plants. Hawaiian Botanical Society Newsletter 26(2): 44-45.
- U.S. Fish and Wildlife Service. 1985. Endangered and threatened wildlife and plants; Review of plant taxa for listing as Endangered and Threatened Species; Notice of review. Federal Register 50(188): 39526-39527 + 57 page table.
- Wagner, W. L., D. Herbst, and S. Sohmer. In press. Manual of the Flowering Plants of the Hawaiian Islands. B. P. Bishop Museum Press.

## SPECIES LIST

A list of all the vascular plants found on the site follows. Plants are organized in two groups -- monocots and dicots. Within each group, they are further arranged in alphabetical order by family and genus. For each species, an accepted common name is given. For Hawaiian plants, the Hawaiian name is given if known. Biogeographic status is indicated by a letter code. Finally, the presence (+) or absence (-) of each species within each vegetation type is provided. An explanation of abbreviations used (other than author citations) is given below.

### SCIENTIFIC NAME

s.l. - in a broad sense

sp. - correct species name not determined

### STATUS

E - endemic, native only to the Hawaiian Islands

I - indigenous, native to the Hawaiian Islands, but also native elsewhere.

P - Polynesian, not considered native, but thought to have been introduced by the Polynesians prior to 1778

X - exotic, not native, introduced after 1778

### VEGETATION TYPE

k - kiawe forest

d - dairy area

SPECIES LIST

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>BIOGEOGRAPHIC STATUS</u>	<u>VEGETATION TYPE</u> k d
<b>FLOWERING PLANTS</b>			
<b>MONOCOTS</b>			
Commelinaceae			
<u>Commelina benghalensis</u> L.	commelina	X	+
Gramineae			
<u>Avena</u> sp.	oat	X	-
<u>Bothriochloa pertusa</u> (L.) A. Camus	hurricane grass	X	+
<u>Brachiaria mutica</u> (Forsk.) Stapf	California grass	X	-
<u>Cenchrus ciliaris</u> L.	buffel grass	X	+
<u>Cenchrus echinatus</u> L.	sandbur	X	-
<u>Chloris barbata</u> (L.) Sw.	finger grass	X	+
<u>Cynodon dactylon</u> (L.) Pers.	Bermuda grass	X	-
<u>Digitaria ciliaris</u> (Retz.) Koel.	crab grass	X	-
<u>Digitaria insularis</u> (L.) Mez ex Ekman	sour grass	X	+
<u>Digitaria radicata</u> (Presl.) Miq.	crab grass	X	-
<u>Eleusine indica</u> (L.) Gaertn.	goose grass	X	+
<u>Eragrostis tenella</u> (L.) Beauv. ex R. & S.	Japanese love-grass	X	+
<u>Panicum maximum</u> Jacq. var. <u>trichoglume</u> Eyles ex Robyns	green panic grass	X	+
<u>Pennisetum purpureum</u> Schumacher.	elephant grass	X	-
<u>Rhynchelytrum repens</u> (Willd.) C. E. Hubb.	Natal redtop	X	+
<u>Setaria verticillata</u> (L.) Beauv.	bristly foxtail	X	+

k d

STATUS

COMMON NAME

SCIENTIFIC NAME

Typhaceae

Typha latifolia L.

cat-tail

X

- +

**DICOIS**

Aizoaceae

Trianthema portulacastrum L.

trianthema

X

- +

Amaranthaceae

Achyranthes aspera L.

Amaranthus spinosus L.

Amaranthus viridis L.

achyranthes

spiny pigweed

slender amaranth

X

X

X

+ +

+ +

- +

Cactaceae

Opuntia ficus-indica (L.) Mill.

panini

X

+ -

Chenopodiaceae

Atriplex semibaccata R. Br.

Atriplex suberecta Verdoorn

Chenopodium carinatum R. Br.

Chenopodium murale L.

Australian saltbush

saltbush

chenopodium

chenopodium

X

X

X

X

- +

- +

- +

- +

Compositae

Ageratum conyzoides L.

Bidens cynapiifolia H.B.K.

Conyza bonariensis (L.) Cronq.

Pluchea indica (L.) Less.

maile hohono

beggarticks

horseweed

pluchea

X

X

X

X

+ +

+ +

+ +

- +

SCIENTIFIC NAME	COMMON NAME	STATUS	k	d
<u>Pluchea symphytifolia</u> (Miller) Gillis	pluchea	X	+	+
<u>Sonchus oleraceus</u> L.	common sowthistle	X	-	+
<u>Tridax procumbens</u> L.	coat buttons	X	-	+
<u>Verbesina encelioides</u> (Cav.) B. & H.	golden crownbeard	X	+	+
Convolvulaceae				
<u>Ipomoea cairica</u> (L.) Sweet	koali	I	+	+
<u>Ipomoea obscura</u> (L.) Ker-Gawl.	yellow bindweed	X	+	+
<u>Ipomoea triloba</u> L.	pink bindweed	X	-	+
<u>Jacquemontia ovalifolia</u> Gray	pa'u-o-Hi'i'aka	I	-	+
<u>Merremia aegyptia</u> (L.) Urban	hairy merremia	P?	+	+
Cucurbitaceae				
<u>Cucumis dipsaceus</u> Ehrenb. ex Spach	wild cucumber	X	+	+
<u>Momordica charantia</u> L.	bittermelon	X	+	+
Euphorbiaceae				
<u>Chamaesyce hirta</u> (L.) Millsp.	hairy spurge	X	-	+
<u>Chamaesyce hypericifolia</u> (L.) Millsp.	spurge	X	-	+
<u>Chamaesyce prostrata</u> (Ait.) Small	prostrate spurge	X	-	+
<u>Euphorbia heterophylla</u> L.	euphorbia	X	-	+
<u>Phyllanthus debilis</u> Klein ex Willd.	phyllanthus	X	+	+
<u>Ricinus communis</u> L.	castorbean	X	+	+

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>	<u>k</u>	<u>d</u>
<u>Labiatae</u>				
<u>Leonotis nepetifolia</u> (L.) R. Br.	lion's ear	X	+	+
<u>Ocimum gratissimum</u> L.	basil	X	+	-
<u>Leguminosae</u>				
<u>Acacia farnesiana</u> (L.) Willd.	klu	X	+	-
<u>Crotalaria incana</u> L.	rattlepod	X	+	+
<u>Desmanthus virgatus</u> (L.) Willd.	virgate mimosa	X	+	+
<u>Glycine wightii</u> (Wight & Arnott) Verdcourt	glycine	X	-	+
<u>Leucaena leucocephala</u> (Lam.) deWit	koa-haole	X	+	+
<u>Prosopis pallida</u> (Humb. & Bonpl. ex Willd.) H.B.K.	kiawe	X	+	+
<u>Samanea saman</u> (Jacq.) Merr.	monkeypod	X	+	+
<u>Tamarindus indica</u> L.	tamarind	X	+	-
<u>Malvaceae</u>				
<u>Abutilon grandifolium</u> (Willd.) Sweet	ma'o	X	+	+
<u>Abutilon incanum</u> (Link) Sw.	abutilon	I?	+	-
<u>Gossypium hirsutum</u> L.	upland cotton	X	-	+
<u>Gossypium tomentosum</u> Nutt. ex Seem.	ma'o, huluhulu	E	+	-
<u>Malva parviflora</u> L.	cheeseweed	X	+	+
<u>Malvastrum coromandelianum</u> (L.) Garcke	malvastrum	X	+	+
<u>Sida fallax</u> Walp.	'ilima	I	+	-
<u>Sida spinosa</u> L.	sida	X	-	+
<u>Nyctaginaceae</u>				
<u>Boerhavia coccinea</u> Mill.	boerhavia	X	-	+

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>	<u>k</u>	<u>d</u>
<u>Oxalidaceae</u> <u>Oxalis corniculata</u> L.	yellow wood-sorrel	I?	-	+
<u>Phytolaccaceae</u> <u>Rivina humilis</u> L.	rouge plant	X	-	+
<u>Polygonaceae</u> <u>Rumex acetosella</u> L.	sheep sorrel	X	-	+
<u>Portulacaceae</u> <u>Portulaca oleracea</u> L.	common purslane	X	+	+
<u>Proteaceae</u> <u>Grevillea robusta</u> A. Cunn. ex R. Br.	silk-oak	X	+	-
<u>Solanaceae</u> <u>Capsicum annuum</u> L. <u>Datura stramonium</u> L. <u>Lycopersicon pimpinellifolium</u> Mill. <u>Nicotiana glauca</u> Grah. <u>Solanum americanum</u> Mill.	chili pepper Jamestown weed, jimson weed currant tomato tree tobacco popolo	X X X X I?	- - - - +	+ + + + +
<u>Sterculiaceae</u> <u>Waltheria indica</u> L. var. <u>americana</u> (L.) R. Br. ex Hosaka	'uha'loa, hi'aloa	I?	+	+

ORDINANCE NO. <sup>(GW)</sup> 78-91

BILL NO. 85 (1978)  
(Draft No. 2)

A BILL FOR AN ORDINANCE TO AMEND THE REVISED ORDINANCES OF HONOLULU 1969, AS AMENDED, BY ADDING A NEW ARTICLE TO CHAPTER 13 RELATING TO EXCEPTIONAL TREES.

BE IT ORDAINED by the People of the City and County of Honolulu:

SECTION 1. The Revised Ordinances of Honolulu 1969, as amended, is hereby further amended by adding thereto a new Article to Chapter 13 to read as follows; further, the Corporation Counsel is authorized to add the appropriate numbers when codifying the R.O. 1969:

"Article \_\_\_\_\_

PROTECTIVE REGULATIONS FOR EXCEPTIONAL TREES

.1. Declaration of Legislative Intent.

The Council of the City and County of Honolulu desires to provide for better environmental control in order to improve the quality of life of its citizens by enacting protective regulations to safeguard exceptional trees. The purpose of this Article is to preserve exceptional trees within the City and County of Honolulu. The Council finds that not only are trees of value for their beauty, but that they perform an important ecological function in that they prevent soil erosion, purify the air, as well as retard flooding. The Council also finds that inasmuch as trees contribute to the beauty of the island, they are an important element in achieving the objectives of the New General Plan "to protect and preserve the natural environment of Oahu" and "to maintain the viability of Oahu's resort industry."

In the belief that protective regulations to safeguard exceptional trees will promote the health, safety and general welfare of the citizens of the City and County of Honolulu, the City Council enacts this ordinance as a means of preserving the environmental character of the City and County within the provisions of Act 105, Session Laws of Hawaii, 1975. The terms of this Article shall be liberally construed to effectuate the purpose stated herein.

.2. Definitions.

The term "exceptional trees," for the purposes of this Article, means a tree or grove of trees with historic or cultural value, or which by reason of its age, rarity, location, size, esthetic quality, or endemic status has been designated by the City Council as worthy of preservation.

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.3. Arborist Advisory Committee.

There shall be an Arborist Advisory Committee consisting of five members who shall be appointed by the Mayor. The Committee shall include the Director of the Department of Land Utilization, or his designee; one member who shall be actively employed in the practice of landscape architecture, and three other members selected on the bases of active participation in programs of community beautification, or research or organization in the ecological sciences, including ethnobotany or Hawaiiana. The Committee shall be attached to the Department of Parks and Recreation for administrative purposes and the Director shall cause employees of his office to furnish such technical, administrative or clerical services as may be needed by the Committee.

.4. Powers and Duties.

The Arborist Advisory Committee shall have the following powers and duties:

- (1) To research, prepare, and recommend to the City Council exceptional trees to be protected by city ordinance or regulation.
- (2) To advise property owners relative to the preservation and enhancement of exceptional trees.
- (3) To recommend to the City Council appropriate protective ordinances, regulations, and procedures.
- (4) To review all actions deemed by the City Council to endanger exceptional trees.

.5. Procedures.

- (1) Any citizen or citizen group may petition the Arborist Advisory Committee to examine a particular tree or grove of trees for the purpose of having it recommended to the City Council for designation as an exceptional tree.
- (2) The Arborist Advisory Committee, on at least an annual basis, shall re-examine the exceptional trees and in the event such tree is found to be dangerous or diseased beyond repair, the Council, upon recommendation from the Committee, may remove such tree from the register.
- (3) Upon designation by the Council of an exceptional tree, the City Clerk shall notify the property owner and/or the occupant of the property by registered mail that such a designation has been made.

.6. Enforcing Authority.

The Building Department, the Department of Land Utilization, and the Department of Public Works shall be charged with the enforcement of this ordinance and shall be clothed with police power to do all acts necessary to ensure that the provisions of this ordinance are not violated including, but not limited to, the issuance of citations for the violation of any provisions of this ordinance. The provisions of this ordinance shall not be superseded by any permit issued by any county agency under any other ordinance.

.7. Register of Exceptional Trees.

The following are hereby designated "exceptional trees":

- \* (1) Adansonia digitata, Baobab (Queen's Medical Center, 1301 Punchbowl Street, TMK: 2-1-35:3).
- (2) Adansonia digitata, Baobab (Ala Moana Park, TMK: 2-3-37:1).
- \* (3) Agathis robusta, Australian Kauri, Queensland Kauri (Foster Botanic Garden, 180 North Vineyard Boulevard, TMK: 1-7-07:2).
- (4) Agathis robusta F. Muell., Kauri (Harold L. Lyon Arboretum, 3860 Manoa Road, TMK: 2-9-55:6).
- (5) Anacardium occidentale, Cashew Nut (Castle Ranch, 1385 Maunawili Rd., TMK: 4-2-09:1).
- (6) Araucaria bidwillii, Bunya-bunya or Monkey Puzzle Tree (Castle Ranch, 1385 Maunawili Road, TMK: 4-2-09:1).
- (7) Araucaria cunninghamii Sweet, Hoop Pine (Harold L. Lyon Arboretum, TMK: 2-9-55:6).
- \* (8) Araucaria cunninghamii, Hoop Pine (Foster Botanic Garden, TMK: 1-7-07:2).
- (9) Araucaria excelsa, Norfolk Island Pine (Castle Ranch, 1385 Maunawili Road, TMK: 4-2-01:1).
- (10) Arecastrum romanzoffianum, Queens Palm, Monkey Nut (10 in a row) (1071 Young Street, TMK: 2-4-02:27, 3).
- (11) Artocarpus incisus, Breadfruit, 'Ulu (Castle Ranch, 1385 Maunawili Road, TMK: 4-2-09:1).
- (12) Bertholletia excelsa, Brazil Nut (2616 Pali Highway, TMK: 1-8-08:1).

\* "Champion Trees of Hawaii," in American Forests, May 1974.

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- \* (13) Bombax malabaricum, Red Silk Cotton, Simal Tree  
(Salmalia malabarica) (Queen's Medical Center,  
TMK: 2-1-35:3).
- (14) Bucida Buceras, Jucaro (Ala Moana Park, TMK: 2-3-37:1).
- \* (15) Bumelia buxifolia, Ironwood (Foster Botanic Garden,  
TMK: 1-7-07:2).
- (16) Calophyllum inophyllum, Kamani Tree, True Kamani,  
Alexandrian Laurel (Kualoa Regional Park--corner  
near Fishpond, makai of Kamehameha Highway,  
TMK: 4-9-04:1).
- \* (17) Canarium commune, Pili Nut, Java almond (Foster  
Botanic Garden, TMK: 1-7-07:2).
- (18) Caryota cumingii Loddiges ex Martius, Fishtail Palm  
(Harold L. Lyon Arboretum, TMK: 2-9-55:6).
- \* (19) Caryota urens, Wine Palm, Toddy Palm (Wahiawa Botanic  
Garden, 1396 California Street, TMK: 7-4-17:1).
- (20) Casuarina equisetifolia, Ironwood, Australian Pine  
(along Kalakaua Avenue from Kapahulu Avenue to Poni  
Moi Road, TMK: 3-1-43:1).
- \* (21) Catalpa longissima, Yoke Wood, Haiti catalpa (Foster  
Botanic Garden, TMK: 1-7-07:2).
- \* (22) Cavanillesia platanifolia, Quipo (Foster Botanic  
Garden, TMK: 1-7-07:2).
- \* (23) Cecropia obtusifolia, Trumpet Tree, Guarumo (Paradise  
Park, 3737 Manoa Road, TMK: 2-9-54:18).
- (24) Ceiba pentandra, Kapok Tree (ground of State Department  
of Agriculture, 1428 South King Street, TMK: 2-4-5:18).
- (25) Ceiba pentandra, Kapok Tree, Silk Cotton Tree (2 trees)  
(Foster Botanic Garden, TMK: 1-7-07:2).
- \* (26) Couroupita guianensis, Cannonball Tree (Foster Botanic  
Garden, TMK: 1-7-07:2).
- (27) Couroupita guianensis Aubl., Cannonball Tree (University  
of Hawaii/Manoa Campus, next to parking lot, makai side  
of Sinclair Library, TMK: 2-8-23:3).
- (28) Cyrtostachys lakka Beccari, Sealing Wax Palm (Harold L.  
Lyon Arboretum, TMK: 2-9-55:6).
- \* (29) Delonix regia, Royal Poinciana (Castle Ranch, 1385  
Maunawili Road, TMK: 4-2-09).
- (30) Elaeodendron orientale, False Olive (Foster Botanic  
Garden, TMK: 1-7-07:2).

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- (31) Enterolobium cyclocarpum, Earpod (Honolulu Zoo, 151 Kapahulu Avenue, TMK: 3-1-43:1).
- (32) Enterolobium cyclocarpum, Earpod Tree (Board of Water Supply--Makiki Pumping Station, TMK: 2-5-20:1).
- \* (33) Enterolobium cyclocarpum, Earpod, Elephant's Ear (Foster Botanic Garden, TMK: 1-7-07:2).
- (34) Enterolobium cyclocarpum, Earpod, Elephant's Ear (Grounds of State Department of Agriculture, 1428 S. King Street, TMK: 2-4-5:18).
- (35) Enterolobium cyclocarpum, Earpod Tree (Waiialua, TMK: 6-7-01: -).
- (36) Erythrina sandwicensis, Wili-wili (Foster Botanic Garden at Koko Head Crater, TMK: 3-9-12:1).
- \* (37) Eucalyptus deglupta, Mindanao Gum, Bagras Eucalyptus (Wahiawa Botanic Garden, 1396 California Avenue, TMK: 7-4-17:1).
- (38) Eugenia malaccensis, Mountain Apple (Castle Ranch, 1385 Maunawili Road, TMK: 4-2-09:1).
- (39) Ficus, Banyan (Ala Moana Park, TMK: 2-3-37:1).
- (40) Ficus benghalensis, Indian Banyan, Vada Tree (Iolani Palace Grounds, TMK: 2-1-25:2).
- (41) Ficus benghalensis, Indian Banyan (Moana Hotel Courtyard, 2365 Kalakaua Avenue, TMK: 2-6-1:12).
- (42) Ficus benghalensis, Indian Banyan (two beside the Judiciary Building, TMK: 2-1-25:3).
- (43) Ficus benghalensis, Indian Banyan (Parking lot Walina Street, The Food Pantry Ltd., 2370 Kuhio Avenue, TMK: 2-6-21:100).
- (44) Ficus elastica Roxb. ex Hornem., Indian rubber tree (University of Hawaii/Manoa campus, next to Campus Way, mauka side of Sinclair Library, TMK: 2-8-23:3).
- (45) Ficus macrophylla, Moreton Bay Fig (Waikiki end of Queen Emma Square by St. Andrew's Priory School, 224 Queen Emma Square, TMK: 2-1-18:02).
- \* (46) Ficus religiosa, Bo Tree, Peepul Tree (Moanalua Gardens Foundation Inc., 1352 Pineapple Place, TMK: 1-1-9:4).
- (47) Ficus religiosa, Bo Tree, Peepul Tree, Sacred Tree (2616 Pali Highway, TMK: 1-8-08:1).
- (48) Ficus religiosa L., Bo Tree, Peepul Tree, Sacred Tree (University of Hawaii/Manoa campus, mauka end of Hawaii Hall, TMK: 2-8-23:3).

- (49) Ficus religiosa, Bo Tree (Foster Botanic Garden, TMK: 1-7-07:2).
- (50) Garcinia mangostana, Mangosteen (3 in grove) (Castle Ranch, 1385 Maunawili Road, TMK: 4-2-09:1).
- \* (51) Guazuma tomentosa, Guacima (South King Street).
- (52) Hernandia ovigera Slickm., Jack-in-a-box fruit tree (University of Hawaii/Manoa campus, mauka-ewa side of Sinclair Library, TMK: 2-8-23:3).
- \* (53) Hyphaena thebaica, Doumpalm Gingerbread Palm (Foster Botanic Garden, TMK: 1-7-07:2).
- (54) Kigelia pinnata, Sausage Tree (1071 Young Street, TMK: 2-4-02:27, 3).
- (55) Kigelia Pinnata, Sausage Tree (James W. Tharp, 115 Kuukama Street, Kailua, TMK: 4-3-14:07).
- \* (56) Lagerstroemia speciosa, Queen Flower, Crepe Myrtle (Foster Botanic Garden, TMK: 1-7-07:2).
- (57) Litchi chinensis, Litchi, Lychee (2616 Pali Highway, TMK: 1-8-08:1).
- (58) Litchi chinensis, Litchi Nut, Lychee (Castle Ranch, 1385 Maunawili Rd., TMK: 4-2-09:1).
- \* (59) Lonchocarpus domingensis, Guama, Genogeno (Foster Botanic Garden, TMK: 1-7-07:2).
- (60) Macadamia integrifolia, Macadamia Nut Tree, Queensland Nut (2616 Pali Highway, TMK: 1-8-08:1).
- \* (61) Mammea americana, Mammee apple (Department of Agriculture, 1428 S. King Street, TMK: 2-4-5:18).
- (62) Mangifera indica, Mango (pirie) (2616 Pali Highway, TMK: 1-8-08:1).
- (63) Manilkara zapota syn. Achras zapota, Chicle Tree (2616 Pali Highway, TMK: 1-8-08:1).
- (64) Manilkara zapota syn. Achras zapota (two trees) (1071 Young Street, TMK: 2-4-02:27, 3).
- \* (65) Manilkara zapota syn. Achras zapota, Chicle (Foster Botanic Garden, TMK: 1-7-07:2).
- (66) Manilkara zapota syn. Achras zapota, Chicle Tree (Judiciary Building Ewa Courtyard, TMK: 2-1-25:3).
- (67) Metroxylon carolinensis, Ivory Nut Palm (grove of five) (Castle Ranch, 1385 Maunawili Road, TMK: 4-2-09:1).

- \* (68) Mimusops elengi, Pogada, Elengi Madras Gum Tree  
(Foster Botanic Garden, TMK: 1-7-07:2).
- (69) Pandanus odoratissimus, Red Hala Pandanus (Swanzy  
Beach Park, TMK: 5-1-12:11).
- \* (70) Peltophorum inerme, Yellow Poinciana (Queen's  
Medical Center, TMK: 2-1-35:3).
- (71) Phyllanthus emblica, Indian Gooseberry, Emblic,  
Myrobalan (2616 Pali Highway, TMK: 1-8-08:1).
- (72) Pithecellobium dulce, Opiuma, Madras Thorn, Manila  
Tamarind (Fernhurst YWCA--1566 Wilder Avenue,  
TMK: 2-4-23:87).
- (73) Pritchardia macrocarpa, Dwarf Loulu Palm (Foster  
Botanic Garden, TMK: 1-7-07:2).
- (74) Prosopis pallida, Kiawe, Algaroba, Mesquite (1071  
Young Street, TMK: 2-4-02:27, 3).
- (75) Psidium cattleianum f. lucidium, Waiawi, Yellow Guava,  
Yellow Cattley (2616 Pali Highway, TMK: 1-8-08:1).
- (76) Pterocarpus indicus, Narra (Tantalus Drive--on curve  
near #3665, TMK: 2-5-12:06)..
- (77) Roystonea aleracea (Jacq.) O. F. Cook, South American  
Royal Palm (Harold L. Lyon Arboretum, TMK: 2-9-55:6).
- \* (78) Roystonea oleracea, Cabbage Palm (Foster Botanic Garden,  
TMK: 1-7-07:2).
- (79) Roystonea regia, Royal Palm (Both sides of Royal Palm  
Drive, Wahiawa, TMK: 7-5-6:17, 18, 19, 20).
- (80) Roystonea regia, Royal Palm (30 line old carriage  
road) (Castle Ranch, 1385 Maunawili Road, TMK: 4-2-09:1).
- (81) Samanea saman, Monkeypod Tree, Rain Tree, Ohai  
(Borthwick, 420 Wyllie Street, TMK: 1-8-6:07).
- (82) Samanea saman, Monkeypod Tree (Central Union Church--  
courtyard Atherton Chapel, 1660 South Beretania St.,  
TMK: 2-8-11:02).
- (83) Samanea saman, Monkeypod Tree (Along Paki Avenue,  
Kapahulu to Monsarrat, TMK: 3-1-43: \_\_\_).
- (84) Samanea saman, Monkeypod Trees (Moanalua Gardens  
Foundation, Inc., 1352 Pineapple Place, TMK: 1-1-9:4).
- (85) Sapindus saponaria, Soapberry (Ala Moana Park,  
TMK: 2-3-37:1).
- \* (86) Spondias mombin, Hog Plum (Foster Botanic Garden,  
TMK: 1-7-07:2).

- (87) Sterculia apetala, Panama (Ala Moana Park, TMK: 2-3-37:1).
- (88) Sterculia foetida L., Skunk tree, Java olives, kelumpang, Bangar (University of Hawaii/Manoa campus, ewa-makai corner of George Hall, TMK: 2-8-23:3).
- \*(89) Sterculia urens, Nawa (Queen's Medical Center, TMK: 2-1-35:3).
- (90) Swietenia mahagoni, Mahogany Tree (Along Kalakaua between Beretania and Kapiolani Sts.).
- (91) Swietenia mahagoni, Mahogany Tree (2616 Pali Highway, TMK: 1-8-08:1).
- (92) Tamarindus indica, Tamarind (two trees) (1071 Young St., TMK: 2-4-02:27, 3).
- (93) Tamarindus indica, Tamarind (Judiciary Building Ewa Courtyard, TMK: 2-1-25:3).
- (94) Terminalia catappa, False Kamani, Tropical Almond (Foster Botanic Garden, TMK: 1-7-07:2).
- (95) Thespesia populnea, Milo, Portia Tree (2616 Pali Highway, TMK: 1-8-08:1).

\_\_\_\_.8. Violation and Penalty.

It shall be unlawful for any person, corporation, public agency or other entity to remove or otherwise destroy any tree in the City and County of Honolulu which has been designated "exceptional" without approval from the City Council. Any person who violates this section shall be fined not more than \$1,000. or imprisoned not more than ninety (90) days; or both. (Am. 10/26/78)

\_\_\_\_.9. Injunctive Enforcement.

Any threatened violation of the provisions of this ordinance is hereby declared to be a public nuisance and may be abated through proceedings for injunctive relief or similar relief in Circuit Court or other court of competent jurisdiction.

\_\_\_\_.10. Severability.

If any section, paragraph, subsection, clause or phrase of this ordinance is for any reason held to be unconstitutional or invalid, such decision shall not affect the validity of the remaining portions of this ordinance.

\_\_\_\_.11. Appeals.

Any person or persons aggrieved by an action of the City Council may within thirty (30) days of such action file an appeal to the Circuit Court.

SECTION 2. Effective Date. This ordinance shall take effect upon its approval.

INTRODUCED BY:

*Walter C. ...*

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Councilmembers

DATE OF INTRODUCTION:

August 9, 1978  
Honolulu, Hawaii

APPROVED AS TO FORM AND LEGALITY:

*James H. Howell*  
Deputy Corporation Counsel

APPROVED this 9th day of  
November, 1978.

*Frank F. ...*  
~~FRANK F. ...~~ Mayor Acting Mayor  
City and County of Honolulu

(OCS/092578/CA)

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78-91

C-24



(GW)  
ORDINANCE NO. 81-32

BILL NO. 34 (1981)  
(DRAFT NO. 3)

A BILL FOR AN ORDINANCE TO AMEND ARTICLE 13-36, REVISED ORDINANCES OF HONOLULU 1978, RELATING TO EXCEPTIONAL TREES.

BE IT ORDAINED by the People of the City and County of Honolulu.

SECTION 1. Section 13-36.1 Revised Ordinances of Honolulu, 1978, is hereby amended to read:

Section 13-36.1 Declaration Of Legislative Intent.

The Council of the City and County of Honolulu desires to provide for better environmental control in order to improve the quality of life of its citizens by enacting protective regulations to safeguard exceptional trees within the City and County of Honolulu. The Council finds that not only are trees of value for their beauty, but that they perform an important ecological function in that they prevent soil erosion, purify the air, as well as retard flooding. The Council also finds that inasmuch as trees contribute to the beauty of the island, they are an important element in achieving the objectives of the New General Plan "to protect and preserve the natural environment of Oahu" and "to maintain the viability of Oahu's resort industry."

While the Council recognizes the limitations inherent in the enforcement of this ordinance on Federal and State property, exceptional trees located on such property are included herein, as a statement of this Council's firm resolve to protect those unique assets to our environment, wherever they might be located on Oahu. Further, it is hoped that this statement of resolve will encourage these Federal and State officials entrusted with the care of designated exceptional trees, to take appropriate steps for their protection.

In the belief that protective regulations to safeguard exceptional trees will promote the health, safety and general welfare of the citizens of the City and County of Honolulu, the City Council enacts this ordinance as a means of preserving the environmental character of the City and County within the provisions of Act 105, Session Laws of Hawaii, 1975. The terms of this article shall be liberally construed to effectuate the purpose stated herein.  
(Am.Ord.78-91)

(OCS/031281/VB)

81-32

SECTION 2. Section 13-36.7.(66), Revised Ordinances of Honolulu 1978, is hereby amended to read:

"(66) Manilkara zapota syn. Achras zapota, Chicle Tree; Acathis robusta, Australian Kauri, Queensland Kauri (Judiciary Building Ewa Courtyard, TMK: 2-1-25:3)."

SECTION 3. Section 13-36.7, Revised Ordinances of Honolulu 1978, is hereby amended by adding the following:

"(96) Hibiscus tiliaceus, Hau Tree (Hawaiian), Halekulani Hotel, sea side of the dining room, TMK: 2-6-04: 8).

(97) Pseudobombax ellipticum, Pink Bombax (Queens Medical Center, front lawn, TMK: 2-1-35: 3).

(98) Canarium vulgare, Pili Nut Tree (two trees) (Washington Place, TMK: 2-1-18: 1).

(99) Kigelia pinnata, Sausage Tree (Coast Guard Station on Kalaniana'ole Highway, Aina Haina, TMK: 3-5-46: 13).

(100) Santalum freycinetianum; Sandalwood Tree (behind Tripler Hospital, TMK: 1-1-12: 15).

(101) Samanea saman, Monkeypod Tree (Lanikai, TMK: 4-3-06: 102).

(102) Ficus benghalensis; Indian Banyan (Kuhio Beach Park, TMK: 2-6-01: 4)."

SECTION 4. Section 13-36.8, Revised Ordinances of Honolulu 1978, is hereby amended to read:

[13-36.8. Violation and Penalty.

It shall be unlawful for any person, corporation, public agency or other entity to remove or otherwise destroy any tree in the City and County of Honolulu which has been designated "exceptional" without approval from the City Council. Any person who violates this section shall be fined not more than \$1,000.]

"13-36.8. Regulations

(a) Tree removal or destruction:

It shall be unlawful for any person, corporation, public agency or other entity to remove or otherwise destroy any tree in the City and County of Honolulu which has been designated "exceptional" without approval from the City Council.

81-32

(OCS/031281/VB)

-2-

C-26

(b) Tree maintenance:

1. It shall be unlawful for any person, corporation, public agency or other entity to alter the characteristic shape of any "exceptional" tree or remove any branch without first obtaining a permit issued by the Department of Parks and Recreation.
2. The Department of Parks and Recreation shall have the necessary powers to make Rules and Regulations, pursuant to Chapter 91 of the Hawaii Revised Statutes, to establish the criteria, standards, and conditions under which a permit may be issued.

SECTION 5. Section 13-36-9, Revised Ordinances of Honolulu 1978, is hereby amended to read:

[13-36.9. Injunctive Enforcement.

Any threatened violation of the provisions of this ordinance is hereby declared to be a public nuisance and may be abated through proceedings for injunctive relief or similar relief in Circuit Court or other court of competent jurisdiction.]

"13-36.9. Violation, Penalty and Injunctive Enforcement.

- (a) Any person who violates Section 13-36.8 shall be subject to a fine of not more than \$1,000.
- (b) In addition, any threatened violation of the provisions of this Article, or of any Rule or Regulation promulgated pursuant to Section 13-36-8(b), is declared to be a public nuisance such proceedings for injunctive or other civil relief as may be necessary to carry out the intent of this Article."

SECTION 6. Material to be repealed is bracketed. New material is underscored. When revising, compiling, or printing this ordinance for inclusion in the Revised Ordinances of the City and County of Honolulu, the Corporation Counsel need not include the underscoring, the brackets, or the bracketed material.

(OCS/031281/VB)

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SECTION 7. This Ordinance shall take effect upon its approval.

INTRODUCED BY:

Tom Nekota  
Mikiya Bouchart  
\_\_\_\_\_  
\_\_\_\_\_  
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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Councilmembers

DATE OF INTRODUCTION:

MARCH 18, 1981

Honolulu, Hawaii

APPROVED AS TO FORM & LEGALITY:

Maria C. Quinn-Tamm  
Deputy Corporation Counsel

APPROVED this 5<sup>th</sup> day of

May, 1981.

Eileen R. Anderson  
EILEEN R. ANDERSON, Mayor  
City and County of Honolulu

81-32

(OCS/031281/VB)

-4-

C-28

Appendix D

GORDON A. CHAPMAN

CONSULTING SERVICES

POTENTIAL ENVIRONMENTAL IMPACTS  
ON GROUNDWATER SUPPLIES  
RESULTING FROM THE APPLICATION OF FERTILIZERS AND BIOCIDES  
ON THE PROPOSED WAIANAЕ KAI GOLF COURSE

Prepared For:  
PBR HAWAII

Prepared By:  
Gordon A. Chapman  
Consulting Services

October 1988

819 16th Avenue, Honolulu, Hawaii 96816 (808) 732-7119

D-0

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POTENTIAL ENVIRONMENTAL IMPACTS  
ON GROUNDWATER SUPPLIES  
RESULTING FROM THE APPLICATION OF FERTILIZERS AND BIOCIDES  
ON THE PROPOSED WAIANAE KAI GOLF COURSE

1. INTRODUCTION

This report has been prepared to assess the potential impacts of the possible filtration of contaminants, e.g., pesticides, herbicides and fertilizers from surface water runoff and/or direct leaching into groundwater resources from the proposed Waianae Kai golf course. The principal concerns that this report addresses are the potential impacts on the quality of groundwater available to adjoining agricultural users and the potential impacts to nearshore coastal surface runoff receiving waters resulting from the application of fertilizers and biocides on the golf course.

The information, analyses and projected potential environmental impacts on groundwater supplies resulting from the application of fertilizers and biocides on the proposed Waianae Kai Golf Course, as described in this report, are based on the basic ecological, groundwater, soil/plant relationships and meteorological/climatological principles given herein. The information herein is derived from existing water well field data collected by various federal and state agencies and from on-site water well field data collected for this report and a companion Preliminary Hydro-Geologic Summary report (Bowles, 1988). The analyses described have been integrated and compared with the results and conclusions of other scientific studies as reported in the literature cited in the text of this report. It is noted that the proposed Waianae Kai Golf Course, as described below, is still in the conceptual planning stages and as such, the discussions and conclusions described in this report are based on the level of planning and

design that has been performed to date. Further, it is noted that for groundwater resources and/or nearshore coastal receiving waters to be significantly affected by the application of fertilizers and biocides on the golf course, those materials would have to be applied in sufficient quantities that would cause detectable quantities to enter the groundwater resources or nearshore coastal receiving waters and rainfall and/or golf course irrigation practices would have to be such that leaching and surface runoff were allowed to occur.

## 2. DESCRIPTION OF PROPOSED PROJECT

The proposed project is the development of a 27-hole golf course, encompassing approximately +244 acres of a +250 acre site located in the Waianae Valley, Waianae, Oahu (Figure 1). The project will include a club house, driving range, parking and a maintenance facility. The proposed layout consists of three nine-hole courses, each averaging par 36 and 3,458 yards (Figure 2). The course will be extensively landscaped with buffering from adjacent landowners provided. It is expected that the golf course fairways will be planted with common bermuda grass (Cynodon dactylon) and the tees and greens planted with Tifton, a hybrid Cynodon dactylon. Surrounding vegetation and golf course landscaping is expected to include common ornamental plants such as croton (Codiaeum sp.), hibiscus (Hibiscus sp.), kiawe trees (Prosopis pallida), coconut trees (Cocos nucifera) and other commonly used landscaping plants.

## 3. PROPERTY DESCRIPTION

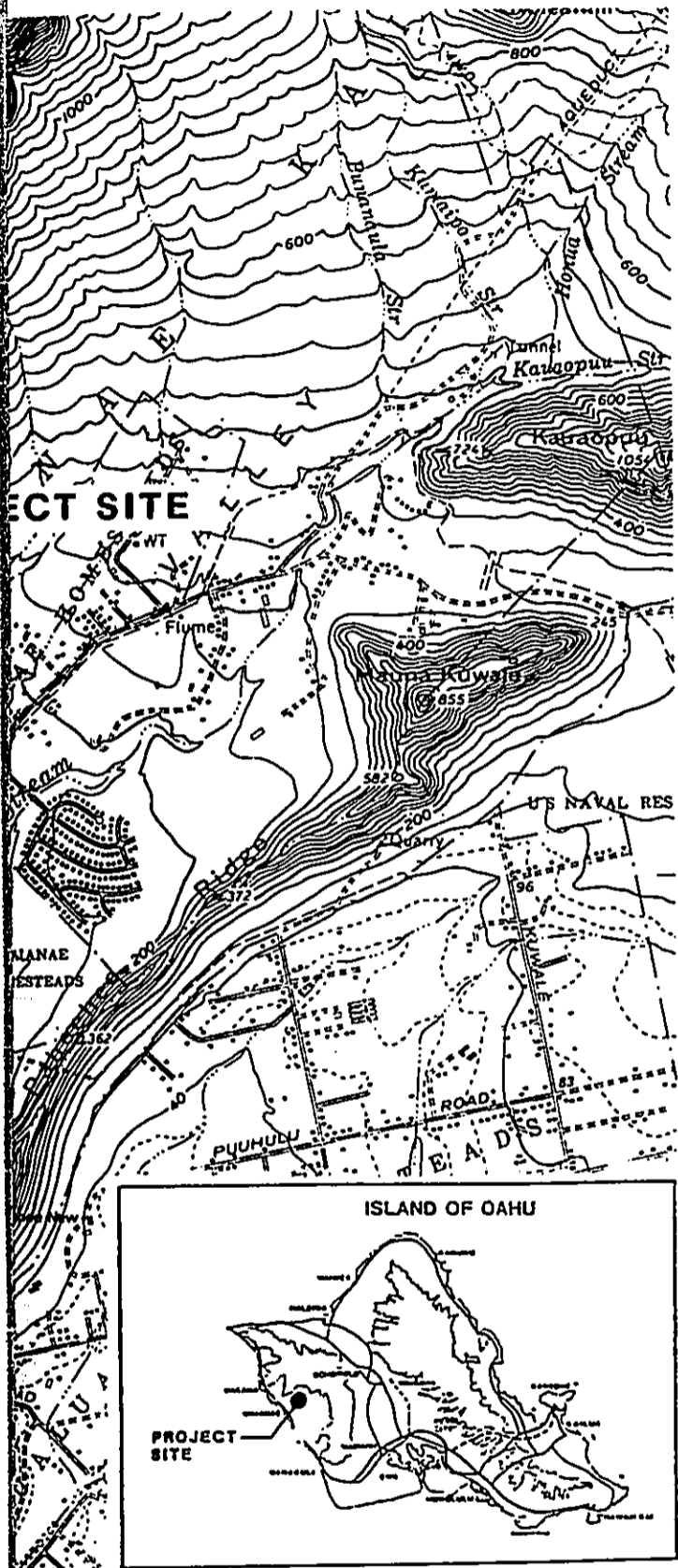
### 3.1 EXISTING CONDITIONS

The proposed project property consists of approximately +250 acres located about one mile northeast (mauka) of Waianae town in the Waianae Valley between Puu Paheehee and Puu Kamaileunu (Figure 1).



FIGURE 1  
**WAIANAE KAI GOLF COURSE**  
WAIANAE, OAHU

**LOCATION MAP**



SOURCE: U.S.G.S. QUAD, 1883

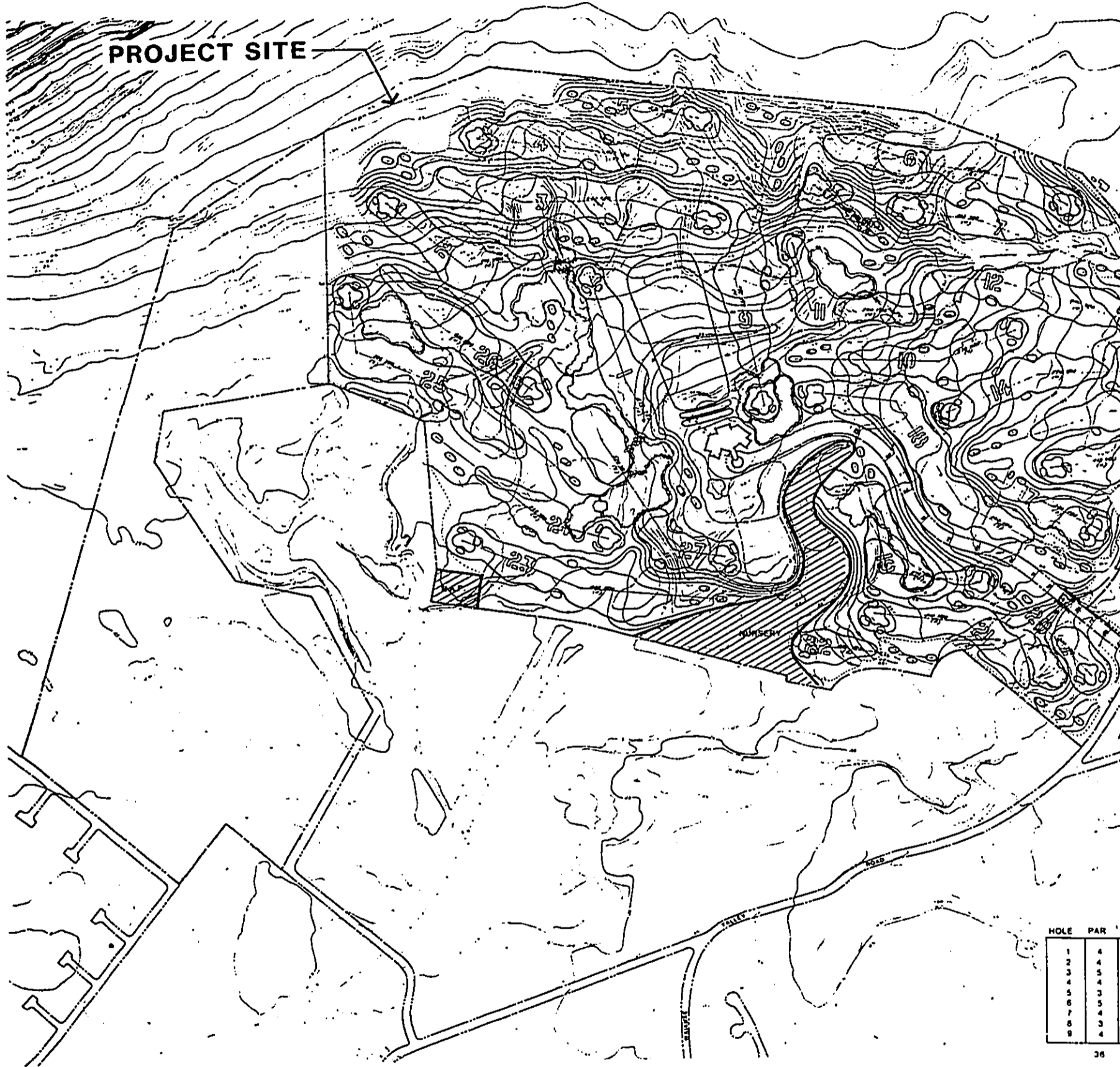


The property is presently vacant with the exception of about 25 to 30 acres that are used by the Mountain View Dairy for feed lots and milking operations. The property is bounded on the north by the Waianae Agricultural Park that is still under construction by the State Department of Agriculture, on the east and south by residences (Wahiona Acres), several small crop farms and residential lots and on the west by the City and County of Honolulu Waianae Land Fill facility. The land fill facility has been in operation since the early 1960's and is in the process of being phased out of operation. Former uses of the project property included sugar cane cultivation and cattle grazing operations. Both of these activities had ceased by the late 1950's. The Mountain View Dairy operation has been the only active agricultural operation on the entire project site since the 1950's, while the remainder of the project site lands have remained entirely vacant.

### 3.2 TOPOGRAPHY

The property slopes from the north boundary at 150 feet mean sea level (MSL) to approximately 10 feet MSL at the southern boundary. General slope analysis indicates that approximately 169 acres (67 percent of the site) are of slopes ranging between 0 and 10 percent, 40 acres (20 percent of the site) are of slopes ranging between 11 and 20 percent and the remaining 32 acres (13 percent of the site) are of slopes greater than 20 percent (Table 1).

The golf course layout has been designed to utilize lands predominantly of slopes up to 10 percent in efforts to maintain the existing topography. As shown on Figure 2, the golf course maintains the existing drainage pattern and topographic features creating a limited impact to the topography.



**PROJECT SITE**

HOLE	PAR
1	4
2	4
3	5
4	4
5	3
6	5
7	4
8	3
9	4

D-7

FIGURE 2

WAIANAE KAI GOLF COURSE

WAIANAE, OAHU

**PROPOSED MASTER PLAN**



HOLE	PAR	YARDS	HOLE	PAR	YARDS	HOLE	PAR	YARDS
1	4	420	10	4	370	19	4	370
2	4	390	11	4	350	20	3	200
3	5	540	12	4	440	21	4	410
4	4	425	13	3	190	22	3	210
5	3	215	14	4	390	23	4	440
6	5	545	15	5	520	24	4	335
7	4	386	16	4	415	25	5	525
8	3	150	17	3	200	26	4	400
9	4	450	18	5	560	27	5	530
36 3570			36 3435			36 3420		

 CUP EXCLUSION



**PBR**  
HAWAII

TABLE 1  
GENERAL SLOPE ANALYSIS

CATEGORY	TOTAL SITE	
	Acres	Percent of Site
Less than 5%	+ 95	39
6% to 10%	+ 68	28
11% to 15%	+ 26	11
16% to 20%	+ 23	9
Greater than 20%	+ 32	13
TOTALS:	+ 244	100%

Proposed grading for construction of the golf course, driving range, clubhouse, access road and parking lot will maintain the present storm drainage pattern. Erosion control measures including temporary desilting basins, berms, swales, grassing and watering will be employed during grading operations. These measures will be included in preparation of an erosion control plan which will be submitted for city review and approval.

### 3.3 SOILS

The soils of the project site have been examined primarily for their overall agricultural productivity and designated importance to the State of Hawaii. The Detailed Land Classification, Island of Oahu, by the Land Study Bureau, University of Hawaii, 1970-71, classifies land, according to its overall productivity, as approximately 85 percent Class E (63, 64, 100, 102, 103, 104, and 112), 13 percent Class C (13), and 2 percent Class B (13i) which is for nursery purposes only (Figure 3). The E soils labeled as "very poor suitability" are considered difficult to work because of excessive rocks. The C rated soils labeled as "fair to marginal suitability" are able to produce viable crops if carefully managed. The B rated soils labeled as "good suitability" can support crops. As such, these soils will be



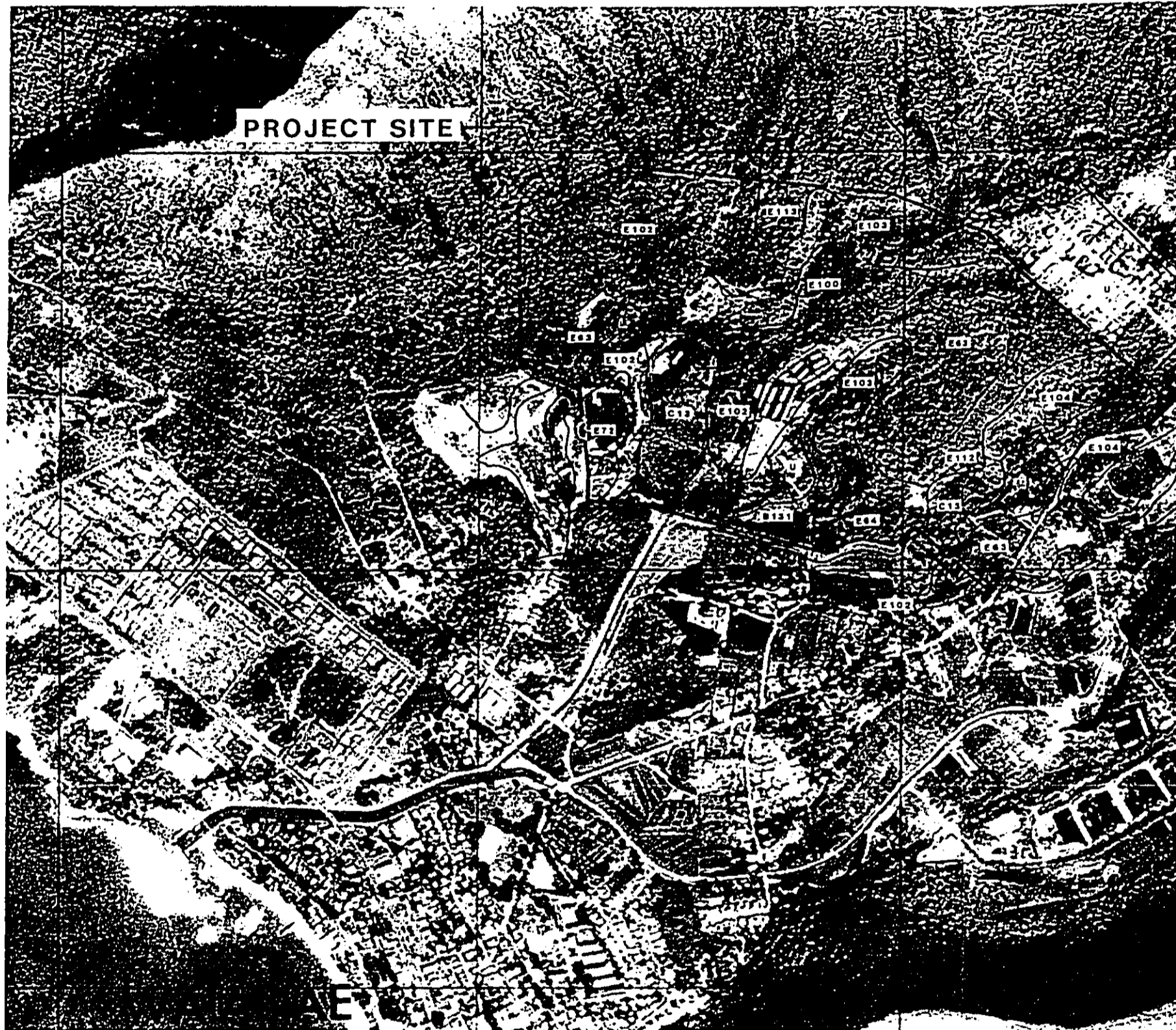


FIGURE 3

WAIANA KAI GOLF COURSE

WAIANA, OAHU

**DETAILED LAND  
CLASSIFICATION**



SOURCE: DETAILED LAND CLASSIFICATION, 1971-71



excluded from the project site for golf course usage, and will be employed as a nursery site.

The Soil Survey, Islands of Kauai, Maui, Molokai, and Lanai, State of Hawaii classifies the land into six categories, of which Lualualei extremely stony clay (LPE), comprises the major portion. The soils and respective characteristics are described below.

- LvB - Lualualei stony clay, 2 to 6 percent slopes, Unified Soil Classification - CH. Runoff is slow and erosion hazard is slight. Stones within the soil hinder machine cultivation. Capability classification IIIe if irrigated, VIi if non-irrigated.
- LPE - Lualualei extremely stony clay, 3 to 35 percent slopes, Unified Soil Classification - CH. Medium to rapid runoff, moderate to severe erosion hazard. It is impractical to cultivate this soil unless the stones are removed. Capability classification VIIi, non-irrigated.
- LuA - Lualualei clay, 0 to 2 percent slopes, Unified Soil Classification - CH. Permeability slow, runoff slow and erosion potential slight. Capability classification IIIi if irrigated, VIi if non-irrigated.
- HnA - Hanalei silty clay, 0 to 2 percent slopes. Permeability is moderate, runoff is very slow, and the erosion hazard is no more than slight. Capability classification IIw irrigated or non-irrigated.
- CR - Coral outcrop derived from coral reefs composed of cemented calcareous sand and coral. Vegetation is sparse, suitable for urban development and quarrying. Capability classification VIIIi non-irrigated.
- rSY - Stony steep land, slopes ranging from 40 to 70 percent. Consists of massed boulders and stones. Capability classification VIIi non-irrigated.

As indicated in the above descriptions, in general the soils of the project site are relatively poorly suited for agricultural purposes, moderately to slowly permeable with runoff rapid to very slow depending on the slope and vegetative cover on which a particular soil type is found. It is likely that because of the generally poor quality of the existing soils that better quality top soil will be brought in for the proposed golf course.

#### 3.4 DRAINAGE

Above the project site, approximately 1,265 acres contribute storm runoff to three major existing natural waterways which traverse the project site. The majority of these mauka drainage areas are mountainous, undeveloped land with exception of the adjacent Wahiona Acres Subdivision and Waianae Agricultural Park. The storm runoff crosses Piliuka Place in underground drain culverts (Figure 4).

There is one intermittent drainage channel indicated as Kawiwi Stream (Figure 4), which bisects the site terminating in the concrete Kawiwi Channel established by the Soil Conservation Service. This channel is predominantly dry except during heavy precipitation or when the dairy farm generates runoff from cattle operations. (Note: present dairy operations are scheduled to be relocated to a new site, thereby eliminating present runoff into Kawiwi Channel). The Kawiwi Channel drains into the Kaupuni Channel which discharges into the ocean immediately southeast of the Pokai Bay military reservation. Additional water retained in the southern most portion of the Kawiwi Channel results from an 1,800 foot linear dike (berm) along the project's southern boundary which dams and directs the runoff west towards the concrete channel. The subject property is above the historic tsunami inundation and high wave level. Flood Insurance Rate Map (FIRM) community panel index number 150001 0001-0135 dated September 4, 1987 designates the entire property as Zone D, "Areas



# CORRECTION

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

WILSON

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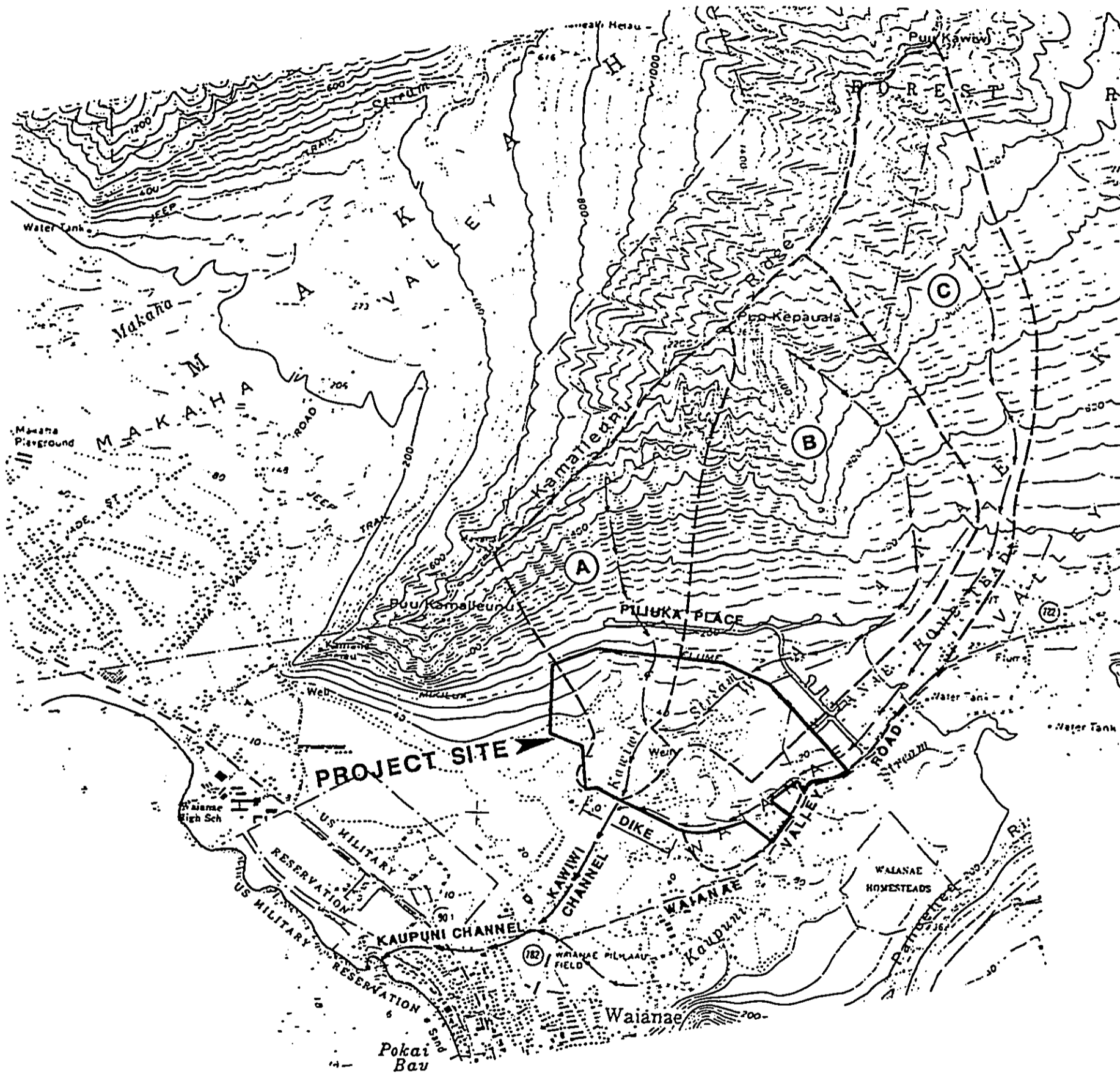
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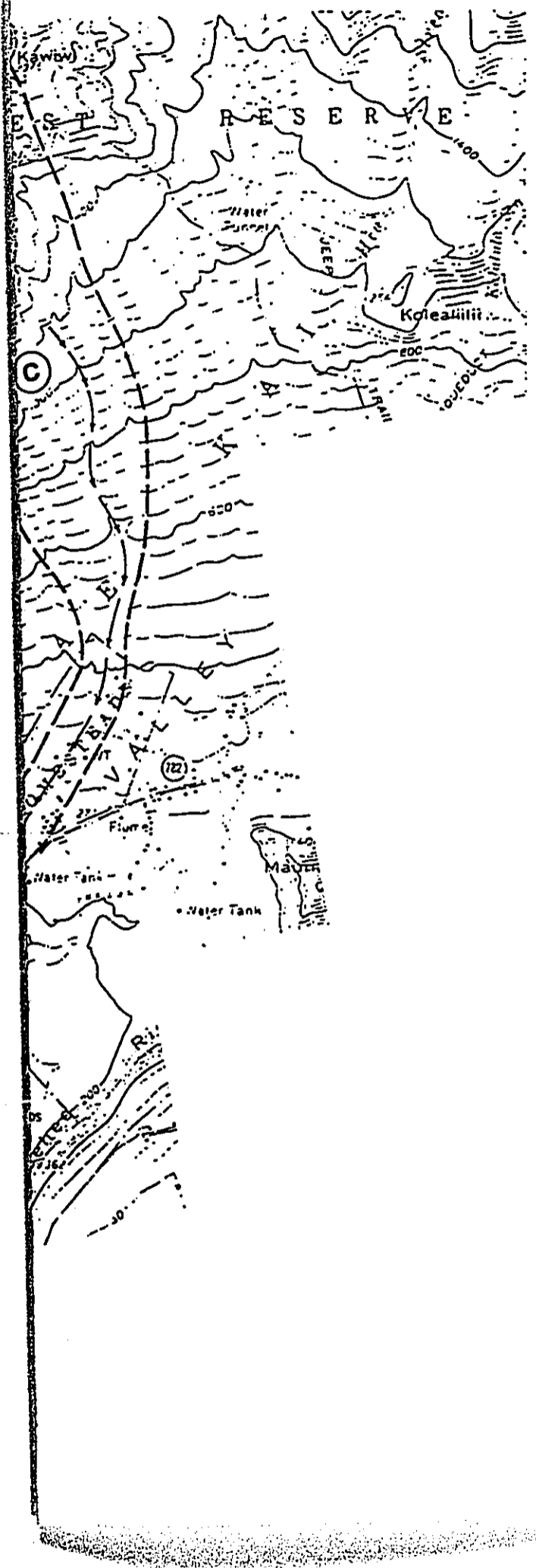
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**FIGURE 4**  
**WAIANAE KAI GOLF COURSE**  
 WAIANAE, OAHU

**SLOPES/SURFACE  
 DRAINAGE PLAN**

**TABULATION OF STORM RUNOFF  
 THRU PROJECT SITE**

<u>TRIBUTARY</u>	<u>AREA (Ac)</u>	<u>Q (cfs)</u>
(A)	340	
(B)	630	
(C)	545	
<b>TOTALS</b>	<b>1515</b>	<b>3800</b>

(Runoff based on C & C PLATE 6  
 modified for Leeward & Ewa)

SOURCE: COMMUNITY PLANNING INC.



of undetermined, but possible flood hazards". The drainage structure has been designed and sized in accordance with this designation.

The proposed golf course design will include a drainage system for the fairways and greens. This system will include swales and berms that will direct rainwater runoff, should it occur, into the ponds that will be included as part of the golf course irrigation system, retention basins within the golf course fairways and into the existing drainage channels, such as Kawiwi Channel. The drainage system for the greens will primarily direct irrigation and runoff water to the golf course ponds thereby enabling that water to be recycled as irrigation water. Should rainwater runoff occur, it is likely that a relatively small portion of that runoff would eventually enter the coastal waters off Waianae.

### 3.5 BIOLOGICAL CHARACTERISTICS

The biological characteristics of the project site are fairly typical of the semi-arid mauka Waianae Coast, especially areas that have been extensively cultivated in the past and/or used for other agricultural purposes such as cattle grazing. The existing vegetation of the project site consists primarily of kiawe (Prosopis pallida) in various stages of maturity, with mature forest covering most of the site. Such trees are 35 and 40 feet high in the gullies, and 25 to 30 feet high on the more exposed high areas. Beneath the canopies there is an understory of koa-haole (Leucaena leucocephala) approximately 10 to 12 feet tall. Both kiawe and koa haole are nitrogen-fixing plants, and, as such, return nitrogen to the soils of the project site. This characteristic could affect the present groundwater resources by increasing the nitrogen content of those resources. In most places the ground is covered with an almost uninterrupted growth of green panic grass (Panicum maximum var. trichoglume), with occasional small patches of buffel grass (Cenchrus ciliaris) or

hurricane grass (Bothriochloa pertusa). The younger forests are correlated to areas of most recent disturbance due to fires and clearing for dairy use. None of the species found on the site are officially listed as endangered or threatened; nor are any species proposed or candidate for such status.

The fauna of the project site is also typical of the semi-arid Waianae Coast mauka kiawe/koa haole scrub vegetation regions and consists primarily of introduced birds and mammals. Typical birds found within the project boundaries include Northern Cardinal (Cardinalis cardinalis), Barred Dove (Geopelia striata), Spotted Dove (Streptopelia chinensis), common myna (Acridotheres tristis) and possibly Francolins (Francolinus sp.). Mice, rats and the Small Indian Mongoose (Herpestes auropunctatus) also inhabit the project area and it is possible that feral pigs frequent the site in search of food. There are no known threatened or endangered species of wildlife inhabiting or frequenting the site.

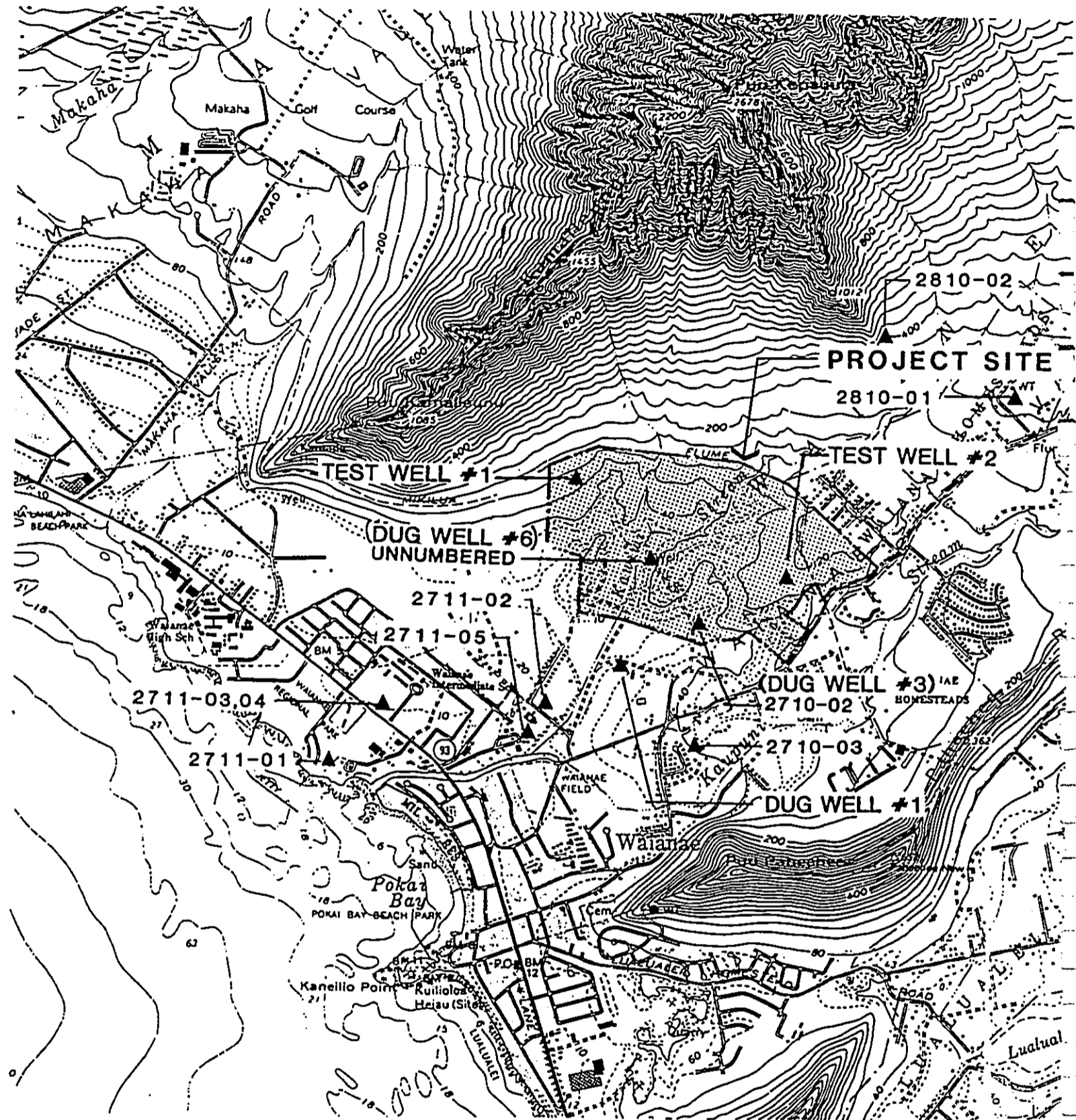
### 3.6 EXISTING GROUNDWATER QUALITY CONDITIONS

The groundwater of Oahu exists in three major aquifers of great extent: the volcanic bedrock; calcareous sedimentary deposits; and noncalcareous sedimentary material. The groundwater of the project site, and the majority of the Waianae Valley, is contained in noncalcareous sedimentary materials. This material consists mostly of talus and alluvium derived from the volcanic bedrock or the reworking of older talus and alluvium. Only a small number of wells on Oahu tap the alluvial unit for water (USGS/DOWALD, 1973). Most of the wells exist only because of failure to develop a suitable supply in deeper, more permeable lava flows or, in some coastal areas, in coral limestone. The relatively low permeability of the noncalcareous sedimentary materials helps to retard sea-water intrusion. Therefore, this aquifer generally contains fresher groundwater than that found in the more permeable lava flows or coralline limestone along coastal areas. Also, even

though individual well yields are generally low, the aquifer does supply sufficient quantities for small truck farms in the Waianae area. Groundwater for golf course irrigation purposes will be drawn from this aquifer. As noted in the Preliminary Hydro-Geologic Summary report (Bowles, 1988), groundwater extraction for the proposed golf course will be such that the quality and quantity of groundwater resources of adjacent and downgradient agricultural users is not substantially limited or impaired to the extent that would preclude use of the surrounding properties.

Existing groundwater quality conditions can be described based on tests that have been performed on surrounding and on-site wells. The groundwater resources of the project site are derived from waters that enter the alluvial sediments from areas of higher head above the project site. Additionally, the groundwaters above the site are being used by a City and County of Honolulu Board of Water Supply (BWS) well that will supply water to the new Agricultural Park. As such, the quantity and quality of the project site groundwater may be affected to some extent by higher level wells. There are several water wells in the vicinity of the project site and two wells on-site (Figure 5). Of the latter, only one is currently in use (State Well No. 2710-02). Similarly, many of the wells in the vicinity of the project site are either not in use or used sparingly for irrigation purposes. Available water well information is given in Table 2. Nutrient data for the two on-site wells is given below in Section 4.3.

Based on the water well data that have been taken in and around the project site it is evident that the quality of the groundwater, i.e., chloride content and most likely inorganic and organic nutrient content, hardness, etc., varies from site to site. It is also likely that the quantity varies from site to site and varies seasonally, depending on the amount of rainfall received upgradient from the project site and the pumping rates of upgradient wells.



SOURCE: DEPARTMENT OF LAND & NATURAL RESOURCES  
DIVISION OF WATER AND LAND MANAGEMENT DEVELOPMENT, 1988

**FIGURE 5**  
**EXISTING AND**  
**SURROUNDING WELLS**  
**WAIANAE KAI GOLF COURSE**  
**WAIANAE, OAHU**



TABLE 2  
WATER WELL CHARACTERISTICS

State Well No.	Year Drilled	Pump Capacity (MGD)	Avg. Pumpage In MGD	Chloride Content Initial Tests (mg/l)*	Primary Use
2710-02 (Dug Well #3)	1930's 1958	1.14 Unknown	0.250 Unknown	350 116 (1974)	Domestic, Dairy (on-site) Irrigation
2710-03	Unknown	0.43	Unknown	Unknown	Irrigation
2711-01	1939	Unknown	Unknown	Unknown	Unused
2711-02	1950	Unknown	Unknown	889 (1974)	Unused
2711-03	1960	Unknown	Unknown	5,200 (1974)	Observation
2711-04	1960	Unknown	Unknown	5,200 (1974)	Observation
2711-05	1985	Unknown	Unknown	Unknown	Unused (1987)
2810-01	1945	Unknown	Unknown	36	Domestic
2810-02	1980	Unknown	Unknown	36	Unused (1983)
Unnumbered	Unknown	Unknown	Unknown	Unknown	Unused (on-site)
Dug Well #1	1930's	0.63	0.40	460	Limited use for off-site cattle drinking water
Test Well #1	1988	0.05	0.14 (Est)	85 (Est)	Observation & Testing
Test Well #2	1988	Unknown	Unknown	50 (Est)	Testing
Dug Well #4	Unknown	0.46	0.100	470	Abandoned & backfilled
Dug Well #6	1930's	0.33	0.080	1,000	Unused since 1940's

\* Note: mg/l = parts per million (ppm).

Source: State of Hawaii, Department of Land and Natural Resources, Division of Water and Land Development, Ground Water Index and Summary Through August 1987 and Bowles, S. P. 1988. Preliminary Hydro-Geologic Summary of Proposed Irrigation Water System for Waianae Kai Golf Course.

Existing water systems serving the project site include two municipal 12-inch water mains located in Waianae Valley Road which provide water for domestic and agricultural use, as well as fire protection. Additionally, one of the two private wells located on the project site (State No. 2710-02 and unnumbered) is presently used for the dairy water requirements. The unnumbered well is not used at present. The present Board of Water Supply "242" system is adequate to serve the golf course clubhouse's estimated potable average water demand of 24,000 gallons per day (gpd). That demand is based on the average daily use of 400 persons at a rate of 60 gpd. For potable water, the developer proposes to request municipal service from the Board of Water Supply and pay the appropriate facility charge for source, storage and transmission.

The developer proposes to use the two existing on-site wells and develop additional private on-site wells for golf course irrigation purposes. The water would be stored and pumped into the irrigation pipe system from lined ponds located in the golf course. Based on 4,000 gallons per acre, the estimated average irrigation water demand is 1,000,000 gallons per day for the +244 acres. This would equal about the same quantity of water that was pumped from the area in the 1930's when the project area was under sugar cultivation. The source development program is planned to maintain the combined waters for all irrigation, including existing users, at a salinity (chlorides) of between 400 and 500 mg/l (ppm), i.e., adequate for irrigation purposes (Bowles, 1988). The location of the project is such that it can be affected by inland, i.e., upgradient, water developments such as those for the new Agriculture Park. However, as noted above, pumpage for the proposed golf course will not adversely affect downgradient users. Although the water system will remain private, appropriate permits will be secured from the Board of Water Supply and/or State Water Commission for construction and use of the wells.



### 3.7 EXISTING METEOROLOGICAL AND CLIMATOLOGICAL CHARACTERISTICS

As will be noted below (see Section 4.2), the meteorological and climatological characteristics of an area significantly affect the scheduling and quantity of golf course watering. As such, the following information is provided to form a basis for the irrigation schedule and watering amount.

In general, the Waianae Coast area is characterized by low rainfall, relatively high temperatures and typical northeast trade winds. Rainfall data (Table 3) indicate that average precipitation varies from a low of about 0.4 inch in June and July to a high of about 4.0 inches in January. The annual average is about 19.7 inches.

TABLE 3  
AVERAGE MONTHLY PRECIPITATION  
WAIANAЕ AREA

Inches per Month												
Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
3.94	2.36	2.56	1.57	0.79	0.39	0.39	0.79	0.79	1.77	1.97	3.35	19.69

Source: Department of Land and Natural Resources, Division of Water and Land Development, Rainfall Atlas of Hawaii, Report R76, June 1986. Rain Station No. 801 (discontinued). Data shown above based on 60-year period.

The average minimum temperature in the Waianae area varies from a low of 62.4 degrees F in January to 71.0 degrees F in August with an annual average low of 66.7 degrees F. The average maximum temperature varies from 81.1 degrees F in January to 89.5 degrees F in August with an annual average high of 85.4 degrees F. The monthly average varies from 71.75 to 80.25 degrees F (Table 4).

**TABLE 4**  
**AVERAGE MINIMUM/MAXIMUM TEMPERATURES**  
**WAIANAË AREA**

	<u>Jan</u>	<u>Aug</u>	<u>Annual</u>
Average Minimum Temp. (°F)	62.4	71.0	66.7
Average Maximum Temp. (°F)	81.1	89.5	85.4
Monthly Average (°F)	71.75	80.25	

Source: Department of Land and Natural Resources, Division of Water and Land Development, Island of Oahu Temperature Readings Through 1978, Unpublished Departmental data.

Wind data collected at Maili Beach, the closest wind data station, indicate that, excluding calms, wind speeds in the 4 to 7 miles per hour (MPH) range occur approximately 36.5 percent of the time with speeds in the 8 to 12 MPH range occurring about 30 percent of the time and winds in the 1 to 3 MPH range occurring about 24 percent of the time. Wind direction is predominantly easterly (51.6 percent) with northeasterly and westerly winds occurring 14.6 percent and 16.9 percent of the time respectively (Table 5).

**TABLE 5**  
**MAILI BEACH WIND OBSERVATIONS**  
**PERCENT FREQUENCIES**

Wind Direction	Wind Speed (Miles per Hour)						Total
	1-3	4-7	8-12	13-18	19-24	25-31	
N	0.5	-	-	-	-	-	0.5
NE	4.2	5.2	3.0	2.0	0.2	-	14.6
E	10.1	17.8	18.0	4.7	0.5	0.5	51.6
SE	0.5	0.7	0.5	0.2	-	-	1.9
S	-	0.5	0.2	-	-	-	0.7
SW	3.2	3.7	2.5	-	-	-	9.4
W	4.4	6.9	4.9	0.7	-	-	16.9
NW	1.2	1.7	1.0	0.2	-	-	4.1
Total	24.1	36.5	30.1	7.8	0.7	0.5	

Source: Department of Land and Natural Resources, Division of Water and Land Development, Unpublished wind data. Data does not include calms and is based on 405 observations from 5:00 am to 9:00 pm in June and July 1970.

Pan evaporation rates, which are affected by wind speeds, for the Waianae area (Table 6) vary from about 4.1 inches in December and January to 8.2 inches in July. The annual average pan evaporation rate is about 74 inches. The estimated average daily evapo-transpiration rate is about 0.203 inch.

**TABLE 6**  
**PAN EVAPORATION RATES**  
**IN INCHES**  
**WAIANAE STATION RECORDS 1940 TO 1947**

Evap. Rate	Month											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
	4.1	4.3	6.0	6.6	7.3	7.7	8.2	8.0	7.0	5.9	4.6	4.1
	Total Annual Average 74.2 inches.											

Source: Department of Land and Natural Resources, Division of Water and Land Development, Pan Evaporation, State of Hawaii 1894 to 1983, Report No. R-74.

#### 4. PROPOSED GOLF COURSE MAINTENANCE PROGRAM

##### 4.1 AREAS TO BE INTENSIVELY MAINTAINED

As indicated previously, the proposed Waianae Kai Golf Course will encompass approximately ±244 acres. The fairways and driving range will cover about 87 acres, the greens and tees about 6.2 acres and the roughs about 130 acres. The remaining acreage will be devoted to ponds, parking and roadways, the clubhouse and a nursery. For the purposes of this report, the acreages of the fairways, roughs, tees and greens are the most important because, with the exception of the roughs, those will be the areas that are fertilized and will receive the greatest amount of the biocides (herbicides and insecticides) that will be applied to the golf course. Also as noted previously, the proposed golf course is

still in the conceptual planning stages, and as such, the maintenance, i.e., fertilization, weed and insect control procedures noted below are based on typical Hawaiian golf course maintenance procedures. As the Waianae Golf Course is developed specific maintenance and irrigation procedures will be developed and implemented. However, it is unlikely that those procedures would differ significantly from those described below.

#### 4.2 IRRIGATION WATER QUANTITY AND SCHEDULE

As noted previously, it is estimated that about 4,000 gallons of water per day per acre or about one million gallons per day will be applied to the golf course. This amount will vary seasonally but is expected to average one million gallons per day. The tees and greens will most likely be watered a greater amount than the fairways, and the roughs will probably be excluded from the irrigation system. The water will be drawn from existing and new water wells on-site. Additionally, it is likely that the majority of watering will be done in the early morning and late afternoon/early evening hours. This is because wind speeds, temperatures and pan evaporation rates are lowest during these times, thereby maximizing the effectiveness of the watering system.

The irrigation water quantity and schedule are based on the soils characteristics, meteorological/climatological characteristics and types of plants (grasses) to be planted on the golf course.

The soils of the project area, and those that will most likely be brought in because of the poor quality of the existing soils, are composed of sand, silt and clay particles which combine with decayed organic material. When water first moves into soil, its molecules form a film around the soil particles by electrical attraction, called adhesion. As more water is applied, cohesion, which is the water molecules' attraction to each other, allow the

film to enlarge and fill the pore spaces between the soil particles. Further additions of water allows gravity to drain it to deeper layers. Depending upon soil texture, drainage is rapid at first, but decreases over time until there is a balance between gravity and cohesion. At this point the soil is holding all the water possible and is said to be at field capacity.

Water moves by capillary action to the soil surface and evaporates primarily by solar evaporation. Additionally, water absorbed by the roots of a plant is passed upwards through its tissue and evaporates from the stomata of the leaves. This transpiration process helps cool the plant and moves nutrients within it. These related processes are called evapotranspiration, which is the key factor in determining the rate and quantity of water that is used. As plants transpire and evaporation draws water from the soil, the film of water becomes thinner and its adhesion to the soil particles is stronger than the root's ability to extract it, slowing the evapotranspiration rate and causing water stress that is visible in the plant, i.e., wilting. Therefore, for continued healthy growth an efficient irrigation schedule is developed that prevents wilting and ensures that the amount of water applied is equal to that which is lost through solar evaporation and evapotranspiration. Watering less than this results in wilting and unhealthy plants and watering more results in a waste of water in that the plants are not be able to assimilate all that is applied and drainage would be beyond the root depth of the plants or grasses. Similarly, overwatering could cause runoff to occur, thereby increasing water waste and costs. As is the case with other golf courses and public parks, the watering schedule would be adjusted during rainy weather periods to ensure that the golf course is not overwatered.

### 4.3 IRRIGATION WATER QUALITY

Based on field water well tests conducted for this report as well as that which has been collected since the 1930's, the existing quality of the water in the two on-site wells is as shown in Table 7.

TABLE 7  
EXISTING ON-SITE WATER WELL QUALITY

Parameter	Unit of Measurement	Well	
		Milking Facility*	Unused Well**
Ammonia	mg N/l	0.009	0.018
Nitrate/ Nitrite	mg N/l	0.66	4.54
Total Nitrogen <sup>1</sup>	mg N/l	0.67	4.55
Ortho-Phosphate	mg P/l	0.045	0.130
Total Phosphate	mg P/l	0.046	0.191
Chloride	mg/l (ppm)	—	250.0

\* State Well No. 2710-02

\*\* Unnumbered Well

<sup>1</sup> Note: The sum of the inorganic nitrogen parameters equals or barely exceeds the value for the Total Nitrogen.

It is apparent from the water quality measurements of the "Unused Well" shown in Table 7, that the water in the well is relatively stagnant as evidenced by the high nutrient readings and relatively high chloride reading. Nitrate-nitrogen is typically high in Hawaiian groundwaters, principally as a result of nitrogen-fixing trees and shrubs, such as Kiawe and Koa haole (Kay, et al., 1977).

It is noted that the chloride levels of the two on-site wells are generally below the older dug wells in the vicinity of the project site (see Table 2), but for the unused well, higher than the test wells that have recently been drilled on-site. This too may reflect the stagnant nature of the well. For comparison purposes, the water quality of Parker Ranch wells on the Island of Hawaii, which are considered to produce good quality potable water, indicate total nitrogen readings of 116.2 mg N/l to 0.879 mg N/l and total phosphate readings of 0.080 mg P/l to 0.104 mg P/l (Kay, et al., 1977). Also, for comparison purposes, the state standards for drinking water and Class AA - Open Coastal Waters are given in Table 8.

**TABLE 8**  
**STATE DRINKING WATER AND CLASS AA**  
**OPEN COASTAL WATERS STANDARDS**

DRINKING WATER STANDARDS

Ammonia	No Standard
Nitrate/Nitrite	No Standard
Total Nitrogen	10.0 mg N/l
Orthophosphate	No Standard
Total Phosphorus	No Standard
Chlorides	250 mg/l (ppm) (Secondary Standard)

CLASS AA OPEN COASTAL WATERS

Ammonium	0.0035 mg n/l
Nitrate/Nitrite	0.005 mg n/l
Total Nitrogen	0.150 mg n/l
Orthophosphate	0.007 mg p/l
Total Phosphorus	0.020 mg p/l
Chlorides	No Standard

Source: Hawaii Administrative Rules, Title 11, Department of Health, Chapters 20 and 54, Drinking Water Standards and Water Quality Standards.

#### 4.4 FERTILIZERS AND BIOCIDES TO BE APPLIED TO GOLF COURSE

It is presumed that the fertilizers, insecticides and herbicides listed in Table 9 will be applied at the frequencies and rates listed. Just as an irrigation schedule will be established for the golf course, a fertilization, insect and weed control schedule will also be established specifically for the proposed Waianae Kai golf course. The rates and frequencies listed in Table 9 are generally per manufacturer's recommendations. It is unlikely that the rates or frequencies would be greater for the Waianae Kai Golf Course because the manufacturer's recommendations are generally greater than or equal to that actually required for maximum effectiveness. The use of greater quantities would be uneconomical in that the plants would not be able to absorb or use the nutrients and they would remain in the soil until degraded or leached into the groundwater. Similarly use of greater quantities of the pesticides, fungicides or herbicides would be wasteful and could cause these materials to leach into groundwater supplies or enter rainwater runoff streams.

#### 5. POTENTIAL EFFECTS OF FERTILIZER AND BIOCIDES APPLICATIONS ON GROUNDWATER SUPPLIES

The potential environmental effects of the application of fertilizers and biocides on the groundwaters of the project area are in part dependent upon the groundwater uses downgradient from the project site, the application rates and quantities, the soil/plant relationships and the ability of the plants to take up and utilize the applied chemicals.



TABLE 9  
 WAIANA KAI GOLF COURSE  
 FERTILIZERS AND BIOCIDES

<u>Location</u>	<u>Total Area</u>	<u>Material</u>	<u>Application Frequency</u>	<u>Appl. Rate</u>	<u>Total N/Year</u>
<u>Fertilizers</u>					
Fairways, Roughs, Driving Range, Fringes & tees	218 AC	DC 168 (18-5-5)	4 times/year	250#/Acre	19.6 Tons
Greens	6 Ac	Ferromec (15-0-0, 6Fe, 4S)	6 times/year	300 gal/Apl.	0.8 Tons
General Landscape Areas	10 Ac	14-4-4	7.5 times/year	250#/Acre	1.3 Tons
				TOTAL	21.7 Tons
					<u>Total Qty./Year</u>
<u>Insecticides</u>					
All Areas	233 Ac	Diazinon AG 500	12 times/year	.33 gal/Apl.	3.96 Gal.
<u>Fungicides</u>					
All Areas	233 Ac	Tersan	26 times/year	1.7#/Apl.	44.2#
<u>Herbicides</u>					
All Areas	233 Ac	Roundup	As Needed	---	Apprx. 120 Gal.
Fairways, Roughs, Fringes & tees	218 Ac	Weed Hoe	Every 12 Days	160 oz/200 gal/4 Ac	Apprx. 1,480 Gal.
Greens	6 Ac	Weed Hoe	Every 10 Days	48 oz/100 gal	

## 5.1 SURROUNDING LAND AND GROUNDWATER USES

The principal land use immediately downgradient from the project site is agricultural with several small crop farms raising a variety of products such as green onions and other vegetables. Below the small farms are residential lots and the town of Waianae. Present groundwater use is limited to one well on-site (State Well No. 2710-02) that provides water for dairy use, one well downgradient from the project site (Dug Well No. 1) that provides water for agricultural purposes and one well (State Well No. 2810-01) upgradient from the project site that is used for domestic potable water. Another well upgradient (State Well No. 2810-02) will supply water to the new Agricultural Park when it opens. Potable water for the majority of the area is drawn from BWS wells downgradient from the project site or wells located in Makaha Valley to the west of Waianae Valley. As noted previously, the golf course water source development program has been planned to maintain the combined waters for all irrigation, including existing users. That is, the groundwater to be extracted for golf course purposes will not adversely affect the quantities of water that are presently being withdrawn by other uses of the groundwater resource.

## 5.2 APPLICATION RATES AND QUANTITIES

As noted previously and as shown in Table 9, the rates and quantities of the chemical fertilizers and biocides that will be applied to the proposed golf course would be per manufacturer's recommendations. It is noted that all of the fertilizers to be used are commonly used on other golf courses, in public parks and private residences. The fertilizers would be applied during periods of low rainfall and adequately watered into the golf course to maximize plant uptake, to prevent surface burning of the grasses and to prevent possible contamination of surface water runoff should an unexpected rainfall occur.

Similarly, the biocides to be used on the golf course are also commonly used by public and private agencies and groups and are in Toxicity Categories III and IV as established under the provisions of the Hawaii Economic Poisons Law, Chapter 149, Hawaii Revised Statutes and the Administrative Rules established pursuant to Chapter 149A (Title 4, Chapter 66, Pesticides). These ratings indicate unrestricted use of the pesticides (see Section 5.4 below). In general, the fungicides and herbicides that are used are selectively applied to specific areas of the golf course rather than applied to all areas equally. As with the fertilizers, the quantities of biocides that would be used are minimal compared to the quantity of irrigation water that would be applied to the golf course.

Also as noted previously, the drainage system and pattern for the golf course will be such that rainwater runoff, should it occur, will be directed into the ponds or retention basins that will be established in the golf course or into the Kawiwi Channel and eventually into the coastal waters off Waianae town. Based on the climatological and meteorological information given above, it does not appear likely that significant quantities of rainwater runoff would occur except possibly during periods of abnormal rainfall.

As indicated in Table 7, the nutrient concentrations of existing on-site wells are relatively low and are generally lower than nearshore coastal waters. Therefore, should any of the applied fertilizers enter the groundwater stream and/or enter surface water runoff streams and eventually find their way to the nearshore coastal waters, they would most likely be in such small quantities to be undetectable due to dilution and chemical breakdown, resulting in no measurable effects on the nearshore coastal waters. Nutrients that might enter coastal receiving waters in quantities that might be detectable would serve as food, i.e., nutrients, for the algae upon which the nearshore fish and invertebrates feed.

Analyses of the fate of fertilizers and pesticides used at the Westin Mauna Kea and Punalu'u Resort golf courses on the island of Hawaii indicate that in the event that surface water runoff of fertilizers did occur, they would likely be sufficiently diluted by the runoff to be insignificant (Murdoch and Green, 1987 and PBR HAWAII, 1988). That is, the chemicals are applied in relatively small amounts and would be diluted by rainwater runoff from the golf course and neighboring lands to the point that they would not cause adverse effects to the receiving waters but could cause positive effects if biostimulation of the algae occurred. Any excess nutrients that might enter the groundwater stream and/or nearshore coastal waters would be further diluted and, due to the actions of basic ecological principals relating to limiting factors and laws of tolerance (see Appendix A), would simply add to the nutrient levels of offshore waters.

### 5.3 SOIL/PLANT RELATIONSHIPS

As noted in Section 3.3, the soils of the project site are generally poorly suited for agricultural purposes because of their clayey and/or rocky nature. Runoff from the existing soils varies from slow to moderate and permeability is slow to moderate. As such, it is probable that top soils will be brought in for the golf course, thereby creating a layer of soil that could act as a permeability barrier, further inhibiting the possibility of leaching of irrigation water and/or rainwater into the groundwater supplies. It is also expected, because it would be better quality soil, that any top soils that would be brought in would promote the uptake of irrigation water and nutrients (fertilizers) by the golf course grasses. In general, the fertilizers and biocides applied to any golf course are fairly rapidly taken up by the grasses and shrubbery and/or biodegrade rather rapidly due to the soil/plant relationships and bacterial action in the soil. That is, the fertilizers are applied in quantities and at rates at which the plants, both roots and aerial portions (leaves, blades,

etc.) can utilize those fertilizers most efficiently. As such, there is an insignificant residual quantity of the fertilizers retained in the soil that might leach into the groundwaters as a result of prolonged or intense rainfall. As indicated in Section 3.7, annual average rainfall for the golf course area is about 20 inches per year, far less than the total annual average pan evaporation rate of 74.2 inches per year. Studies at Punalu'u Resort golf course on the Island of Hawaii have indicated that irrigation water, when properly applied, does not penetrate below the root zone of the golf course grasses and as such, does not enter the groundwater stream (PBR HAWAII, 1988). Although the depth of the root zone of the grasses varies, generally it extends about 6 to 12 inches deep, depending on the soil type, drainage and permeability characteristics of the soil.

#### 5.4 BIOCIDES APPLICATIONS AND POTENTIAL IMPACTS

In 1947, the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) was enacted primarily to protect consumers from ineffective products. In 1972, FIFRA was greatly amended by the Federal Environmental Pesticides Control Act which because of growing concerns about the risks of chemical pollutants shifted the act's emphasis to health and environmental safety issues. The act is administered by the Environmental Protection Agency as are the pesticide provisions of the Federal Food, Drug and Cosmetic Act.

The FIFRA contains several provisions of relevance to this report. First, the act requires extensive testing of all new pesticide products prior to registration, and retroactive testing or recertification of older pesticides lacking adequate data upon which to base risk assessments. Second, the act differentiated between two major categories of pesticides, general use and restricted use. Third, the act required certification of

pesticide sales personnel and applicators of restricted pesticides.

In Hawaii, the Hawaii Economic Poisons Law, Chapter 149, Hawaii Revised Statutes (HRS), was enacted in 1970. This law attempted to regulate pesticides before they were sold by assuring that labels on pesticide containers included proper use instructions, and that the pesticides performed as specified. The 1972 amendments to the FIFRA prompted passage of Hawaii's Pesticide Law, Chapter 149A, HRS. This law closely paralleled the FIFRA, but was even more stringent in its requirements for applicator certification.

The Administrative Rules established pursuant to Chapter 149A (Title 4, Chapter 66, Pesticides) established toxicity categories for all pesticides. The category is assigned on the basis of the highest hazard shown by any of the indicators in Table 10. Pesticides in toxicity categories I and II are automatically in the restricted use category. None of the pesticides that would be used at the Waianae Kai golf course are restricted and all are commonly used on other golf courses, public parks and private residences.

Of the biocides that will probably be used at the Waianae Kai golf course (see Table 9), Diazinon is classified as moderately toxic to some birds, bees and marine organisms. However, the small amounts of this insecticide to be used and its relatively short persistence in soil and water (0 percent residual in water after 16 weeks, and 10 percent residual in soil after 3 weeks) indicate that its use would be safe for use at Waianae Kai golf course. Should it be required, malathion, which is classified as slightly toxic or liquid sevin could be substituted for diazinon. In mammals, malathion is rapidly deesterfied to a harmless acid that is rapidly eliminated. Sevin acts upon the mouth parts of insects such that they are essentially rendered inoperable.

TABLE 10  
PESTICIDE TOXICITY CATEGORIES

<u>Toxicity Category</u>	<u>Indicator</u>	<u>Limits</u>
I	Oral LD50 Inhalation LC50 Dermal LD50 Eye Effects Skin Effects	Up to and including 50 mg/kg Up to and including 0.2 mg/l Up to and including 200 mg/kg Corrosive; corneal opacity not reversible within 7 days Corrosive
II	Oral LD50 Inhalation LC50 Dermal LD50 Eye Effects Skin Effects	From 50 through 500 mg/kg From 0.2 through 2 mg/l From 200 through 2,000 mg/kg Corneal opacity reversible within 7 days Severe irritation at 72 hours
III	Oral LD50 Inhalation LC50 Dermal LD50 Eye Effects Skin Effects	From 500 through 5,000 mg/kg From 2 through 20 mg/l From 2,000 through 20,000 mg/kg No corneal opacity; irritation reversible within 7 days Moderate irritation at 72 hours
IV	Oral LD50 Inhalation LC50 Dermal LD50 Eye Effects Skin Effects	Greater than 5,000 mg/kg Greater than 20 mg/l Greater than 20,000 mg/kg No irritation Mild or slight irritation at 72 hours

Notes: LD50 means a single oral or dermal dose of a substance that is lethal to fifty percent of the test population of animals under test conditions for FIFRA. LC50 means a concentration of a substance that is lethal to fifty percent of the test population of animals under test conditions acceptable for registration under FIFRA.

Tersan, a systemic fungicide that will be used at the golf course, is of low toxicity to mammals, although occupational exposures have caused acute adverse effects and it can be irritating to the skin and mucous membranes. In order for Tersan to be approved for use, the active compound (thiram) and all possible degradation products within the plants upon which it is applied must present no danger to the consumer if used as intended, i.e., per manufacturer's recommendations. Tersan (thiram) is not highly soluble in water, and therefore, leaching is not a major concern. Its persistence has been shown to vary from more than two months in sandy soil to less than one week in compost. Tersan could be harmful to marine organisms if it entered the coastal nearshore waters in significant concentrations. Therefore, the primary measure used to mitigate potential adverse effects from Tersan is to avoid contamination of nearby waters. The creation of the ponds in the golf course will effectively do this as will the development of the remainder of the golf course drainage system which will include swales and berms that will create retention basins and slow rainwater runoff that might enter the drainage channels that lead to the ocean. As noted above, rainfall is relatively low in the Waianae area and flooding of the project site is not known to occur except during periods of abnormal rainfall. During these periods the applications of both fertilizers and biocides would be curtailed.

The other biocides that will be used on the golf course (Roundup and Weed Hoe) would also be selectively applied to specific areas. Both are relatively benign and degrade rapidly. The major active ingredient in Roundup, glyphosphate, is practically non-toxic to mammals, birds, fish, insects and bacteria. A large proportion of the herbicide applied to vegetation reaches the soil where it may be bound to soil constituents including clay minerals, organic matter or metal oxides, transported elsewhere by evaporation, diffusion or mass transport by water or soil particles or degraded through photochemical, chemical and biological processes.



Immediately after application, glyphosphate is rendered biologically inactive by being rapidly bound to soil clay particles and organic matter. Based on limited tests of the product on marine and freshwater organisms, there does not appear to be a high risk of significant impacts on nearshore marine communities. The herbicide must, however, be applied per manufacturer's recommendations and protective eyewear, gloves and clothing should be worn.

Weed Hoe is moderately toxic to mammals, but the arsenical compounds in the product have the lowest toxicity of any of the arsenical compounds. Studies have shown that the major active ingredient of Weed Hoe, MSMA, is degraded fairly rapidly (1.7 to 10 percent during a three-week period) and that residuals in soil after repeated applications show results varying from "no buildup" to "statistically significant buildup" but less than applied amounts. The movement of MSMA from treated weeds to water is likely to be minimal because of the fixation phenomena in plants, soils and sediments. Toxicities to specific marine organisms are not available, but based on reported results in freshwater ecosystems, significant impacts to nearshore marine communities are not expected. As with the other chemicals, the design of the golf course drainage system and inclusion of ponds, swales and berms to direct rainwater runoff to specific areas will mitigate the potential adverse environmental effects of Weed Hoe.

## 6. SUMMARY AND CONCLUSIONS

Because of the relatively small amounts of fertilizers and biocides that would be applied to the golf course, the low rainfall and high evapotranspiration rate of the area and the design of the golf course drainage system, there appears to be little likelihood of contamination of the groundwater supplies or nearshore coastal waters below or downgradient of the project site as a result of the application of the fertilizers and biocides on

the Waianae Kai golf course. As noted, the design of the golf course is such that a portion of the golf course will drain into the lined ponds that will be created as part of the irrigation system. As such, should runoff occur, that runoff would, for the most part, be retained in the golf course ponds and reapplied during the normal irrigation schedule. As noted and implied above, for the fertilizers and biocides to be an environmental problem downgradient from the project site, those chemicals would have to be soluble in water and leach into the groundwater supplies or enter rainwater runoff streams. Given the low rainfall, limited quantities of chemicals to be applied, the insolubility of the chemicals and the high evapotranspiration rate, it does not appear likely that leaching into the groundwaters would occur nor would the chemical enter rainwater runoff streams, thereby negating any potential adverse environmental effects.

It is known that the improper application of pesticides on golf courses can cause adverse impacts on the wildlife frequenting golf courses and at times to the maintenance workers and golfers using those courses (Edmondson, 1987). However, preliminary studies of the effects of fertilizers and biocides on golf courses have shown that generally there are no adverse impacts on the golf course, wildlife or surrounding areas, providing proper application rates and procedures are followed (Edmondson, 1987). The key factors in avoiding potential adverse effects on the downgradient groundwater supplies are proper application of the chemicals and the development of an optimum irrigation schedule such that the water applied penetrates to the root zone depth but not significantly beyond the root zone. In general, these are standard procedures for golf courses because they result in the least costly and most effective maintenance procedures.

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APPENDIX A

BASIC ECOLOGICAL PRINCIPLES  
RELATING TO LIMITING FACTORS

BASIC ECOLOGICAL PRINCIPLES  
RELATING TO LIMITING FACTORS

I. INTRODUCTION

The basic ecological principles relating to limiting factors information given below is provided to inform the reader of the natural mechanisms which occur that prevent large quantities of materials that are needed for growth and reproduction in organisms from overwhelming and causing severe adverse impacts on population levels. The principles described have been accepted by biologists since the 1880's and are generally applicable to aquatic and terrestrial plant and animal populations. One basic recognized reference source for these principles is Odum, E. P. 1953. Fundamentals of Ecology. Second Edition. W. B. Saunders Company. Philadelphia and London. 546 p.

II. PRINCIPLES PERTAINING TO LIMITING FACTORS

A. Liebig's "Law" of the Minimum

To occur and thrive in a given situation, an organism must have essential materials which are necessary for growth and reproduction. These basic requirements vary with the species and with the situation. The essential material available in amounts most closely approaching the critical minimum needed will tend to be the limiting one. That is, the rate of growth is dependent on the nutrient or other conditions present in the minimum quantity in terms of need and availability. Stated in other words, an organism is no stronger than the weakest link in its ecological chain of requirements. This principal was first clearly expressed by Justus Liebig in 1840. Liebig stated that "growth of a plant

is dependent on the amount of foodstuff which is presented to it in minimum quantity". Since that time, the principal has been extended to include other factors, such as temperature, time, etc. However, to avoid confusion, the concept of the minimum has been restricted to chemical materials (oxygen, nitrogen, phosphorus,, etc.) necessary for physiological growth and reproduction, as was originally intended by Liebig.

#### B. Shelford's "Law" of Tolerance

The presence and success of an organism depend upon the completeness of a complex of conditions. Absence or failure of an organism can be controlled by the qualitative or quantitative deficiency or excess with respect to any one of several factors which may approach the limits of tolerance for that organism. That is, not only may too little of something be a limiting factor, as proposed by Liebig, but also too much, as in the case of such factors as heat, light and water. Thus, organisms have an ecological minimum and maximum, with a range in between which represents the limits of tolerance. The concept of the limiting effect of maximum as well as minimum was incorporated into the "law" of tolerance by V. E. Shelford in 1913.

#### C. Combined Concept of Limiting Factors

The presence and success of an organism or group of organisms depends on a complex of conditions. Any condition which approaches or exceeds the limits of tolerance is said to be a limiting condition or factor. By combining the idea of the minimum and the concept of limits of tolerance, the general principal that organisms are controlled in nature by (1) the quantity and variability of materials for which there is a minimum requirement and physical factors which are critical,

and (2) the limits of tolerance of the organisms themselves to these and other components of the environment.

D. Application of Minimums and Tolerance to Waianae Kai Golf Course

Given the relatively low quantities of chemical fertilizers, insecticides, fungicides and herbicides that would be applied annually to the proposed Waianae Kai golf course versus the relatively large quantity of irrigation water, combined with low rainfall, high temperatures, high pan evaporation rate and high evapotranspiration rate, it is unlikely that significant or even detectable quantities of those fertilizers and biocides would enter either the groundwater or rainwater runoff streams. However, in the event that golf course maintenance procedures were such that the course was heavily fertilized and given recommended dosages of biocides, followed by the usual watering schedule with an abnormally heavy rainstorm immediately following the application of the fertilizers, biocides and regular watering (a worst case scenario), it is possible that some of the fertilizers and biocides would reach both the groundwater and rainwater runoff streams. In such a case, it is likely that some portion of those chemicals would enter the nearshore waters off Waianae via groundwater discharge as well as directly via the drainage channels. In such a case, it is likely that the marine and freshwater algae, and possibly other organisms, in the nearshore waters and drainage channels would go through a short-term "bloom" and dramatically increase population levels. However, for the most part, because of the relatively active circulation and outward movement of nearshore and offshore waters, as well as the relatively rapid flushing of the drainage channels that would accompany a heavy rainstorm, excess nutrients, i.e., amounts not required for maximum growth and reproduction by nearshore and drainage channel organisms, would be carried out to sea where

they would be utilized by the offshore organisms. Similarly, because only a relatively small amount of biocides are applied to the golf course at any one time, those biocides that might enter the nearshore and drainage channel waters would be diluted to the extent that they would be rendered harmless and ineffective against the nearshore and drainage channel plants and animals.

That is, even though the worst case scenario might occur, because of the laws of tolerance and limiting factors, adverse impacts to the nearshore and/or drainage channel organisms would not be expected to occur. Similarly, long-term adverse impacts to the groundwater resources of the area would not be expected to occur due to the dilution of the chemicals by added groundwater from the heavy rainstorm and the natural drainage and seepage of those waters into the nearshore marine environment.



Appendix E

Hydrogeologic Summary  
Of Proposed Irrigation Source For  
The Waianae Kai Golf Course

Prepared by S.P. Bowles  
December, 1988

## Background

A water resources evaluation and testing program has been conducted on three existing dug wells and two drilled exploration wells on the subject properties (see EXHIBIT A).

The study was undertaken to:

1. Evaluate the present status of existing wells on the subject property.
2. Drill test wells to further determine water development alternatives.
3. Conduct pumping tests of dug wells 1, 3, and 6 owned by the developer.
4. Based on results of this investigation, estimate the approximate quantity of irrigation water which can safely be developed.

Dug Well #6 has not been in use since the 1940's. Dug well #3 has been pumped continuously at a rate of about 200 gpm for dairy and some irrigation use on site. Dug Well #4 (adjacent to the site and next to the sanitary landfill) has been abandoned and back filled. Dug Well #1 has been in limited use for cattle drinking water (off site) and local truck farming (near site) totalling an occasional use of about 25,000 to 50,000 gpd.

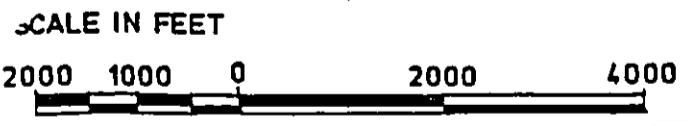
The dug wells were constructed in the 1920's and 1930's by the Waianae Plantation Company. Dug wells #1, #3 and #6 are owned by the developer. The original pumpage capacities and quality are summarized as follows:



SOURCE: DEPARTMENT OF LAND & NATURAL RESOURCES  
 DIVISION OF WATER AND LAND MANAGEMENT DEVELOPMENT, 1988

**WATER RESOURCE PLAN**  
**WAIANAE KAI GOLF COURSE**

**EXHIBIT A**



Name	Average Pumpage in MGD <sup>1</sup>	Pump Capacity in gpm	Chlorides in MG/L
DW 1	.400	790	520
DW 3	.250	490	360
DW 4	.100	320	470
DW 6	.080	230	1000
Total	.830	1,830	--

### Testing Results of Existing Dug Wells

Recent tests have produced the following data:

1) Dug Well 1	Test rate	440 gpm	(.63 MGD)
	Chlorides	460 MG/L	
2) Dug Well 3	Test rate	200 gpm	(.29 MGD)
	Chlorides	350 MG/L	
3) Dug Well 6	Test rate	60 gpm	(.09 MGD)
	Chlorides	333 MG/L	
Total			----- (1.01 MGD)

### Exploration Wells

Test well #1 was drilled to a total depth of 155 feet. The well penetrated alluvial boulders, cobbles and silty clay. Test results indicated that the water level stands at about +14 feet and the yield is 50 gpm with a chloride salinity of 68 mg/l.

Test well #2 was drilled to a total depth of 151 feet. The well penetrated alluvial cobbles, sands, gravels, and silty clay. The well was tested at a pumping rate of 50 gpm with a drawdown of 7 feet. The non-pumping water level was about 24 feet.

<sup>1</sup> Typical for period of record 1933-1939.

Chlorides during pumping averaged 477 mg/l.

The relatively high yield of test well #2 (specific capacity of .7 gallons per foot of drawdown) demonstrates that it can be placed in service at a pumping rate of 100 gpm (.07 mgd) with a drawdown of less than 20 feet. Additional wells could be located near well #2 to provide better system hydraulics if needed. It is not anticipated that test well #1 will be used in the system as the present yield is poor.

#### Hydrogeology

Geologically, the majority of the land use area overlies the alluvial sediments of the buried valley and the ground waters are entering the sediments from areas of higher head (EXHIBIT B). The primary sources of irrigation water are to be the existing dug wells owned by the developer and constructed in either the alluvium of the valley fill or coralline limestone.

Attached are edited portions of two reports prepared by the U.S. Geological Survey to assist the reader. The first portions are from Circular C16 of D.L.N.R. by C. P. Zones, 1963 (Appendix A). The others are from Atlas HA-358 by K. J. Takasaki, 1971 (Appendix B).

The existing BWS facilities at Kamaile pump water from the basalt aquifer which is intruded by dikes. The wells for the State agricultural park, new BWS wells in the upper Waianae Valley, and wells in the upper Makaha Valley all extract water from this same groundwater system. Test Well #2 will tap the discharge edge of this same aquifer.

**TYPICAL GEOLOGIC SECTION**  
**FROM WAIANAE VALLEY ROAD THROUGH**  
**THE WAIANAE KAI GOLF COURSE**

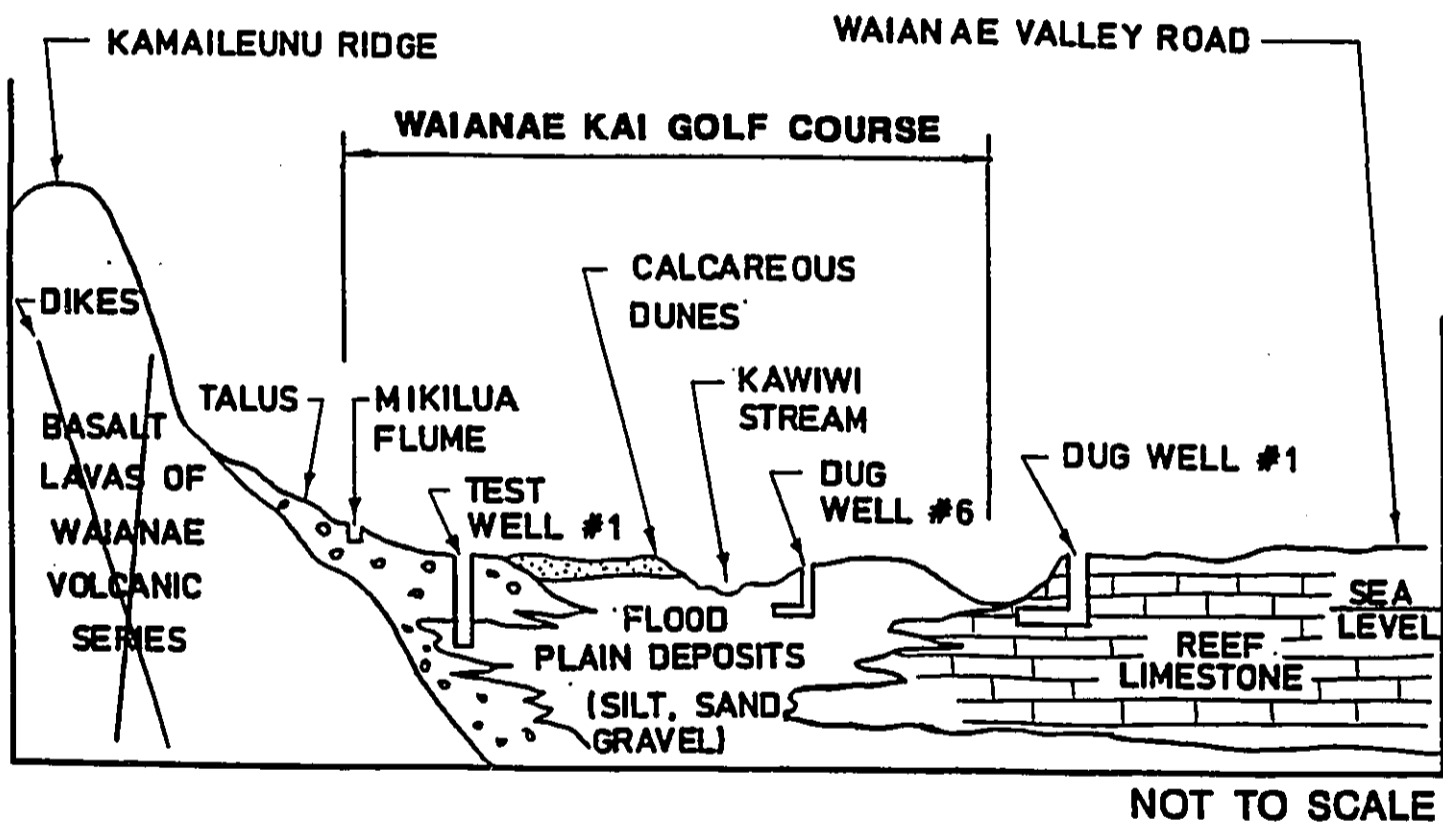


EXHIBIT B

The location of the project is such that it can be adversely effected by inland water developments. However, its pumpage cannot influence up gradient water developments such as those for the State Agricultural Park or the Honolulu Board of Water Supply (BWS).

No attempt has been made to identify organic or other pollutants because of the nearby existence of the City and County sanitary landfill and agricultural fields. It should be expected that ground water in the lower Waianae Valley would contain some identifiable pollutants and the proposed land use should have very little positive or negative impact other than a salt water encroachment potential based on total ground water flow.

#### Conclusions and Recommendations

The total water to be developed and pumped from on site wells is not recommended or anticipated to exceed 1 MGD (700 gpm) in the maximum month or about the same as that pumped from the area in the 1930's. None of the wells are suitable for domestic uses as they either have too high a salinity or are vulnerable to surface pollutants or salt water encroachment. Seaward or down gradient wells are more vulnerable and have essentially been abandoned. A source development program should be planned to maintain the combined waters for all irrigation (including existing users) at a salinity of between 400 and 500 MG/L chlorides.

It is recommended that the dug wells be designed as follows:

1. Dug Well 1 - Three pumps at 200 gpm each or an



installed capacity of 600 gpm.

2. Dug Well 3. - Two pumps at 200 gpm each or an installed capacity of 400 gpm.
3. Dug Well 6. - 1 pump at 75 gpm if needed.

Test Well #2 should have an installed capacity of about 100 gpm. Additional drilled wells may be needed to provide for more flexibility in quality management. The combined installed capacity would be about 1,175 gpm and should not be pumped in excess of about 1 mgd during the dry months.

During the design phase of the irrigation system the following should be considered:

1. Adequate storage ponds in volume and location.
2. Operations (sources) flexibility.
3. Additional drilled wells similar to Well #2.

APPENDIX A

Excerpts From

Circular C16 of D.L.N.R.

by C. P. Zones, 1963

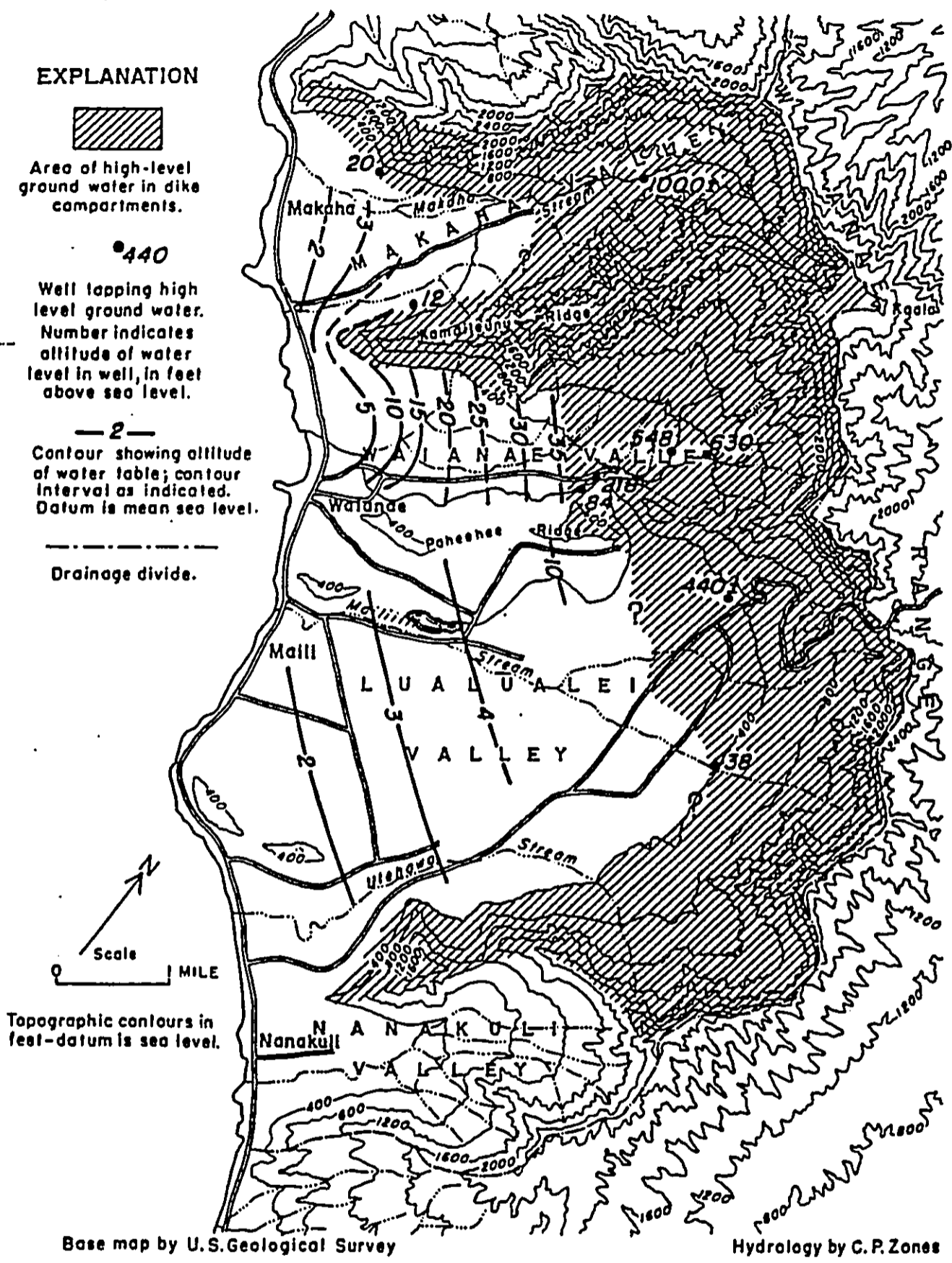


Figure 3. Map of part of the Waianae area, showing ground-water levels and probable areas of high-level water in dike compartments in Makaha, Waianae, and Lualualei Valleys. The ground-water levels shown were measured at different times over a period of several years. The effect of local pumping on ground-water levels is not shown.

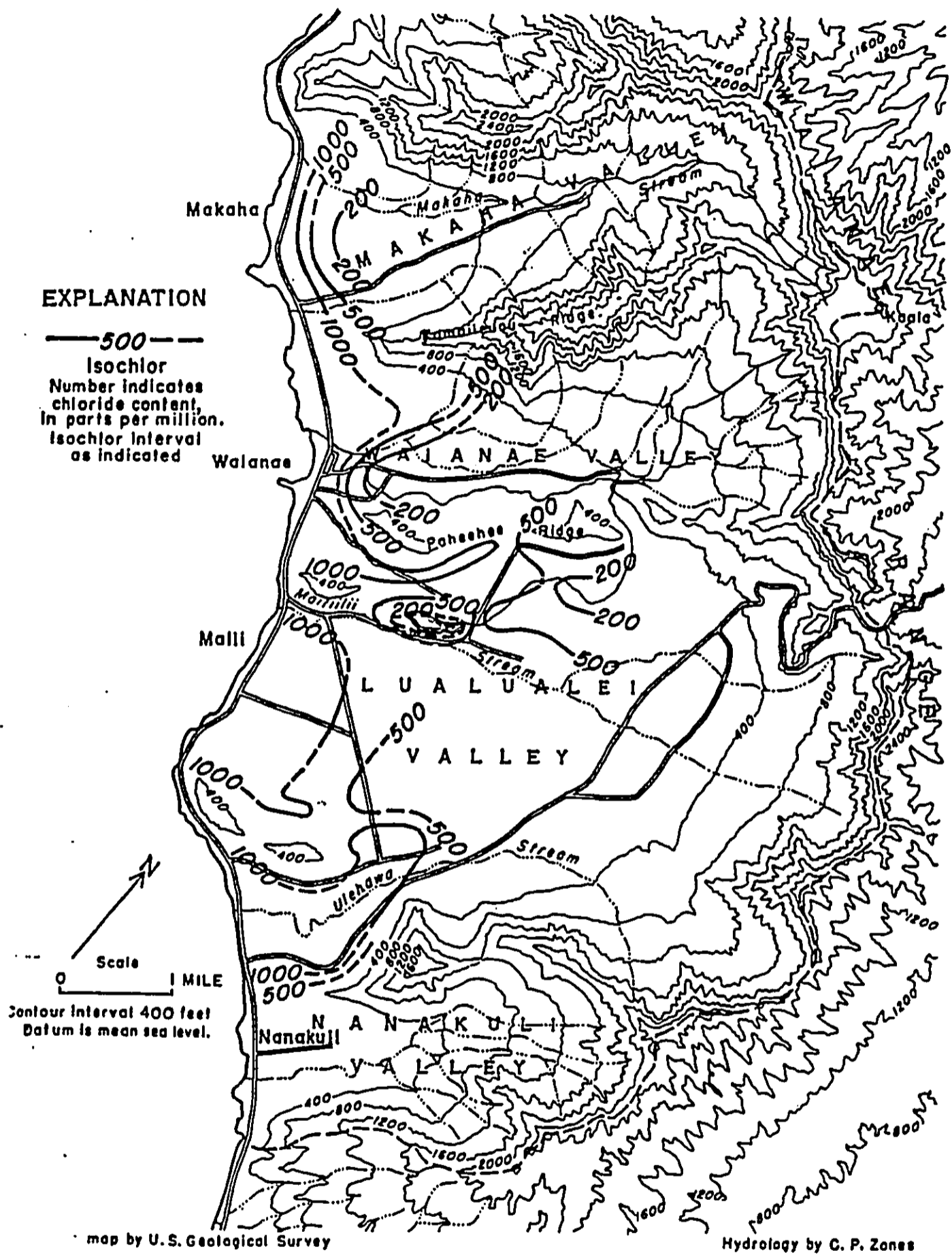


Figure 7. Map of part of the Waianae area showing the concentration of chloride in parts per million in Makaha, Waianae, and Lualualei Valleys in 1955.

APPENDIX B

Excerpts From  
Atlas HA-358  
by K. J. Takasaki, 1971

## GROUND WATER IN THE WAIANAE DISTRICT, OAHU, HAWAII

By  
Kiyoshi J. Takemaki  
1971

### GROUND WATER WHERE AND HOW IT OCCURS

Most of the fresh ground-water supply in the Waianae District occurs in flows of the lower and middle members of the Waianae Volcanic Series. Flows of the upper member are mostly above the water table and contain only a small perennial supply. Some fresh ground water occurs in sedimentary materials, but development of this supply is generally limited by the low permeability of alluvium, the restricted storage available in talus, or by sea-water intrusion in coral or coral rubble.

The ground-water reservoir in the volcanic rocks is large. The top of the reservoir extends from an altitude of a few feet near the coast to more than 1,800 feet near the crest of the range at Kaala. Although the reservoir seems to be continuous, it is far from being homogeneous (having a uniform water-level gradient). Instead, as shown by water levels in wells (geologic map), the gradient is steplike, reflecting the damming effects due to local changes in permeability, caused by variations in dike density and in number of dike intersections, and to breccia. Local changes in permeability are reflected also in the wide range of specific capacities shown in the geologic map.

Springs, which discharge at altitudes as high as 1,500 feet in Waianae and Makaha Valleys, contribute to perennial flow of streams. Most of the flow disappears below an altitude of 1,000 feet in both valleys. These and other deep valleys that breach dikes and breccia deposits act as line sinks. Water in wells drilled near stream channels is either artesian or occurs at shallow depths. Artesian conditions prevail where wedges of poorly permeable older alluvium and weathered rock overlie the aquifer.

Ground water also occurs in highly permeable coral and coral rubble near sea level. Information from drillers' logs indicates that coralline rocks extend at least 3 miles inland in Luualualei Valley and about 1 mile inland in Waianae and Makaha Valleys (quality-of-water map). About 100 wells have been drilled into this aquifer, but most have been abandoned because

of an increase in chloride content of the water with continued pumping. Water levels in wells tapping the coralline aquifer are shown by contours on the geologic map.

Several wells have been dug or drilled in younger alluvium adjacent to inland extensions of the coralline material. Water levels in these wells are somewhat higher than those in wells tapping the coralline material (geologic map). Prospects are good for developing small supplies of fresh water in younger alluvium.

Talus deposits apparently do not form ground-water reservoirs of any significance because most of them lie above the main water table. However, because of the high permeability of the deposits and their location at the base of cliffs, they provide excellent catchments during periods of heavy rainfall. Lack of heavy vegetation on most talus slopes indicates that they are quickly drained after rains.

### QUALITY

Data on ground-water quality are given on the quality-of-water map which also shows probable distribution of the principal aquifers at sea level. The map was prepared from drillers' logs and by projecting slopes of outcrops.

The quality of water from wells tapping the volcanic aquifer is generally good, except in near-shore areas and areas abutting landward edges of the coralline aquifer, where the major contaminant is sea water. Other contaminants result from leaching of hydrothermally altered volcanic rocks in the central vent area and of carbonate rocks above or adjacent to the volcanic aquifer. Most of the coralline aquifer is intruded by sea water, so the volcanic aquifer is highly susceptible to sea-water intrusion where it is in contact with the coralline aquifer.

The low overall permeability of volcanic rocks, which is mostly caused by dike intrusions, is the principal deterrent to sea-water encroachment. Where dike intersections are numerous, landward movement of sea water is almost completely retarded. Where dikes are mostly parallel, permeability is much greater

along the trend of the dikes than it is at right angles to them. Where they are parallel to the shoreline, dikes channel fresh water along their trend by retarding its flow across them, thereby also retarding sea-water intrusion. The chloride content of water from wells 277-99 and 277-101, 222 and 218 mg/l (milligrams per liter), respectively, is unusually low for ground water near the coast and may reflect water channeling and sea-water exclusion by dikes.

The high dissolved-solids content of more than 1,700 mg/l and sulfate content of 700 mg/l (well 277-92) probably reflects leaching of hydrothermally altered rocks in an area where the permeability of the altered rocks is further reduced by intersecting dikes. The temperature, 25.5°C (Celsius), of water from this well compared with that of water from tunnels in upper Waianae Valley, 18.3°C, water from the City and County tunnel, 21.1°C, and water from well 277-07, 22.9°C, is further evidence of sluggish movement of water and effects of hydrothermal activity on the aquifer tapped by well 277-92.

Water in the coralline aquifer ranges widely in chloride concentration. The lines of equal chloride content shown on the map represent only the fresher upper part of a lenslike water body that floats on sea water. Because recharge from rainfall and underflow from other water bodies is small, the fresh-water lens is thin and unstable. It is subject to rapid contamination by sea water if wells tapping it are pumped heavily.

The lack of fresh water needed to develop a thicker lens is at least partly due to a luxuriant growth of algaroba, or kiawe (*Prosopis chilensis*), a close relative of mesquite. Transpiration by this plant, from shallow water bodies in volcanic rock and alluvium, reduces underflow that would otherwise recharge the coralline aquifer. Where kiawe growth is most luxuriant on the coralline aquifer, transpiration constitutes the main discharge of ground water.

Ground water in the alluvium is generally fresh. Sea-water intrusion is limited to near-shore areas and to areas abutting edges of the coralline aquifer.



# E X P L A N A T I O N

**C**  
**Calcareous sedimentary materials**  
*Includes coral, coral rubble, and beach sand*

**N**  
**Noncalcareous sedimentary materials**  
*Includes alluvium and talus*



**Cinder**



**Lava flows of upper member of the Waianae Volcanic Series**



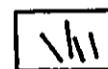
**Breccin**



**Lava flows of lower and middle members of the Waianae Volcanic Series**



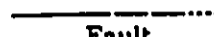
**Lava flows of the Koolau Volcanic Series**



**Dikes**



**Contact**



**Fault**

*Dashed where inferred; dotted where concealed*

**Length and direction of tunnel in Waianae Volcanic Series**

**40**  
8

**Well**

**13**

**Shaft**

**Tapping rocks of Waianae Volcanic Series**

**14**  
10

**Well**

**3**

**Shaft or dug well**

**Tapping alluvium**

**0**

**Well**

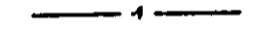
**0**

**Shaft or dug well**

**Tapping calcareous sedimentary material**

**Wells, shafts, and dug wells**

*Upper number, where present by well symbol, is altitude of water level, in feet above mean sea level. Lower number, where present by well symbol, is specific capacity, in gallons per minute per foot of drawdown. Single number, where present by well or shaft or dug well symbols, is altitude of water level, in feet above mean sea level*



**Water-level contour**

*Shows altitude of water level in calcareous sedimentary material. Contour interval 1 foot*

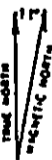
**Drainage divide and boundary of study area**

158°15'

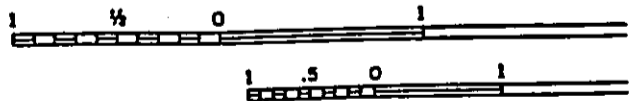
10'

SCALE 1

U.S. Geological Survey, 1960



APPROXIMATE MEAN DECLINATION, 1971



CONTOUR INTERVAL  
 DOTTED LINES REPRESENT  
 DATUM IS MEAN SEA LEVEL  
 DEPTH CURVES IN FEET-DATUM  
 SHORELINE SHOWN REPRESENTS THE MEAN RANGE OF TIDE ISLAND

## GEOLOGIC MAP OF WESTERN OAHU SHOWING AREA OF ALTITUDE OF WATER LEVELS, AND SPECIFIC CAPACITY

E-15



Appendix F

Preliminary Hydrogeologic Summary  
Of Proposed Irrigation Source For  
The Waianae Kai Golf Course

Prepared by S.P. Bowles

October, 1988

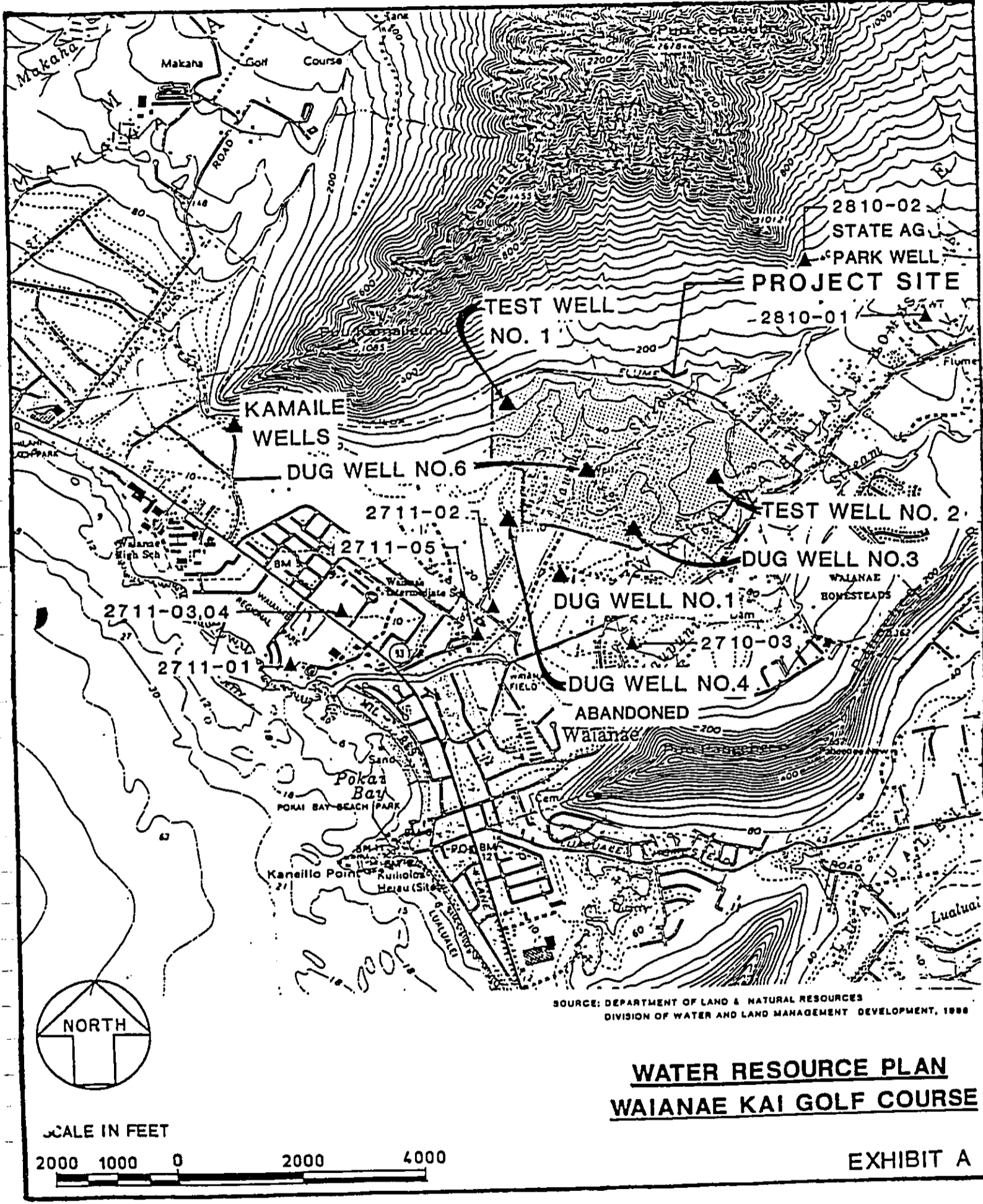
A water preliminary resources evaluation and testing program has been conducted on three existing dug wells and two drilled exploration wells on the subject properties (see EXHIBIT A). The evaluation examines the quality and quantity of ground waters to be used for the proposed 27-hole golf course in Waianae. In addition, the study examines effects to adjoining water users up- and down-gradient from the project site.

Dug Well #6 has not been in use since the 1940's. Dug Well #3 has been pumped continuously at a rate of about 200 gpm for dairy and some irrigation use on site. Dug Well #4 (adjacent to the site and next to the sanitary landfill) has been abandoned and back-filled. Dug Well #1 has been in limited use for cattle drinking water (off site) and local truck farming (near site) totaling an occasional use of about 25,000 to 50,000 gpd.

These dug wells were constructed in the 1920's and 1930's by the Waianae Plantation Company. Dug Wells #1, #3 and #6 are owned by the developer. The original pumpage capacities and quality are summarized as follows:

Name	Average Pumpage in MGD <sup>1</sup>	Pump Capacity in GPM	Chlorides in MG/L <sup>1</sup>
DW 1	.400	790	520
DW 3	.250	490	360
DW 4	.100	320	470
DW 6	.080	230	100 <sup>1</sup>
Total	.830	1,830	-

<sup>1</sup> Typical for period of record 1933-1939.



SOURCE: DEPARTMENT OF LAND & NATURAL RESOURCES  
DIVISION OF WATER AND LAND MANAGEMENT DEVELOPMENT, 1988

**WATER RESOURCE PLAN**  
**WAIANAE KAI GOLF COURSE**

**EXHIBIT A**

Recent tests in May and June, 1988 have produced the following data:

Name	Pump Test Rate in GPM (MGD)	Chlorides in MG/L
DW 1	440 (0.63)	460
DW 3	200 (0.29)	350
DW 6	60 (0.09)	333

Test Well #1 is to be deepened and capacity increased to about 100 gpm. Preliminary results at the present depth show a capacity of about 35 gpm and chlorides of 85 MG/L. (See map for location) Test Well #2 has been drilled to a depth of 150 feet and has not been cased or tested. The salinity is expected to be about 50 MG/L chlorides.

The total water to be developed and pumped from on site wells is not expected or anticipated to exceed 1 MGD (700 GPM) in the maximum month or about the same as that pumped from the area in the 1930's. None of the wells are suitable for domestic uses as they either have too high a salinity or are vulnerable to surface pollutants or salt water encroachment. Seaward or down gradient wells are more vulnerable and have essentially been abandoned. The source development program is planned to maintain the combined waters for all irrigation (including existing users) at a salinity of between 400 and 500 MG/L chlorides. The two new test wells plus others which may need to be constructed are intended to provide higher quality water for seasonal use and not to expand the total annual or peak month pumpage.

No attempt has been made to identify organic or other pollutants because of the nearby existence of the City and County sanitary landfill and agricultural fields. It should be expected that ground water in the lower Waianae Valley would contain some identifiable pollutants and the proposed land use should have very little positive or negative impact other than a salt water encroachment potential based on total ground water flow. Geologically, the majority of the land use area overlies the alluvial sediments of the buried valley and the ground waters are entering the sediments from areas of higher head. The location of the project is such that it can be adversely affected by inland water developments. However, its pumpage cannot influence up gradient water developments such as those for the State Agricultural Park or the Honolulu Board of Water Supply (BWS).

The existing BWS facilities located at Kamaile (see EXHIBIT A) pump water from the basalt aquifer which is intruded by dikes. The wells for the State Agricultural Park, new BWS wells in the upper Waianae Valley, and wells in the upper Makaha Valley, all extract water from this same ground water system. For this reason, the BWS Kamaile wells may be affected in the long term by these other existing wells. The location of the Waianae sanitary landfill in close proximity to the Kamaile wells, presents a further complication to the longevity of the Kamaile wells. Test Well #1 will tap the discharge edge of this same aquifer. However, it will only be pumped on a limited basis as needed to maintain composite water quality for irrigation.

The primary sources of irrigation water are to be the three existing dug wells owned by the developer and constructed in either the alluvium of the valley fill or coral-line limestone.

In summary, the recent tests on the existing dug wells indicate that they can be pumped at a sustainable yield of 1.0 million gallons per day and, therefore, provide the required irrigation water for the proposed 27-hole golf course at acceptable chloride levels. For water management purposes, however, new drilled wells (presently Test Wells No. 1 and 2) are only proposed to provide higher quality water for seasonal use.

Based on the hydrogeology and historical information of the water use in the Waianae area, no significant impacts on the quantity and quality of water from the proposed golf course wells on adjoining agricultural users is anticipated.

Upon final completion of testing, the results and proposed water use will be submitted to the Board of Health, Board of Water Supply, Department of Land & Natural Resources, and the State Water Commission, for their approval.

Attached are edited portions of two reports prepared by the U. S. Geological Survey to assist the reader. The first portions, Figures 3 and 7, are from Circular C16 of D.L.N.R. by C. P. Zones, 1963, and indicate ground water levels and concentration of chlorides in the Waianae area. The others are from Atlas HA-358 by K. J. Takasaki, 1971, on ground water in the Waianae District.

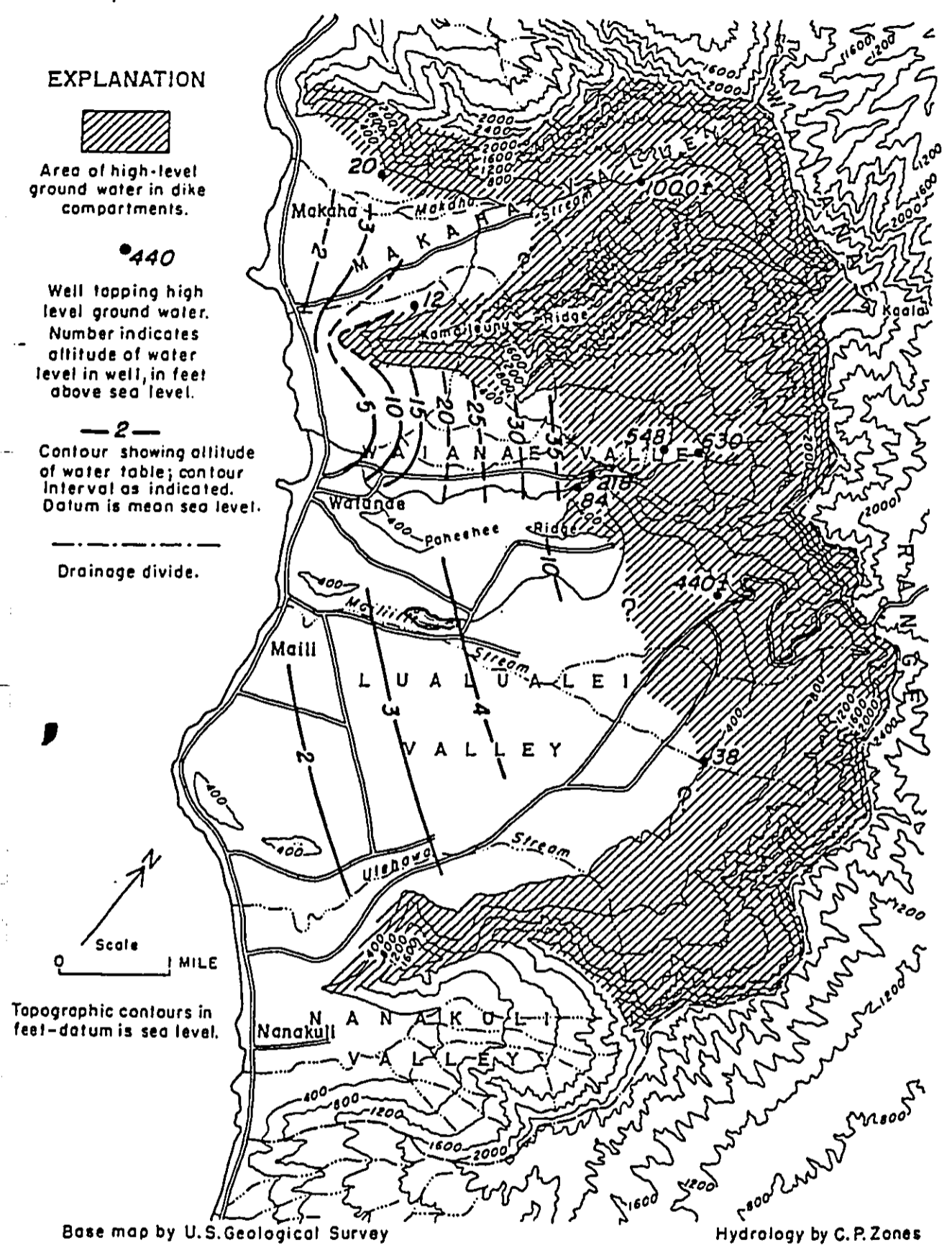


Figure 3. Map of part of the Waianae area, showing ground-water levels and probable areas of high-level water in dike compartments in Makaha, Waianae, and Lualualei Valleys. The ground-water levels shown were measured at different times over a period of several years. The effect of local pumping on ground-water levels is not shown.



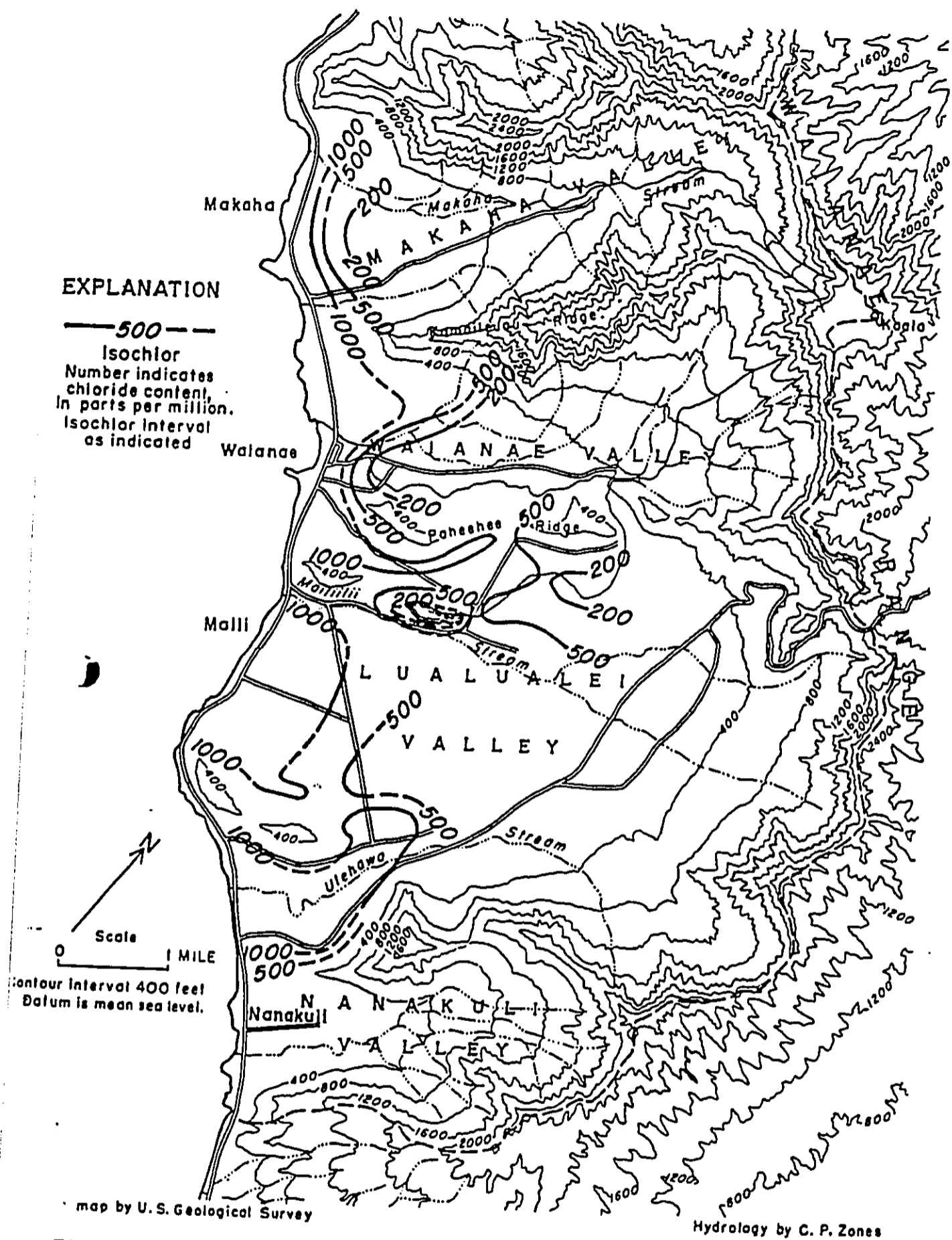


Figure 7. Map of part of the Waianae area showing the concentration of chloride in parts per million in Makaha, Waianae, and Lualualei Valleys in 1955.

## GROUND WATER IN THE WAIANAË DISTRICT, OAHU, HAWAII

By  
Kiyoshi J. Tokunuki  
1971

### GROUND WATER WHERE AND HOW IT OCCURS

Most of the fresh ground-water supply in the Waianae District occurs in flows of the lower and middle members of the Waianae Volcanic Series. Flows of the upper member are mostly above the water table and contain only a small perennial supply. Some fresh ground water occurs in sedimentary materials, but development of this supply is generally limited by the low permeability of alluvium, the restricted storage available in talus, or by sea-water intrusion in coral or coral rubble.

The ground-water reservoir in the volcanic rocks is large. The top of the reservoir extends from an altitude of a few feet near the coast to more than 1,800 feet near the crest of the range at Kaala. Although the reservoir seems to be continuous, it is far from being homogeneous (having a uniform water-level gradient). Instead, as shown by water levels in wells (geologic map), the gradient is steplike, reflecting the damming effects due to local changes in permeability, caused by variations in dike density and in number of dike intersections, and to breccias. Local changes in permeability are reflected also in the wide range of specific capacities shown in the geologic map.

Springs, which discharge at altitudes as high as 1,800 feet in Waianae and Makaha Valleys, contribute to perennial flow of streams. Most of the flow disappears below an altitude of 1,000 feet in both valleys. These and other deep valleys that breach dikes and breccia deposits act as line sinks. Water in wells drilled near stream channels is either artesian or occurs at shallow depths. Artesian conditions prevail where wedges of poorly permeable older alluvium and weathered rock overlie the aquifer.

Ground water also occurs in highly permeable coral and coral rubble near sea level. Information from drillers' logs indicates that coralline rocks extend at least 3 miles inland in Lualualei Valley and about 1 mile inland in Waianae and Makaha Valleys (quality-of-water map). About 100 wells have been drilled into this aquifer, but most have been abandoned because

of an increase in chloride content of the water with continued pumping. Water levels in wells tapping the coralline aquifer are shown by contours on the geologic map.

Several wells have been dug or drilled in younger alluvium adjacent to inland extensions of the coralline material. Water levels in those wells are somewhat higher than those in wells tapping the coralline material (geologic map). Prospects are good for developing small supplies of fresh water in younger alluvium.

Talus deposits apparently do not form ground-water reservoirs of any significance because most of them lie above the main water table. However, because of the high permeability of the deposits and their location at the base of cliffs, they provide excellent catchments during periods of heavy rainfall. Lack of heavy vegetation on most talus slopes indicates that they are quickly drained after rains.

### QUALITY

Data on ground-water quality are given on the quality-of-water map which also shows probable distribution of the principal aquifers at sea level. The map was prepared from drillers' logs and by projecting slopes of outcrops.

The quality of water from wells tapping the volcanic aquifer is generally good, except in near-shore areas and areas abutting landward edges of the coralline aquifer, where the major contaminant is sea water. Other contaminants result from leaching of hydrothermally altered volcanic rocks in the central vent area and of carbonate rocks above or adjacent to the volcanic aquifer. Most of the coralline aquifer is intruded by sea water, so the volcanic aquifer is highly susceptible to sea-water intrusion where it is in contact with the coralline aquifer.

The low overall permeability of volcanic rocks, which is mostly caused by dike intrusions, is the principal deterrent to sea-water encroachment. Where dike intersections are numerous, landward movement of sea water is almost completely retarded. Where dikes are mostly parallel, permeability is much greater

along the trend of the dikes than it is at right angles to them. Where they are parallel to the shoreline, dikes channel fresh water along their trend by retarding its flow across them, thereby also retarding sea-water intrusion. The chloride content of water from wells 277-99 and 277-101, 292 and 218 mg/l (milligrams per liter), respectively, is unusually low for ground water near the coast and may reflect water channeling and sea-water exclusion by dikes.

The high dissolved-solids content of more than 1,700 mg/l and sulfate content of 700 mg/l (well 277-92) probably reflects leaching of hydrothermally altered rocks in an area where the permeability of the altered rocks is further reduced by intersecting dikes. The temperature, 26.6°C (Celsius), of water from this well compared with that of water from tunnels in upper Waianae Valley, 18.3°C, water from the City and County tunnel, 21.1°C, and water from well 277-97, 23.9°C, is further evidence of sluggish movement of water and effects of hydrothermal activity on the aquifer tapped by well 277-92.

Water in the coralline aquifer ranges widely in chloride concentration. The lines of equal chloride content shown on the map represent only the fresher upper part of a lenslike water body that floats on sea water. Because recharge from rainfall and underflow from other water bodies is small, the fresh-water lens is thin and unstable. It is subject to rapid contamination by sea water if wells tapping it are pumped heavily.

The lack of fresh water needed to develop a thicker lens is at least partly due to a luxuriant growth of algaroba, or kiawe (*Prosopis chilensis*), a close relative of mesquite. Transpiration by this plant, from shallow water bodies in volcanic rock and alluvium, reduces underflow that would otherwise recharge the coralline aquifer. Where kiawe growth is most luxuriant on the coralline aquifer, transpiration constitutes the main discharge of ground water.

Ground water in the alluvium is generally fresh. Sea-water intrusion is limited to near-shore areas and to areas abutting edges of the coralline aquifer.


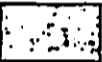




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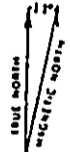
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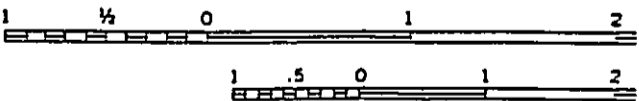
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| <p style="text-align: center;"><span style="border: 1px solid black; padding: 2px 10px;">C</span></p> <p style="text-align: center;"><b>Calcareous sedimentary materials</b><br/><i>Includes coral, coral rubble, and beach sand</i></p> <p style="text-align: center;"><span style="border: 1px solid black; padding: 2px 10px;">N</span></p> <p style="text-align: center;"><b>Noncalcareous sedimentary materials</b><br/><i>Includes alluvium and talus</i></p> <p style="text-align: center;"></p> <p style="text-align: center;"><b>Cinder</b></p> <p style="text-align: center;"><span style="border: 1px solid black; padding: 2px 10px;"> </span></p> <p style="text-align: center;"><b>Lava flows of upper member of the Waianae Volcanic Series</b></p> <p style="text-align: center;"></p> <p style="text-align: center;"><b>Breccia</b></p> <p style="text-align: center;"><span style="border: 1px solid black; padding: 2px 10px;">WV</span></p> <p style="text-align: center;"><b>Lava flows of lower and middle members of the Waianae Volcanic Series</b></p> <p style="text-align: center;"></p> <p style="text-align: center;"><b>Lava flows of the Koolau Volcanic Series</b></p> <p style="text-align: center;"><span style="border: 1px solid black; padding: 2px 10px;">/ / /</span></p> <p style="text-align: center;"><b>Dikes</b></p> | <p style="text-align: center;">—————</p> <p style="text-align: center;"><b>Contact</b></p> <p style="text-align: center;">- - - - -</p> <p style="text-align: center;"><b>Fault</b></p> <p style="text-align: center;"><i>Dashed where inferred; dotted where concealed</i></p> <p style="text-align: center;"></p> <p style="text-align: center;"><b>Length and direction of tunnel in Waianae Volcanic Series</b></p> <p style="text-align: center;">40<br/>8<br/>●</p> <p style="text-align: center;">Well</p> <p style="text-align: center;">13<br/>■</p> <p style="text-align: center;">Shaft</p> <p style="text-align: center;"><b>Tapping rocks of Waianae Volcanic Series</b></p> <p style="text-align: center;">14<br/>10<br/>⊖</p> <p style="text-align: center;">Well</p> <p style="text-align: center;">3<br/>⊖</p> <p style="text-align: center;">Shaft or dug well</p> <p style="text-align: center;"><b>Tapping alluvium</b></p> <p style="text-align: center;">○</p> <p style="text-align: center;">Well</p> <p style="text-align: center;">□</p> <p style="text-align: center;">Shaft or dug well</p> <p style="text-align: center;"><b>Tapping calcareous sedimentary material</b></p> <p style="text-align: center;"><b>Wells, shafts, and dug wells</b></p> <p style="text-align: center;"><i>Upper number, where present by well symbol, is altitude of water level, in feet above mean sea level. Lower number, where present by well symbol, is specific capacity, in gallons per minute per foot of drawdown. Single number, where present by well or shaft or dug well symbols, is altitude of water level, in feet above mean sea level.</i></p> <p style="text-align: center;">— 4 —</p> <p style="text-align: center;"><b>Water-level contour</b></p> <p style="text-align: center;"><i>Shows altitude of water level in calcareous sedimentary material. Contour interval 1 foot</i></p> <p style="text-align: center;">—————</p> <p style="text-align: center;"><b>Drainage divide and boundary of study area</b></p> |
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158°15' 10'

U.S. Geological Survey, 1960 SCALE 1:6



APPROXIMATE MEAN DECLINATION, 1971



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**GEOLOGIC MAP OF WESTERN OAHU SHOWING AREA OF STUDY, ALTITUDE OF WATER LEVELS, AND SPECIFIC CAPACITY**

E-11

Appendix G

PAUL H. ROSENDAHL, Ph.D., Inc.  
*Consulting Archaeologist*

Report 436-052588

**ARCHAEOLOGICAL RECONNAISSANCE SURVEY  
AND LIMITED SUBSURFACE TESTING  
WAIANAЕ KAI PROPERTY**

**Land of Waianae,  
Waianae District, Island of Oahu**

June 1988

G-1

305 Mohouli Street • Hilo, Hawaii 96720 • (808) 969-1763 or 966-8038

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**Land of Waianae.  
Waianae District, Island of Oahu  
(TMK:8-5-03:9,10,29,31,32,43;  
8-5-04:28; 8-5-19:35,36,37)**

by

**William A. Shapiro, B.A.  
Supervisory Archaeologist**

and

**Paul H. Rosendahl, Ph.D.  
Principal Archaeologist**

Prepared for

**FBR Hawaii  
Financial Plaza of the Pacific  
130 Merchant Street, Suite 1111  
Honolulu, Hawaii 96813**

June 1988

305 Mohouli Street • Hilo, Hawaii 96720 • (808) 969-1763 or 966-8038

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## SUMMARY

At the request of Mr. Matthew E. Grady, project manager for PBR Hawaii, Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted a combined surface and subsurface archaeological reconnaissance survey of the approximately 250 acre Waianae Kai Property project area, located in the Land of Waianae, Waianae District, Island of Oahu (TMK:8-5-03:9,10,29,31,32,43; 8-5-04:28; 8-5-19:35,36,37). The primary objective of the survey was to provide information appropriate to and sufficient for the preparation of a Conditional Use Permit application to be submitted to the Department of Land Utilization-City and County of Honolulu.

Prior to conducting the field work, a general scope of work and specific field tasks for the project were discussed with staff archaeologists in the Hawaii State Department of Land and Natural Resources-Historic Sites Section (DLNR-HSS) (Dr. Ross H. Cordy, chief archaeologist, and Dr. Joyce Bath, staff archaeologist for Oahu). Field work was conducted May 5-20, 1988. Approximately 384 man-hours of labor were expended on the field work. The surface reconnaissance survey consisted of 100% coverage (0-100%), variable intensity (30-90 ft transect intervals) pedestrian survey of the project area (excluded from the surface reconnaissance was the area actively occupied by Mountain View Dairy). The subsurface reconnaissance included backhoe trenching in selected areas, four shovel tests at Site T-24, and a cut made into an ash-like lime deposit at Site T-24 so that a profile and stratigraphic information could be obtained. The shovel tests at Site T-24 (coral and lithic scatter), excavated to 30-50 cm below surface, were conducted in order to determine the extent of the scatter.

During the surface reconnaissance, 34 sites (45 component features) were identified within or immediately adjacent to the project area. Of the thirty-four sites, only eight were recorded in detail; the remainder represented recent historic agricultural rock clearings, recent debris, and material associated with a modern dairy. Formal feature types present in the project area include rock piles, walls, dams, flumes, ditches, a terrace, a coral and basalt lithic scatter, a concrete swimming pool, a well, concrete foundations, a bridge, and a culvert. Probable functional interpretations for the feature types include agricultural (historic), tool manufacture, habitation, transportation, recreation, and erosion and water control. In addition to the sites, several road cuts were noted and plotted on project maps.

The purpose of the backhoe trenching was to determine the presence or absence of potentially significant buried cultural remains. Twelve trenches were placed within areas of former Land Commission Awards (LCAs), as indicated on a 1902 map of Waianae by M.D. Monsarrat. Seven of the 12 trenches revealed gleys or gley-like clay deposits most likely evidencing previous taro cultivation. Soil samples were collected from the trenches



and profiles of the trenches were recorded. Radiocarbon samples from the gley deposits were submitted for dating analysis. Results were as expected: samples yielded calibrated ranges that overall spanned 340 years (AD 1170-1510), indicating the gley layers were prehistoric. Aside from the gley deposits, no other subsurface cultural remains were observed.

Of the 34 identified sites, all are assessed as important solely for information content. For 33 of the 34 sites, no further data collection is necessary. Further data collection (detailed recording, surface clearing, and test excavation) is recommended for the remaining one site (T-24).

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## INTRODUCTION

### BACKGROUND

Between May 5-20, 1988, Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted a combined surface and subsurface archaeological reconnaissance survey of the approximately 250 acre Waianae Kai Property project area in the Land of Waianae, Waianae District, Island of Oahu (TMK:8-5-03:9,10,29,31,32,43; 8-5-04:28; 8-5-19:35,36,37). The survey was conducted at the request of Mr. Matthew E. Grady, project manager, PBR Hawaii, in order to provide information for the preparation of a Conditional Use Permit application.

Field work was conducted under the direction of PHRI Supervisory Archaeologist William A. Shapiro, and under the overall direction of PHRI Principal Archaeologist Dr. Paul H. Rosendahl. Field personnel included PHRI Field Archaeologists Mike Fager, Jack Harris, Lisa Shapiro, Erik Pearthree, and Vickie Kai. Approximately 384 man-hours of labor were expended conducting the field work. The present document comprises the final report of the survey.

### SCOPE OF WORK

The goal of a reconnaissance survey is to identify--to discover and locate on available maps--all sites and features of potential archaeological significance. A reconnaissance survey is extensive rather than intensive in scope, and is conducted to determine the presence or absence of archaeological resources within a specified project area. Reconnaissance survey indicates both the general nature and variety of archaeological remains present, and the general distribution and density of such remains. A reconnaissance survey permits a general significance assessment of the archaeological resources, and facilitates the formulation of realistic recommendations and estimates for such further archaeological work as might be necessary or appropriate. Such further work could include intensive survey--further data collection involving detailed recording of sites and features, and selected test excavations; and possibly subsequent mitigation--data recovery research excavations, interpretive planning and development, and/or preservation of sites and features with significant scientific research, interpretive, and/or cultural values.

The principal objectives of the combined surface and subsurface reconnaissance survey were four-fold: (a) to identify (find and locate) all sites and site complexes present within the project area; (b) to evaluate the potential significance of all identified archaeological remains; (c) to determine the possible impacts of proposed development upon the identified remains; and (d) to define the scope of any subsequent

archaeological work that might be necessary or appropriate. Based on a preliminary review of available background literature and records, and on discussions with Mr. Grady of PBR Hawaii and with staff archaeologists in the Hawaii State Department of Land and Natural Resources--Historic Sites Section (DLNR-HSS) (Dr. Ross H. Cordy, chief archaeologist, and Dr. Joyce Bath, staff archaeologist for Oahu), the following specific tasks were determined to constitute an adequate scope of work--one both appropriate to and sufficient for the preparation of a Conditional Use Permit application--for the combined reconnaissance survey of the Waianae Kai Property project area:

1. Conduct limited archaeological and historical documentary background research involving review and evaluation of readily available archaeological and historical literature, historic documents and records, and cartographic sources relevant to the immediate project area;
2. Conduct a variable coverage (partial to 100%), variable intensity (30- to 90-ft intervals) surface reconnaissance survey of the project area, with (a) relatively higher intensity coverage being given non-cultivated and otherwise minimally modified lands, and (b) relatively lower intensity coverage to areas extensively modified by historic period and/or recent cultivation;
3. Conduct limited subsurface testing of selected locations within the project area by means of mechanical backhoe to determine the presence or absence of potentially significant buried cultural features or deposits;
4. Analyze background research data and field data; and
5. Prepare appropriate reports.

The combined reconnaissance survey was carried out in accordance with standards for reconnaissance-level survey recommended by the Society of Hawaiian Archaeology (SHA). These standards are currently used by the DLNR-HSS/State Historic Preservation Office (SHPO) as guidelines for review and evaluation of archaeological reconnaissance survey reports submitted in conjunction with various development permit applications.

#### PROJECT AREA DESCRIPTION

The Waianae Kai Property project area is comprised of c. 250 acres located in the Land of Waianae, Waianae District, Island of Oahu (TMK: 8-5-03:9,10,29,31,32,43; 8-5-04:28; 8-5-19:35,36,37). The project area is bordered on the north by Mikilua Flume (Site T-1) and the slopes of Puu Kamaileunu ridgeline, on the south by an irrigation drainage ditch, on the west by an existing landfill, and on the east by Waianae Valley Road and a residential subdivision (Figure 1).

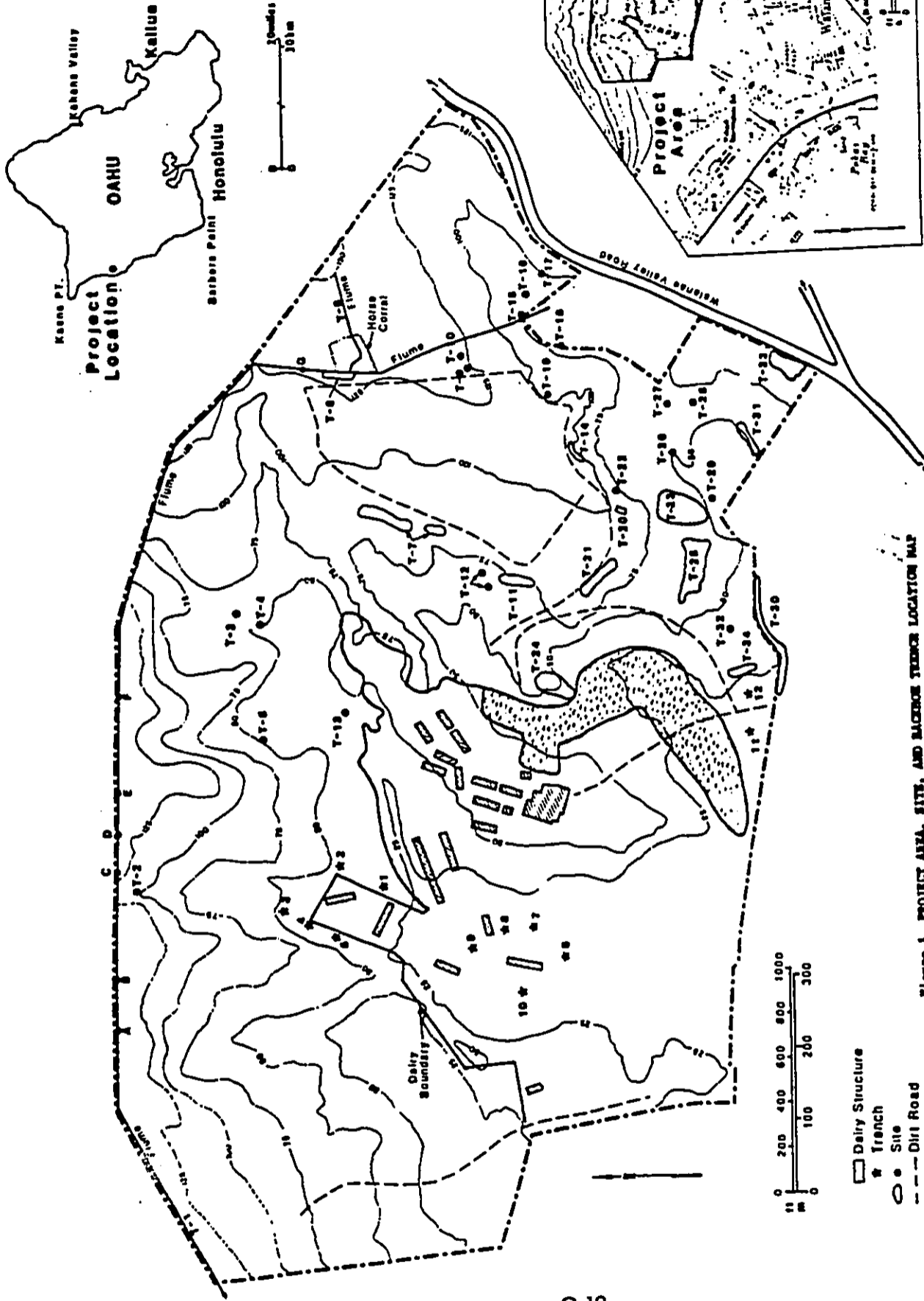


Figure 1. PROJECT AREA, SITE, AND TRENCH LOCATION MAP

Archaeological Reconnaissance Survey  
 and Limited Subsurface Testing  
 Waiānae Kai Property  
 Land of Waiānae, Waiānae District  
 Island of Oahu

PHI 88-436 June 1988

- Dairy Structure
- \* Trench
- Site
- - - Dirt Road
- ~ Meadow

Terrain in the project area ranges from 10-150 feet above mean sea level (AMSL). There are six drainages/ravines within the project area and five soil types. The drainages, which includes Kawiwi Stream, did not have running water at the time of the survey. The five soil types include Lualualei extremely stony clay, 3 to 35 percent slopes; Lualualei clay, 0 to 2 percent slopes (used for cultivation of sugar cane and truck crops, and for pasture and urban development); Lualualei stony clay, 2 to 6 percent slopes (used for cultivation of sugar cane and truck crops, and for urban development, military installations, and pasture); Hanalei silty clay, 0 to 2 percent slopes (used for cultivation of taro, sugar cane, and vegetables, and for pasture); and coral or cemented calcareous sand (Foote et al. 1972:29,38,84-85). The primary soil type in the project area is Lualualei extremely stony clay, 3 to 35 percent slopes. It is of interest that Foote states, "it is impractical to cultivate this soil unless the stones are removed" (1972:85), which helps to account for the large number of rock clearing piles located throughout the project area.

The climate in the project area is typical of leeward Oahu, with average annual precipitation of c. 20 inches and average temperatures ranging from 72-80 degrees F. Vegetation in the project area is characteristic of Oahu's Waianae Coast. Within the project area are scattered stands of kiawe (Prosopis pallida [Humb. and Bonpl. ex Willd.] HBK); koa-haole (Leucaena glauca [L.] Benth.); lantana (Lantana camara L.); lion's ear (Leonotis nepetaefolia L.); and various grasses and weeds.

#### PREVIOUS ARCHAEOLOGICAL WORK

Only a limited amount of archaeological work has been conducted in the Waianae area. One of the more extensive studies on the area is by Roger C. Green (Makaha Valley Historical Project [1980]). Green's data suggests that permanent settlement within Makaha ahupua'a was not on the coast (which was the basic assumption) but inland (1980:70). Green indicates that there is evidence of permanent housing, and evidence of larger structures for religious and social functions, in the inland part of lower Makaha Valley. Green's study also indicated that irrigated taro plots in the valley were not confined to the upper area, but had begun along a main ditch leading from the upper valley down to the lower valley (1980:70).

Other archaeological studies conducted within the Waianae District include (a) Barrera's 1975 survey of c. 70 acres, during which six sites (five historic stone structures and a subsurface midden deposit) were located (Barrera 1975); (b) Cordy's 1976 survey of 130 acres, during which fifteen sites, most of which were historic and/or heavily disturbed, were located (Cordy 1976); and (c) Mayberry and Rosendahl's 1987 survey of 415 acres, during which 26 sites, consisting primarily of historic walls and mounds, were identified (Mayberry and Rosendahl 1988).

## SUMMARY OF HISTORIC LAND USE

Waianae is a dry coastal strip of land with poor soil and only four small streams (extending from the mountains to the sea) running through it (Handy et al. 1972:467-468). The name "Waianae" can be translated thus: wai (water) 'anae (full-grown mullet), or "water-of-the-mullet." Waianae may have been named in reference to a freshwater mullet fishpond (known as Pueha) which was once present in the area (Handy et al. 1972:468). Waianae Kai is the largest valley on the leeward side of the Waianae mountain range. Puu Kawiwi is the name of a prominent mountain peak on the Waianae-Makaha border that, according to historical accounts, was used as a place of refuge during times of war (Sterling and Summers 1978:75).

Early land use in the Waianae region is documented by historical accounts, early tax records, and informant information. The earliest account of Waianae is by the voyager Vancouver in 1798, who described Waianae as "one barren, rocky waste, nearly destitute of verdure, cultivation, or inhabitants," the exception being a single "narrow valley, presenting a fertile cultivated aspect" (Handy 1940:83). Vancouver states that Waianae Village was "situated in a grove of cocoanut and other trees" approximately one mile south of the "high rock" (which is probably Mauna Lahilahi), and that Waianae was the only village they had seen "westward of Opooroah."

Although the soil of Waianae was generally poor, it was nonetheless cultivated during both the prehistoric and historic periods. During the prehistoric period, extensive terraces were present along the various Waianae streams (Handy 1940:84), and Waianae Valley once had a "considerable development of wet taro culture along the main stream and its tributaries in the uplands" that extended down into the broad areas used for sugar cane in more recent times (Handy 1940:84). Waianae land was also used for ranching (ranching in the area dates to the 1850s). By 1900, agriculture and ranching had resulted in extensive environmental changes: the valley floor was overgrown with kiawe; extensive water irrigation systems had been constructed; and many prehistoric and historic structures had been destroyed, their stones reused for corrals and property line walls (Mayberry and Rosendahl 1988:4).

The specific Waianae Kai Property project area was once used for sugar cane and taro cultivation. Sugar cane was primarily cultivated by the Waianae Company, Ltd. (also referred to as the Waianae Sugar Plantation or the Waianae Sugar Company), which encompassed 10,000 acres. Waianae Company Ltd., was established in 1878 by Hermann A. Wildemann (McGrath et al. 1973:141). The local Hawaiians cultivated the taro in the area. A local informant, Ernest Verra, who has lived in Waianae all his life, indicates that in the 1930s taro was grown in the wetlands and sugar was grown on the drier slopes within the project area. He remembers that during the 1930s, taro patches were present in the meadow portions of the project area (area of Trenches 6-10), and he also remembers that taro was grown (at some time) in the area near the modern dairy road entrance (area of Trenches 11 and 12). Mr. Verra also indicates that the area occupied



by Mountain View Dairy used to be occupied by a piggery (Ernest Verra, pers. comm.).

During the period of sugar cane cultivation, water shortages were a problem in the project area. There was a constant struggle over water between the sugar company and the local farmers, the military, and new business interests. McGrath et al. (1973:41) mentions that the Waianae tradition was such that Hawaiian taro farmers shared irrigation water with the local Chinese, who raised the sugar cane. The Mikilua lands in Lualualei that were planted by the Waianae Company, Ltd. were supposed to have been fully irrigated by the Kamaile-Mikilua flume, which was to have carried artesian-well water from Makaha Valley. However, Makaha artesian wells were found to have too high a salt content, so fresh water ditched from upper Waianae Valley had to be mixed with it before it was sent on to Mikilua, which of course depleted the already small amount of available fresh water. The Kamaile-Mikilua flume was built by the Waianae Company, Ltd., under the direction of John M. Dowsett (1890s-1931). According to records which may pertain to the flume system, in 1906 Waianae Company, Ltd. obtained a 21-year right-of-way lease on 6.87 acres at \$55 per year for the purpose of constructing a waterway by ditch, pipe, tunnel, or otherwise, 20 ft wide and 14,975 ft long, across land at Lualualei, Waianae. Simultaneously, J.M. Dowsett purchased 827.35 acres of land, around the mill and up into Waianae Valley (Grant 5009), for \$69,700 (Commissioner of Public Lands 1906, IN Kelly, Marion and "Notes on the History of Lualualei"). The Kamaile-Mikilua galvanized iron flume and tunnel system was originally 13,900 feet long, of which 1,500 feet was tunnel and 10,200 feet was iron flume. By the time the flume system was completed, it may have measured as long as 24,100 feet, from the Makaha artesian wells to the cane fields farthest south in Mikilua (Honolulu Advertiser, 6 December 1931). Scarcity of water and the loss of cane lands to the military during WWII contributed to the closing of the Waianae Sugar Plantation on Oct. 17, 1946 (McGrath et al. 1973:140). During its time, it had been one of the most successful, modern, and efficient sugar cane plantations in Hawaii.

Remains of Mikilua flume were recorded (as Site T-1) during the present survey. The flume, which is present on contemporary maps, is non-functional and is collapsed in many places. Historical research provided no definite information on initial construction of the flume; however, the flume does appear on a 1902 map. The flume was probably built in the late 1800s. Also present within the project area were the foundations and associated artifacts of a historic dairy (Site T-23). According to Mr. David Wong, vice-president of Mountain View Dairy, Inc., the old dairy and associated concrete swimming pool (Site T-20) belonged to a Mr. Tim Au. Mr. Au had arthritis and used pool therapy to treat his arthritis.

The following record of early historic occupation and land use of the Waianae Kai Property project area is provided by Ann Yoklavich of Spencer-Mason Architects (see Table 1 and Figure 2 [Land Grant and LCA Location Map]). Records show that Waianae Ahupua'a was originally the property of Kekuanoa, who later returned the land to Crown Lands in

Table 1.

LAND AWARDS

Waianae Kal Property

LCA/Grant #	Apana	Awardee	Term of Aqulait. Uses/Area	Register Description	Testimony Description
Waianae Ahupua'a					
Crown Lands					
Gr. 6504		Fred Meyer, Jr.	Dec. 17, 1915	49.31 ac.	
Gr. 3928		The Waianae Co.	Apr. 21, 1898	6.1 ac.	
Gr. 5009		J.M. Dowsett	Dec. 31, 1906	827.35 ac.	
2953	Ap. 1	Hauna	from Kaapuiki at time of Kekauloohi	7 patches & a pasture 3.52 ac	bounded N. & E. kula, S. Kauanoo's land, W. lo'i ko'ele & Wahineikalai's land
2961	Ap. 1	Akaloa	from Kaapuiki at time of Kekauloohi	4 patches 0.79 ac	bounded N. lo'i ko'ele, E. Kalawalahooalahala's land, S. Nahu's pond, W. Kulepe's land
2971	2 Ap. on M's map (1 in pro)	Paoa	from Kaapuiki at time of Kekauloohi	4 patches & a pasture (& konohiki ko'ele) 1.24 ac (2 Ap.)	bounded N. Mulea's land, E. Kamaua's land, S. Gov. Road, W. Pauli's lo'i
2988	Ap. 2	Lokoino	from Aheakalani in 1846	10 patches & a pasture 2.55 ac.	(Note both descriptions are of 1 Apana, but 2 Apana on map and index) bounded N. Keauhee's land, E. Kapela's land, S. stream & kula, W. kula of Lehano
3018	(2 Ap.)	Mulea	from Kaapuiki at time of Poki	1) Iaro moo 6 patches & a pasture (& konohiki ko'ele) 2) House lot	1) bounded N. lo'i ko'ele and Kekoa's land, E. lo'i ko'ele and S. Paoa's land, W. Haawenui's land 2) bounded N. kula, E. pool, S. Puehu's muliwal, W. government house lot
3022		Kauanoo Kanaloaoo	from Kaapuiki at time of Poki	1.27 ac (2 Ap.) moo land 6 patches & a pasture 4.14 ac	W. government house lot 1) bounded N. lo'i ko'ele, E. & S. "my cultivated kula", W. Kamouo's land 2) bounded N. Hauna's cult. kula, E. Waiale's land, S. Kahoolanako, W. Kamouo's kula
3032		Keahia	from Kaapuiki at time of Liholiho	1 patch & 1 pasture 2.46 ac	bounded N. Nalehu's land, E. Lehanonui's kula, S. Kaukania's land, W. Nalehu's land
					bounded Wa. Hauna's moo land, Mau. Kulepe's patch, Ew. gov. road, Mak. Kamona moo land bounded Wa. Kahai moo land, Mau. stream, Ew. Kauhania moo land, Mak. ko'ele

Table 1. (Cont.)  
Waianae Kai Property

LCA/Grant #	Apana	Awardee	Term of Acquisi.	Uses/Area	Reglstr. Description	Testimony Description
3035		Kalawalahoohalahala	from Kaapuiki at time of Kekauluohi	5 patches 0.59 ac	bounded N. Keku's land, E. Haawenui's land, S. Nalu's pond, W. Akaloa's land	bounded Wa. Kokee iii land, Mau. Haawenui's moo land, Ew. Nalu moo land, Mak. Akaloa moo land
3070		Kekoa no Kaapuiki Kekua	from Kaapuiki at time of Kekauluohi	moo land- 3 patches & a pasture 2.18 ac	bounded	bounded Wa. Puupili pasiuo, Mau. Wahineokalai moo land, Ew. Kumukoa's ko'ele, Mak. Mulea ko'ele
3074		Kamoo Kamoua Kamono	from Kaapuiki at time of Kekauluohi	moo land- 3 patches & a pasture & house site [ko'ele in center] 1.61 ac	bounded N. lo'i ko'ele, E. Kanaloa's land, S. flowing stream, W. Paoa's kula	bounded Wa. Kumukoa ko'ele, Mau. Kanaloano moo land, Ew. gov. trail, Mak. Paoa moo land
3080	Ap. 1	Kamai	from Kaapuiki at time of Kekauluohi	house site 3 ac in 5 Ap.	bounded N. kula, E. Nua's houses, S. Puehu's stream, W. Keauwal's house and lot [4 other apana described]	bounded Wa. Paakea pasture, Mau. Makalo's house site, Ew. Puehu stream, Mak. Aheakalani's house site [2 other apana described]
3085		Kalikipulehiwa	given to him long ago	moo land- 6 patches & a pasture [house & kula] 1.19 ac	no description of boundaries	bounded Wa. Kahai moo land, Mau. Keahia moo land, Ew. ?Kanehania moo land, Mak. Kaakaaka iii land
3094	Ap. 1 & 2	Kauhanea Kauhania	received at time of Kamehameha	1) 8 patches & a house site [8] a pasture 2) 4 patches & a pasture 7.08 ac (2 Ap.)	1) bounded N. Keahia's land, E. Lehano's kula land & houses, S. Nalu's land, W. Nalehu's land 2) N. kula adjoining the pali of Kil, E. Lokoino, S. Lokino's taro lot, W. Kamai's cultivated kula	1) bounded Wa. Keahia moo land, Mau. Maika playground, Ew. Kaohiwaana moo land, Mak. Kealii's ko'ele patch 2) Wa. Kil pali, Mau. Waiakoloba stream, Ew. Nawai's moo land, Mak. Waihee ko'ele
3095		Kahonu	from Kaapuiki, Kahuna bequests to Pooloa	6 patches 1.24 ac (2 Ap.)	bounded N. Kaohiwaana's land, E. Kulepe's land and lot ko'ele, S. Nalu's pond, W. Nalu's land & the ko'ele	bounded Wa. Kokee iii land, Mau. Kalepe moo land, Ew. pali, Mak. Nane moo land
3119		Kaawenui Haawenui		1.81 ac (2 Ap.)	bounded N. lo'i pa'ahao adjoining Kekee, E. Maa's land, S. Pauli's land, W. Kalawalahoohalahala's land	bounded Wa. Kokee iii land, Mau. Mulea moo land, Ew. Pauli moo land, Mak. Kalawalahoohalahala moo land
7334	Ap. 1	Kulepe	from Kaapuiki at time of Kekauluohi	5 lo'i 4.77 ac (5 Ap.)	no description of boundaries	bounded Wa. Kokee iii land, Mau. Akaloa's moo land, Ew. Konohiki ko'ele, Mak. Kahonu's moo land

Table 1. (Cont.)

Waianae Kal Property

LCA/Grant #	Apana	Awardee	Term of Aquisit.	Uses/Area	Register Description	Testimony Description
2970		Patuli	from Kaapuiki at time of Kinau	3 patches & a pasture 1.54 ac	bounded N. Haawenui's land, E. Paea's land, S. kula, W. Naliu's pond	bounded Wa. Haawenui moo land, Mau. Kalai-a moo land, Ew. gov. rd., Mak. Lehanoiki iii land
4465		Nalu		4 lo'i, 2 ponds or 7 patches & a pasture 7.48 ac	[2 other apana described] bounded N. Kahoolalahala's lo'i & Akaloa's lo'i & lo'i ko'ele & Kahonu's lo'i & Kachwaana's lo'i, E. Pauli's pond, S. a pig pen & a hala grove & a coconut grove, W. buirushes	[1 other apana described] bounded Wa. Kauui paili, Mau. Pauli moo land, Ew. Gov. road, Mak. Akaakal sea/beach plant

NOTES

\* Map by Variation in name  
Monsarrat spelling is common  
(Reg. Map in various indexes, Survey Office 375) - maps, and registers undated of land holdings.

N. = North  
E. = East  
S. = South  
W. = West

Wa. = Waianae direction  
Mau. = Mauka  
Ew. = Ewa  
Mak. = Makai

All spellings are given as they appear in the typed translation of the Native Register

All spellings are given as they appear in the typed translation of the Native Testimony

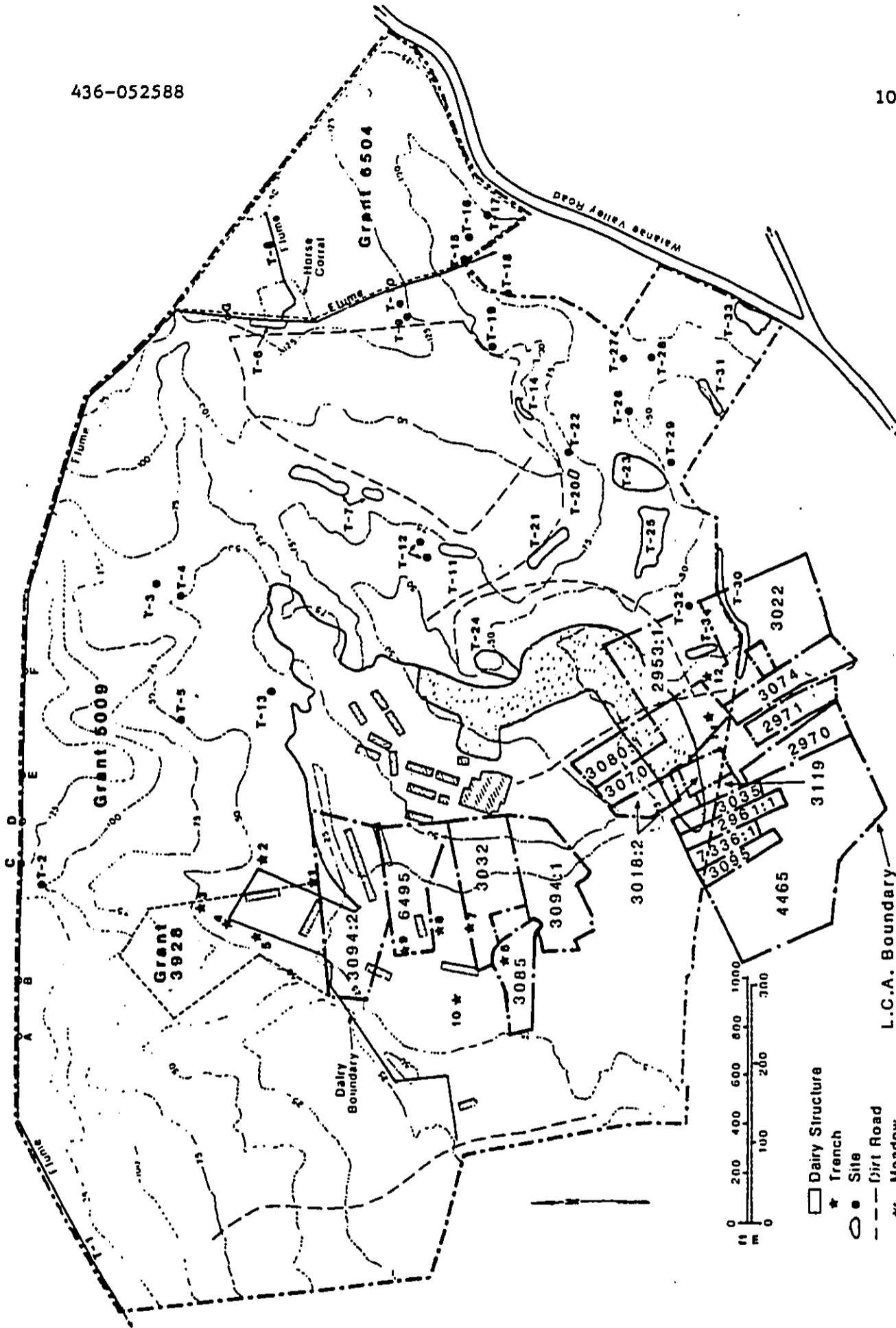


FIGURE 2. Land Grant and LCA Location Map

exchange for land debts. Subsequently, 16 Land Commission Awards (LCAs), and three land grants were recorded within the present project area. Land grants include: Gr.6504 to Fred Meyer, Jr.; Gr.3928 to The Waianae Co.; and Gr.5009 to J.M. Dowsett. LCAs include: 2953:1 to Hauna; 2961:1 to Akaloa; 2971 to Paoa; 2988:2 to Lokoino; 3018:2 to Mulea; 3022 to Kauanauoo and Kanaloauoo; 3032 to Keshia; 3035 to Kalawaihoohalahala; 3070 to Kekoa no Kaapuki and Kekua; 3074 to Kamoao, Kamoua, and Kamono; 3080:1 to Kamai; 3085 to Kailikupelehiwa; 3094:1,2 to Kauhanea and Kauhania; 3095 to Kahonu; 3119 to Kaawenui and Haawenui; and 7334:1 to Kulepe. Additionally, records show two LCAs close to the project boundary: 2970 to Pauali and 4465 to Nalu.

#### FIELD METHODS AND PROCEDURES

The reconnaissance survey field work was conducted May 5-20, 1988. A 100% ground surface survey was accomplished using a series of systematic pedestrian sweeps. The only area not covered by the surface survey was the property actively operated by Mountain View Dairy. The distance between crew members varied from 30-90 feet, depending upon terrain, vegetation encountered, and the amount of cultivation or modification to the land. Identified sites were assigned a sequential temporary field number (T-#) and were flagged. All identified sites were plotted on project contour maps (1":200' scale) and on aerial photographs (1":200' scale, 12-5-82). Only eight of the 34 sites identified warranted complete recording. Recording included (a) filling out standard PHRI site and feature record forms, (b) mapping all sites to scale using compass and metric tape, (c) photographing each site using 35 mm black-and-white film, and (d) tagging each site with an aluminum strip bearing the PHRI project number (88-436), the site number, and the date.

At Site T-24, four shovel tests were excavated to help determine the maximum extent of the deposit at the site. The shovel tests were placed in the area of each feature and throughout the length of the site. Each shovel test measured c. 0.50 by 0.50 m, and each test was excavated 30-50 cmbs. Material from each shovel unit was screened through 1/8-in mesh, and stratigraphic information from each shovel unit was recorded. In addition, a cut was made into an ash-like lime deposit at Site T-24 so that a profile and samples could be obtained.

Twelve backhoe test trenches were excavated in areas of previous land grants and Land Commission Awards. Trench excavation was conducted in order to determine the presence or absence of buried cultural deposits. The trenches were monitored during excavation, then each trench was recorded in detail, was profiled, and the stratigraphy of each trench was photographed. In addition, soil samples from every layer of each trench were collected, and five samples were processed for radiocarbon dating. After all the information was gathered, and after each trench was precisely located on project maps, the trenches were backfilled.

## FINDINGS

Thirty-four sites (45 component features) were recorded during the present survey. The sites, all newly identified, are summarized in Table 2 according to site number, formal type, tentative functional interpretation, and Cultural Resource Management (CRM) Value Mode Assessments; and the locations of the sites are shown on Figure 1. Formal features present at the sites include rock piles, walls, dams, flumes, ditches, a terrace, a coral and basalt lithic scatter, a concrete swimming pool, a well, concrete foundations, a bridge, and a culvert. Probable functional interpretations for the features include agricultural (historic), tool manufacture, habitation, transportation, recreation, erosion and water control.

### SURFACE SURVEY

As mentioned previously, because most of the 34 sites in the project area were of little archaeological value, i.e., consisting of recent agricultural rock clearings and modern material associated with sugar cane cultivation and dairy operation, only eight were recorded in detail (Sites T-1, T-2, T-3, T-4, T-5, T-8, T-13, and T-24). Detailed descriptions of these eight sites are presented in Appendix A.

Of the eight sites, seven (Sites T-1 thru T-5, T-8, and T-13) are probably related to Waianae Sugar Company sugar cultivation. Site T-1 is Mikilua Flume, which was used to transport water to the sugar fields (Figures 3 and 4). Mikilua Flume is depicted on a May 1902 tracing of M.D. Monsarrat's map of Waianae, Oahu (scale 1:3600) (Monsarrat 1902). The flume does not appear on another (assumed earlier) undated map of Waianae by M.D. Monsarrat (Monsarrat nd). This would suggest the flume was constructed perhaps in the late 1800s. Site T-8 consists of the remnants of an earthen ditch. This ditch may be the same ditch depicted on a May 1906 map by M.D. Monsarrat of the forest reserve in Waianae Valley (Monsarrat 1906). Sites T-2, T-3, and T-4 (Figure 5) consist of rock retaining walls probably related to sugar cane irrigation. Site T-13 is a rock and concrete retaining wall with dam, on which is inscribed "Dec. 1939" (Figure 6).

Site T-24, a complex with prehistoric and historic components, is the most significant site identified within the project area (Figure 7). Site T-24 consists of a historic retaining wall and terrace, and a coral, lithic, and midden scatter with a possible surface paving. As part of field work, four shovel tests were excavated at Site T-24 in order to determine the extent of the cultural deposit at the site. Shovel Unit 1 (SU-1) was placed within the terrace, near the retaining wall. Three layers were identified in the unit. Historic materials (a metal file and metal fragments) were present in the unit at 30-35 cmbs. Streaks of lime were present in silty clay at 40-50 cmbs. The streaks may represent cane cultivation. SU-2 was placed in the center of the main coral and lithic

Table 2.  
SUMMARY OF IDENTIFIED SITES - WAJAMAE KAI PROPERTY PROJECT AREA

Site Number	Formal Site Type	Tentative Functional Interpretation	ACRM Value Mode Assess.		Field Work Tasks		Comments
			R	I C	DR	SC EX	
T-1	Flume (8)	Agriculture	L	L L	-	-	Historic Mikilus flume used for sugar cane cultivation.
T-2	Wall	Agriculture	L	L L	-	-	Rock diversion in drainage.
T-3	Wall	Agriculture	L	L L	-	-	Rock retaining wall along drainage.
T-4	Complex (2)	Agriculture	L	L L	-	-	Two rock retaining walls on either side of drainage.
T-5	Wall	Agriculture	L	L L	-	-	Rock retaining wall along fence line.
T-6	Rock piles	Agriculture	L	L L	-	-	Historic agricultural clearing.
T-7	Rock piles	Agriculture	L	L L	-	-	Historic agricultural clearing.
T-8	Ditch	Agriculture	L	L L	-	-	May be part of ditch present on May 1906 map.
T-9	Rock pile	Agriculture	L	L L	-	-	Historic agricultural clearing.
T-10	Wall	Agriculture	L	L L	-	-	Dozer push or historic agricultural clearing.
T-11	Rock piles	Agriculture	L	L L	-	-	Historic agricultural clearing.
T-12	Rock piles	Agriculture	L	L L	-	-	Two historic agricultural clearings.
T-13	Complex (2)	Agriculture	L	L L	-	-	Two rock and concrete retaining walls with dam and diversion. Date in concrete: "Dec. 1939," probably associated with sugar cane cultivation.
T-14	Rock pile	Agriculture	L	L L	-	-	Historic agricultural clearing.
T-15	Dam	Agriculture	L	L L	-	-	Rock dam across drainage.
T-16	Dam	Agriculture	L	L L	-	-	Rock dam with associated historic scrap metal.
T-17	Wall	Erosion control	L	L L	-	-	Wooden reinforcement along cut bank below collapsed house.
T-18	Dam	Agriculture	L	L L	-	-	Rock dam with rock reinforcement along side of drainage.
T-19	Rock pile	Agriculture	L	L L	-	-	Historic agricultural clearing.
T-20	Swimming pool	Recreation	L	L L	-	-	Large concrete pool located upslope from historic dairy. Owned by Mr. Tim Au and used as part of his therapy for his arthritic condition.

\* Cultural Resource Mgmt--Nature: R = scientific research, I = interpretive, C = cultural; Value Mode Assessment Degree: H = high, M = moderate, L = low

# Field Work Tasks: DR = detailed recording (scaled drawings, photographs, and written descriptions), SC = surface collections, EX = test excavations.



Table 2. (Cont.)

Site Number	Formal Site Type	Tentative Functional Interpretation	CRM Value Mode Assess.			#Further Work	Comments
			R	I	C		
T-21	Flume/Ditch	Agriculture	L	L	L	- - -	Includes flume section, rock and concrete ditch, large ceramic pipe, sheet metal, railroad ties, and rock piles. Associated with dairy or sugar cane cultivation.
T-22	Rock pile	Agriculture	L	L	L	- - -	Historic agricultural clearing.
T-23	Complex (7)	Agriculture	L	L	L	- - -	Historic dairy owned by Mr. Tim Au. Includes six large concrete foundations and a concrete watering trough. Dates inscribed in concrete are from 1950 and 1951.
T-24	Complex (2)	Tool Manufacture/ Habitation	M	L	L	- - -	Coral scatter, basalt flakes, Conus shell, possible paving, and historic retaining wall, terrace, and lime deposits. Four shovel tests conducted at the site; prehistoric deposit c. 35 cubs (maximum).
T-25	Rock pile	Agriculture	L	L	L	- - -	Ten rock piles located just west of historic dairy (T-23).
T-26	Bridge	Transportation	L	L	L	- - -	Concrete bridge spanning drainage on road cut to dairy (T-23).
T-27	Rock pile	Agricultural	L	L	L	- - -	Historic agricultural clearing.
T-28	Culvert	Water control	L	L	L	- - -	Rock and concrete culvert located under a road within a drainage.
T-29	Rock pile	Agriculture	L	L	L	- - -	Historic agricultural clearing.
T-30	Well	Agriculture	L	L	L	- - -	Rock retaining wall along drainage at south project boundary.
T-31	Rock pile	Agriculture	L	L	L	- - -	Historic agricultural clearing.
T-32	Well	Agriculture	L	L	L	- - -	Concrete wall associated with irrigation pipe and agricultural clearing.
T-33	Foundation	Habitation	L	L	L	- - -	Concrete house foundation associated with scattered historic debris.
T-34	Flume	Agriculture	L	L	L	- - -	Concrete containers and metal flume sections; may be associated with T-32. Date inscribed in concrete: "June 19, 1937"; probably associated with sugar cane cultivation.

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Figure 3. SITE T-1. From within Mikilua Flume. View to east.  
(PHRI Neg.793:34)

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Figure 4. SITE T-1, FEATURE C. Rock support wall and fallen wood.  
View to east. (PHRI Neg.793:32)



Figure 5. SITE T-4, FEATURE A. Rock retaining wall. View to west.  
(PHRI Neg.793:4)

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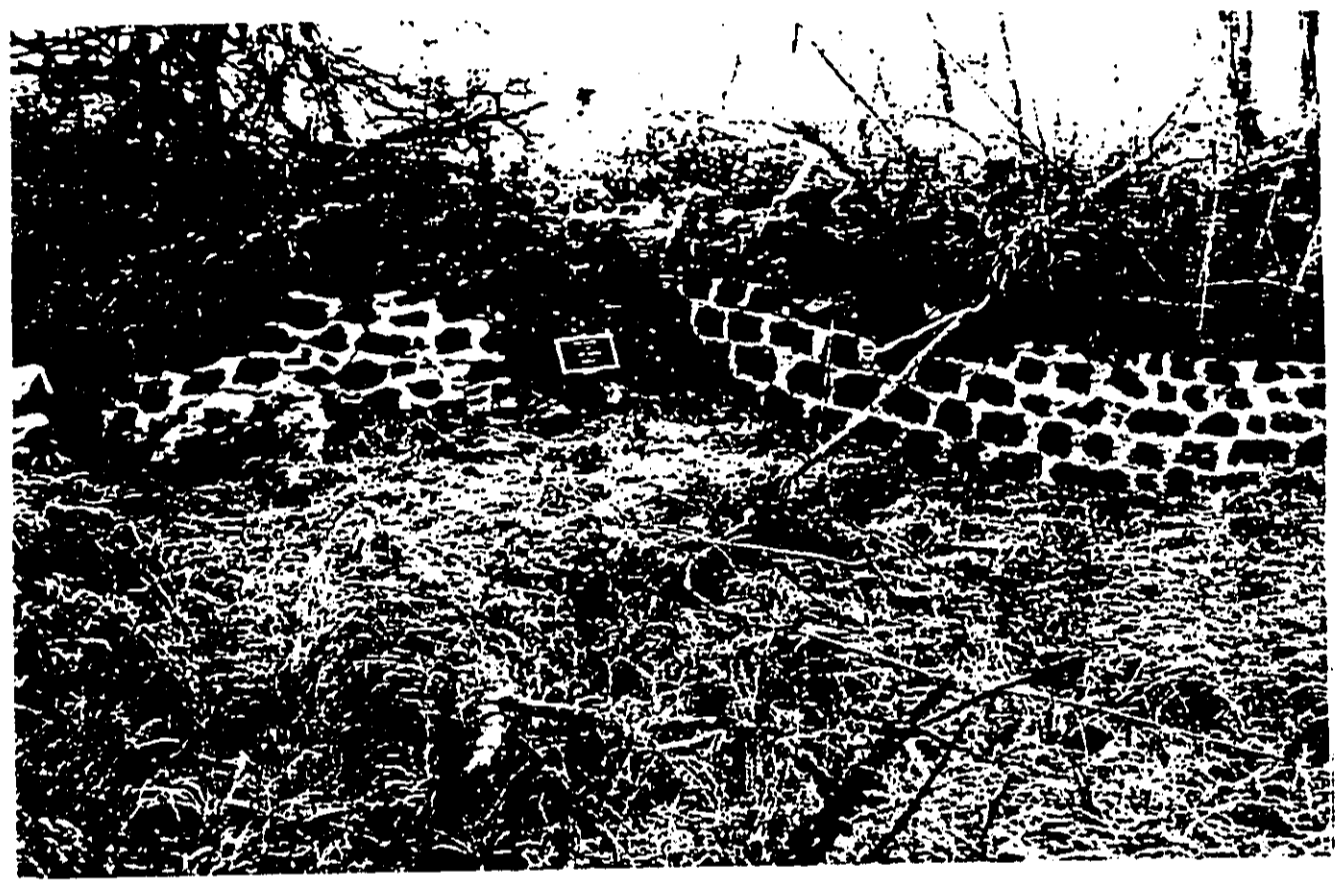


Figure 6. SITE T-13, FEATURE A. Dam/diversion in creek. View to northwest. (PHRI Neg.793:6)

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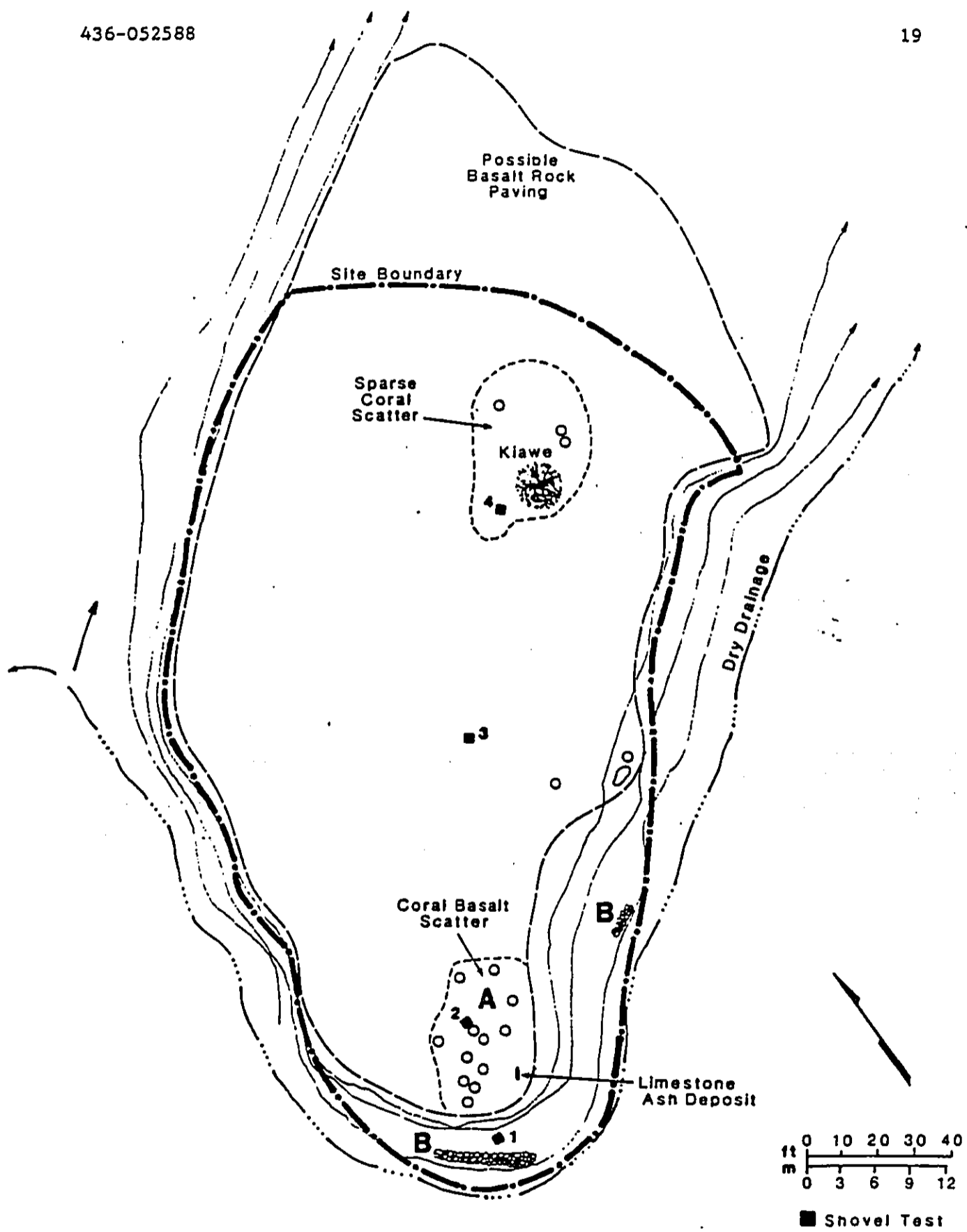
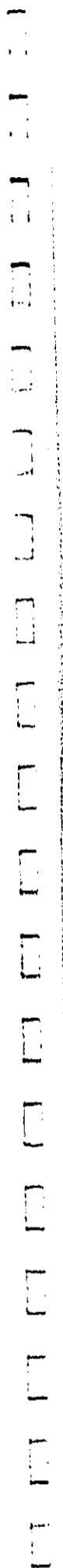


FIGURE 7. Site T-24

G-26



scatter. SU-2 yielded four layers. Pieces of coral were recovered at 17 cmbs. At 35 cmbs, soil in the unit lightened in color (contained more silt and sand). The cultural deposit appeared to terminate at 35 cmbs (maximum). SU-3 and -4 were excavated in the possible paved area. Cultural material had been observed on the surface of the paved area, but no cultural material was recovered below surface. Besides, the shovel tests, a cut was made into an ash-like lime deposit at Site T-24. A sample of the deposit was collected.

#### SUBSURFACE RECONNAISSANCE

Twelve backhoe test trenches were excavated in the general vicinities of former LCAs and land grants. The approximate locations of the trenches are shown on Figure 1, stratigraphic descriptions for each trench are summarized in Table 3, detailed stratigraphic descriptions for representative trenches are presented in Table 4, profiles of the detailed trenches (Trench 2, 4, 7 and 11) are shown in Figure 8, and a general view of the Trench 6-10 area is presented in Figure 9.

Seven of the 12 trenches yielded gley or gley-like clay deposits--deposits which probably represent wetland taro cultivation. Five samples of the gley deposits were submitted to Beta Analytic, Inc., Coral Gables, Florida for radiocarbon age determination. Unfortunately, preliminary processing indicated an oil-based contaminate was present in all the samples. Since the samples were from various localities, it was apparent that the contamination was widespread. It was speculated that former sugar or dairy operations might have used an oil-based pesticide or herbicide in the area. Because of the contamination, which was expected to slightly skew the early ends of results, only one sample was initially fully processed. The results for this sample were favorable enough to recommend the other samples be processed (letter of June 14, 1988 from Dr. Jerry J. Stipp, Beta Analytic, Inc., to Dr. Alan E. Haun, PHRI). Results for all processed samples are presented in Table 5. Two of the five samples (RC-365 and RC-367) were found to contain insufficient carbon for dating. Sample RC-364 from Trench 7, Layer III, yielded a calibrated range of AD 1270-1480. Sample RC-366 from Trench 10, Layer IV, yielded three calibrated ranges: AD 1299-1366, AD 1370-1510, and AD 1609-1611. Sample RC-368 from Trench 2, Layer V yielded a calibrated range of AD 1170-1430.

Of the three ranges for RC-366, the former two are considered the more likely. Including only the former two ranges from RC-366 (which overall span 1299-1510) the ranges from the three samples show considerable consistency. The ranges overall span 340 years (AD 1170-1510), and when the former two ranges from RC-366 are considered as one long range (1299-1510), dates from the three samples overlap to create a most probable range of 130 years (AD 1300-1430).

As mentioned above, it was reasoned that if the samples were skewed they would be skewed on the early side. Considering the possible skewing,

the dates still fall into the range of what might be expected in the project area specifically, and for Hawaiian pondfield cultivation in general. Given the location of the project area, an area documented to have been used till as late as the 1930s to grow taro, it was expected that buried gleyed prehistoric pondfield layers would be encountered and that those layers would date to roughly between 1200-1600.



Table 3.

## SUMMARY OF BACKHOE TEST TRENCH STRATIGRAPHY\*

Trench	Layer	Description
1	I	0-35 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay loam; gradual and wavy boundary; surface roots
	II	35-63 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay loam; clear and wavy boundary; with cobbles
	III	63-98 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay loam; clear and wavy boundary
	IV	98-115 cmbs; very dark brown (10YR 2/2 moist) silty clay; abrupt and wavy boundary; charcoal flecks
	V	115-122 cmbs; very dark gray (10YR 3/1 moist) silty clay; abrupt and smooth boundary
	VI	122-160 cmbs; very dark gray (5YR 3/1 moist) silty clay loam; abrupt and smooth boundary
	VII	160-235 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay; abrupt and wavy boundary; charcoal flecks from 200-215 cmbs within Layer VII
	VIII	235-260+ cmbs; very dark grayish-brown (10YR 3/2 moist) sandy clay; bottom boundary unknown; large cobbles
3	I	0-68 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay loam; clear and wavy boundary
	II	68-170 cmbs; dark brown (10YR 3/3 moist) sandy clay; smooth and clear boundary; basalt gravels, pebbles and cobbles
	IIIa	170-210 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay; smooth and clear boundary
	IIIb	210-230+ cmbs; dark grayish-brown (10YR 4/2 moist) sandy clay; bottom boundary unknown

\*See Table 4 for detailed stratigraphic descriptions of representative trenches (Trenches 2, 4, 7, and 11).

Table 3. (Cont.)

Trench	Layer	Description
5	I	0-110 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay; abrupt and smooth boundary
	II	110-150 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay with gravels; clear and wavy boundary
	III	150-230 cmbs; dark brown (10YR 3/3 moist) clay; clear and wavy boundary
	IV	230-290+ cmbs; very dark brown (10YR 2/2 moist) silty clay with gravels and rocks; bottom boundary unknown
6	I	0-15 cmbs; dark brown (10YR 3/3 moist) clay loam with surface roots; gradual and wavy boundary
	II	15-128 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay; clear and wavy boundary; fill layer
	III	128-235 cmbs; dark brown (10YR 3/3 moist) gley mottled with rusty brown oxidized molds; clear and wavy boundary
	IV	235-250+ cmbs; dark grayish-brown (2.5Y 4/2 moist) gley; terminated at water table at 250 cmbs; bottom boundary unknown
8	I	0-15 cmbs; very dark grayish-brown (10YR 3/2 moist) clay loam with surface roots; gradual and wavy boundary
	II	15-50 cmbs; very dark grayish-brown (10YR 3/2 moist) clay loam; clear and smooth boundary; fill layer
	IIIa	50-90 cmbs; dark brown (10YR 3/3 moist) silty clay; clear and smooth boundary
	IIIb	65-70 cmbs; dark brown (10YR 3/3 moist) gley-like clay; clear and smooth boundary; Layer IIIb within Layer IIIa
	IV	90-185 cmbs; very dark gray (10YR 3/1 moist) gley-like clay; contains root mold and charcoal flecks; clear and smooth boundary

Table 3. (Cont.)

Trench	Layer	Description
8.	V	185-235 cmbs; very dark grayish-brown (10YR 3/2 moist) gley-like silty clay; contains charcoal flecks; clear and smooth boundary
	VI	235-275 cmbs; very dark grayish-brown (10YR 3/2 moist) gley; contains charcoal; clear and smooth boundary; sample processed for radiocarbon dating
	VII	275-285+ cmbs; dark grayish-brown (10YR 4/2 moist) gley; terminated at water table at 285 cmbs; bottom boundary unknown
9	I	0-15 cmbs; very dark brown (10YR 2/2 moist) silty clay loam with surface roots; diffuse and smooth boundary
	II	15-42 cmbs; very dark brown (10YR 2/2 moist) silty clay loam; gradual and smooth boundary
	III	42-114 cmbs; very dark grayish-brown (10YR 3/2 moist) gley-like clay with rusty brown root molds; clear and smooth boundary; some charcoal flecks
	IV	114-224 cmbs; very dark gray (5YR 3/1 moist) silty gley; clear and smooth boundary
	V	224-270 cmbs; very dark grayish-brown (10YR 3/2 moist) gley-like coarse clay; clear and smooth boundary
	VI	270-285+ cmbs; very dark grayish-brown (10YR 3/2 moist) gley-like clay; some charcoal flecks; terminated at water table at 280 cmbs; bottom boundary unknown

Table 3. (Cont.)

Trench	Layer	Description
10	I	0-15 cmbs; dark brown (7.5 YR 3/2 moist) silty loam; surface duff and roots; clear and smooth boundary
	II	15-75 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay loam; clear and smooth boundary
	III	75-85 cmbs; dark brown (7.5 YR 3/2 moist) sandy clay loam with gravels; clear and smooth boundary
	IV	85-150 cmbs; dark brown (7.5YR 3/2 moist) clay loam; clear and smooth boundary; some oxidation; sample processed for C-14 date
	V	150-225 cmbs; very dark grayish-brown (10YR 3/2 moist) gley with charcoal flecks and oxidation; charcoal flecks at 175-180 cmbs; clear and smooth boundary, sample processed for radiocarbon dating
	VI	225-270+ cmbs; very dark gray (10YR 3/1 moist) gley; not as fine-grained as Layer V; terminated at water table at 270 cmbs; bottom boundary unknown
12	I	0-55 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay loam; disturbed fill containing recent historic rubbish; clear and wavy boundary
	II	55-90 cmbs; dark brown (10YR 3/3 moist) silty clay loam; some fill; abrupt and smooth boundary
	III	90-120 cmbs; dark brown (10YR 3/3 moist) gley-like silty clay; contains charcoal flecks; abrupt and smooth boundary
	IV	120-250 cmbs; very dark gray (10YR 3/1 moist) gley-like clay; contains charcoal flecks and some oxidized roots; abrupt and smooth boundary
	V	250-280+ cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay with limestone; terminated at large limestone and basalt boulders at 280 cmbs

Table 4.

## DETAILED STRATIGRAPHY OF REPRESENTATIVE BACKHOE TEST TRENCHES

Trench Layer	Description
2 I	0-60 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay loam; strong, fine to coarse, angular blocky structure; hard, friable, slightly sticky, nonplastic consistence; clear and wavy boundary; common, medium, tubular roots
II	60-80 cmbs; dark brown (10YR 3/3 moist) silty loam with waterworn pebbles; weak, very fine to medium, granular structure; soft, loose, nonsticky, nonplastic consistence; abrupt and smooth boundary; few, micro, tubular roots
III	80-90 cmbs; very dark grayish-brown (10YR 3/2 moist) sandy loam with gravel; moderate, fine to medium, single-grain structure; soft, very friable, slightly sticky, nonplastic consistence; abrupt and smooth boundary; few, micro, tubular roots
IV	90-100 cmbs; dark grayish-brown (10YR 4/2 moist) silt loam; structureless, very fine, single-grain structure; soft, very friable, nonsticky, nonplastic consistence; abrupt and smooth boundary; few micro, tubular roots
V	100-110 cmbs; brown (10YR 4/3 moist) silty clay with gravel; weak, very fine to medium, single-grain structure; slightly hard, friable, nonsticky, nonplastic consistence; abrupt and smooth boundary; few, micro, tubular roots; charcoal lens from 110-111 cmbs
VI	110-140 cmbs; very dark gray (10YR 3/1 moist) clay loam; weak, very fine to coarse, single-grain structure; soft, very friable, slightly sticky, nonplastic consistence; clear and wavy boundary; no roots; charcoal lens from 115-119 cmbs; coral flecks throughout Layer VI
VII	140-175 cmbs; very dark gray (5YR 3/1 moist) clay with gravel and cobbles; strong, fine to coarse, angular blocky structure; slightly hard, friable, slightly sticky, nonplastic consistence; abrupt and smooth boundary; no roots; charcoal flecks at bottom of Layer VII from 165-175 cmbs
VIII	175-280+ cmbs; dark brown (10YR3/3 moist) silty clay; moderate, very fine to coarse, single-grain structure; slightly hard, very friable, nonsticky, nonplastic consistence; bottom boundary unknown; terminated at 280 cmbs; no roots

Table 4. (Cont.)

Trench	Layer	Description
4	I	0-45 cmbs; dark brown (7.5YR 3/2 moist) silty clay loam; weak, very fine to medium, granular to single-grain structure; soft, very friable, slightly sticky, nonplastic, consistence; clear and smooth boundary; few, medium to coarse, tubular roots; gravel lens within Layer I from 15-20 cmbs
	IIA	45-170 cmbs; very dark, grayish-brown (10YR 3/2 moist) silty clay with cobbles and gravel; moderate, fine to medium, granular structure; soft, friable, nonsticky, nonplastic consistence; clear and smooth boundary; no roots
	IIB	80-95 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay; moderate, medium, granular to single-grain structure; soft, very friable, slightly sticky, nonplastic consistence; clear and smooth boundary; no roots; Layer IIB is distinct within Layer IIA
	III	170-230 cmbs+; dark brown (10YR 3/3 moist) clay; moderate medium to coarse, angular blocky structure; slightly hard, very friable, slightly sticky, nonplastic consistence; bottom boundary unknown, terminated at 230 cmbs; no roots
7	I	0-15 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay loam; weak, very fine to medium, single-grain structure; slightly hard, very friable, slightly sticky nonplastic consistence; gradual and wavy boundary; many fine to medium tubular roots
	II	15-100 cmbs; dark brown (10YR 3/3 moist) clay loam; strong fine to medium, angular blocky structure; hard, friable slightly sticky, nonplastic consistence; gradual and wavy boundary; few very fine tubular roots; charcoal flecks throughout Layer II; very diffuse charcoal lens from 88-92 cmbs

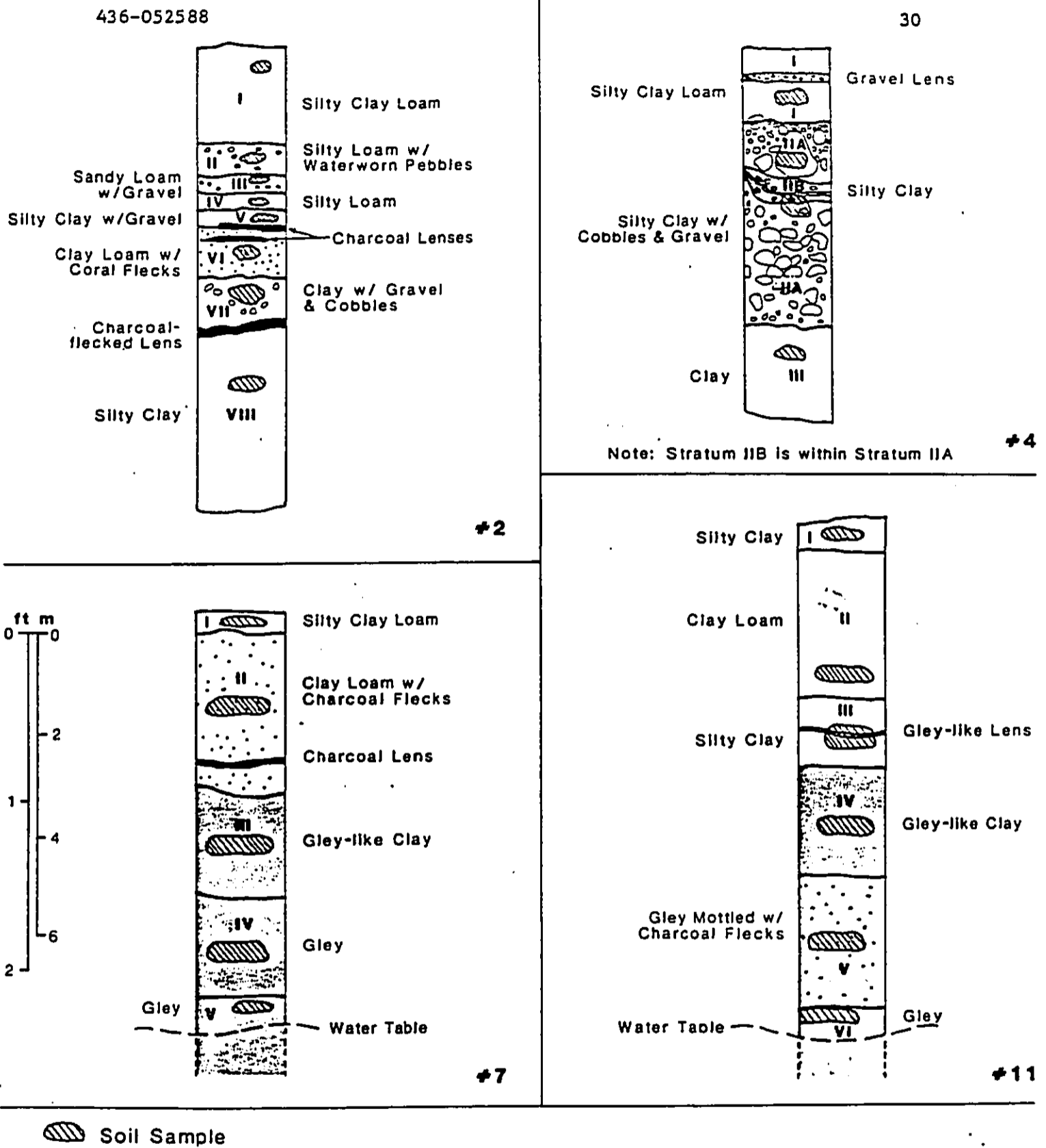
Table 4. (Cont.)

Trench	Layer	Description
7	III	100-160 cmbs; very dark grayish-brown (10YR 3/2 moist) gley-like clay; strong, fine to coarse, angular blocky structure; slightly hard, friable, sticky, nonplastic consistence; clear and wavy boundary; very few, very fine tubular roots; sample of Layer III processed for radiocarbon dating
	IV	160-220 cmbs; very dark gray (10YR 3/1 moist) gley; structureless, medium to very coarse, single-grain structure; very hard, firm, nonsticky, slightly plastic consistence; clear and smooth boundary; no roots
	V	220-240+ cmbs; gray (5Y 5/1 moist) gley; structureless, medium to very coarse, single-grain structure; soft, very friable, nonsticky, plastic consistence; bottom boundary unknown, terminated at water table at 240 cmbs; no roots
11	I	0-20 cmbs; very dark grayish-brown (10YR 3/2 moist) silty clay; weak, very fine to medium, single-grain structure; slightly hard, friable, nonsticky, nonplastic consistence; clear and wavy boundary; many micro to fine tubular roots
	II	20-110 cmbs; very dark grayish-brown (10YR 3/2 moist) clay loam; moderate, fine to coarse, angular blocky structure; slightly hard, friable, nonsticky, nonplastic consistence; abrupt and smooth boundary; few, fine, tubular roots
	III	110-150 cmbs; dark brown (10YR 3/3 moist) silty clay; weak, very fine to coarse, single-grain structure; soft, very friable, nonsticky, plastic consistence; abrupt and smooth boundary; very few, fine to medium, tubular roots; gley-like lens in Layer III from 130-132 cmbs
	IV	150-215 cmbs; very dark gray (10YR 3/1 moist) gley-like clay; strong, fine to medium, granular to single-grain structure; soft, very friable, slightly sticky, nonplastic consistence; abrupt and smooth boundary; very few, fine, tubular roots; the clay in Layer IV is mottled with red oxidized roots

Table 4. (Cont.)

Trench	Layer	Description
11	V	215-295 cmbs; very dark gray (5YR 3/1 moist) gley; structureless, very fine, single-grain structure; very hard, very friable, slightly sticky, plastic consistence; abrupt and smooth boundary; no roots; Layer V contains red oxidized roots and charcoal flecks; sample of Layer V processed for radiocarbon dating
	IV	295-315 cmbs+; very dark gray (10YR 3/1 moist) gley; structureless, very fine, single-grain structure; hard, very friable, slightly sticky, plastic consistence; bottom boundary unknown, terminated at water table at 315 cmbs; no roots





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Figure 9. GENERAL VIEW OF AREA OF TRENCHES 6-10. View to east.  
(PHRI Neg.794:24)

Table 5.

SUMMARY OF RADIOCARBON AGE DETERMINATIONS  
WAIANAË KAI PROPERTY

PHRI Lab.No. RC-	Lab. No. BETA-	Provenience	C-14 Age Yrs. B.P. (one sigma)	C-13/ C-12 Ratio	C-13 Adjusted C-14 Age Yrs. B.P.	*Calendric Range Yrs. AD
364	26102	Trench 7 Layer III 130-140 cmbs	450 $\pm$ 90	-18.8	550 $\pm$ 90	1270-1480
365	--	Trench 8 Layer VI 250-260 cmbs	--	--	--	Insufficient carbon
366	26104	Trench 10 Layer IV 110-120 cmbs	350 $\pm$ 60	-16.2	490 $\pm$ 70	1299-1366 <sup>#</sup> 1370-1510 <sup>#</sup> 1609-1611
367	--	Trench 10 Layer V 170-185 cmbs	--	--	--	Insufficient carbon
368	26106	Trench 2 Layer V 250-260 cmbs	630 $\pm$ 100	-22.6	670 $\pm$ 100**	1170-1430

\*Calibrated according to Stuiver and Pearson (1986). Range at two sigmas.

#Selected as probable age range(s).

\*\*Oiliest sample; had detectable oil scent.

## CONCLUSION

### DISCUSSION

During the present survey, 34 sites (45 component features) were located. Only eight of the 34 sites warranted complete recordation. Formal feature types present in the project area include rock piles, walls, dams, flumes, ditches, a terrace, a coral and basalt lithic scatter, a concrete swimming pool, a well, concrete foundations, a bridge, and a culvert. Probable functional interpretations include agricultural (historic), tool manufacture, habitation, transportation, recreation, erosion, and water control.

The sites in the Waianae Kai Property project area include remains dating to the prehistoric and historic periods. Historic period remains are found at all the sites (T-1 through T-34). Historic remains consist primarily of agricultural clearing rock piles, irrigation features related to sugar cane cultivation, and features associated with a modern dairy. The only prehistoric site identified within the project area is Site T-24, which also has a historic component. The prehistoric component of T-24 consists of a coral, midden, and lithic scatter with a possible paved area. Shovel tests conducted within the scatter indicate the scatter extends to approximately 35 cmbs.

As part of the present survey, twelve backhoe trenches were excavated in the general areas of former LCA awards and land grants. Seven of the 12 trenches yielded evidence (gley or gley-like deposits) which indicates that wetland taro cultivation had occurred along the drainages within the project area. Five samples from trench gley layers were submitted for radiocarbon analyses. Two of the five samples were found to contain insufficient carbon for analysis. The remaining three samples (RC-364, -366, and -368) yielded age ranges which overall span 340 years (AD 1170-1510) (excluding the least likely of three ranges yielded by RC-366). When the two most likely ranges yielded by sample RC-366 are considered as a single long range (AD 1299-1510), the ranges of the three samples overlap to produce a most likely range of 130 years (AD 1300-1430).

As mentioned in the Findings section of this report, because all samples were slightly contaminated, it was expected that the early ends of their ranges would be skewed somewhat. Considering the skewing factor, the dates derived still are well within the range of dates expected for the project area; i.e., given the fact the project area is located in an area documented to have been used till as late as the 1930s to grow taro, it was not unexpected that gley layers representing taro cultivation would be encountered and that the layers would yield such date ranges. Based on the dating results and the fact that no other subsurface cultural remains were encountered during trenching, it was determined that no further backhoe trenching was necessary in the project area. Dating results were reported orally to Dr. Joyce Bath, DLNR staff archaeologist for Oahu. Dr. Bath concurred that the results were as expected, and that the results

warranted no further backhoe trenching. Dr. Bath also concurred with the overall evaluations and recommendation concerning the project area put forth in the following section.

#### GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED GENERAL TREATMENTS

To facilitate outside review, general significance assessments and recommended general treatments for all identified sites are summarized in Table 6. Significance categories used in the site evaluation process are based on the National Register criteria for evaluation, as outlined in the Code of Federal Regulations (36 CFR Part 60). The DLNR-HSS/State Historic Preservation Office (SHPO) uses these criteria for evaluating cultural resources. Sites determined to be potentially significant for information content (Category A, Table 6) fall under Criterion D, which defines significant resources as ones which "...have yielded, or may be likely to yield, information important in prehistory or history." Sites potentially significant as representative examples of site types (Category B, Table 6) are evaluated under Criterion C, which defines significant resources as those which "...embody the distinctive characteristics of a type, period, or method of construction...or that represents a significant and distinguishable entity whose components may lack individual distinction."

Sites with potential cultural significance (Category C, Table 6) are evaluated under guidelines prepared by the Advisory Council on Historic Preservation (ACHP) entitled "Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review" (Draft Report, August 1985). The guidelines define cultural value as "...the contribution made by an historic property to an ongoing society or cultural system. A traditional cultural value is a cultural value that has historical depth." The guidelines further specify that "[a] property need not have been in consistent use since antiquity by a cultural system in order to have traditional cultural value."

Of the 34 sites identified within the Waianae Kai Property project area, all are assessed as significant solely for information content. For 33 of the 34 sites, no further work is necessary. These 33 sites (consisting primarily of recent agricultural rock clearings, agricultural retaining walls, flumes, ditches, and recent dairy or sugar cane plantation features) have been measured, described, and plotted on maps. Seven of the 33 sites (formally recorded Sites T-1, T-2, T-3, T-4, T-5, T-8, and T-13) have also been photographed. Data collected from the 33 sites during the present survey is considered to be sufficient; preservation of the 33 sites is not essential, although some sites could possibly be considered for inclusion into development landscaping. For the remaining one site (T-24), further data collection is necessary. Data collection would consist of surface clearing, sweeping of possible paved areas, detailed recording, test excavations, and possibly subsequent data recovery (mitigation) excavations.

Table 6.

**SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS  
AND RECOMMENDED GENERAL TREATMENTS  
WAIANAË KAI PROPERTY PROJECT AREA**

Site Numbers	Significance Category				Recommended Treatment			
	A	X	B	C	FDC	NEW	PID	PAI
T-1 thru -23 T-25 thru -34	-	+	-	-	-	+	-	-
Subtotal: 33	0	33	0	0	0	33	0	0
T-24	+	-	-	-	+	-	-	-
Subtotal: 1	1	0	0	0	1	0	0	0
Total: 34	1	33	0	0	1	33	0	0

**General Significance Categories:**

- A=Important for information content, further data collection necessary (PHRI=research value);  
 X=Important for information content, no further data collection necessary (PHRI=research value, SHPO=not significant);  
 B=Excellent example of site type at local, region, island, State, or National level (PHRI=interpretive value); and  
 C=Culturally significant (PHRI=cultural value).

**Recommended General Treatments:**

- FDC=Further data collection necessary (intensive survey and testing, and possibly subsequent data recovery/mitigation excavations);  
 NEW=No further work of any kind necessary, sufficient data collected, archaeological clearance recommended, no preservation potential (possible inclusion into landscaping suggested for consideration);  
 PID=Preservation with some level of interpretive development recommended (including appropriate related data recovery work); and  
 PAI=Preservation "as is," with no further work (and possible inclusion into landscaping), or minimal further data collection necessary.

To facilitate management decisions regarding the subsequent treatment of resources, the general significance of all archaeological remains identified during the reconnaissance survey were evaluated in terms of potential scientific research, interpretive, and/or cultural values. Scientific research value refers to the potential of archaeological resources for producing information useful in the understanding of culture history, past lifeways, and cultural processes at the local, regional, and interregional levels of organization. Interpretive value refers to the potential of archaeological resources for public education and recreation. Cultural value, within the framework for significance evaluation used here, refers to the potential of archaeological resources for the preservation and promotion of cultural and ethnic identity and values. Thirty-three of the 34 sites identified in the project area are assessed as having minimal scientific research, interpretive, and cultural values. One site (Site T-24) is assessed as having minimal interpretive and cultural values and moderate research value.

It should be noted that the above evaluations and recommendations are based on the findings of a surface reconnaissance survey and limited subsurface testing. There is always the possibility, however remote, that potentially significant unidentified cultural remains will be encountered in the course of future development activities. In such a situation, archaeological consultation should be sought immediately.

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APPENDIX A:  
SITE DESCRIPTIONS

SITE NO.: State: 3325\* BPBM: -- PHRI: T-1 (Figures 3 and 4)  
 SITE TYPE: Flume  
 TOPOGRAPHY: Undulating slopes.  
 VEGETATION: Grasses, kiawe, koa-haole, lion's ear  
 CONDITION: Poor-fair  
 INTEGRITY: Altered  
 PROBABLE AGE: Historic  
 FUNCTIONAL INTERPRETATION: Agriculture-irrigation  
 DIMENSIONS: 0.00 m by 0.95 m by 0.45 m (approx.)  
 DESCRIPTION: Site T-1 comprises Mikilua Flume which irrigated sugar cane for the Waianae Sugar Plantation. The flume consists mostly of sheet metal. It is directly on the ground with segments over drainage areas resting on wooden trestles. Some sections of the flume are earthen ditches. Metal strips are used as girth supports.

Site T-1 consists of the following elements (a) side ditch with wooden valve box, with rocks laid in mortar to prevent erosion from where the water leaves the valve (1.0 m deep by 2.0 m wide); (b) side ditch with stone work support (c. 4 ft wide by 3 ft deep); (c) rock support for span of flume across drainage; (d) built-up retaining wall to keep frames supporting flume from eroding (6.5 m long by 1.0 m high); (e) point where flume turns into wood, then into stone, then into metal again (3000+ ft); (f) rock retaining wall, possible diversion off flume; (g) concrete diversion off flume; and (h) two concrete supports, one on each side of drainage, to support flume across the drainage.

The flume is disturbed along existing subdivision on the east side of the project area. The flume extends c. 4000 ft in a E-W direction at 140-145 ft elevation. It turns south for 1,800 ft to the project boundary crossing contour lines and drops in elevation from 145 ft to 75 ft.

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\*After the field work for the present report was completed and after this report was written, the DLNR provided the eight major sites identified in the present project area with permanent Hawaii Register of Historic Places (HRHP) site numbers (HRHP site designation system: three- and four-digit site numbers prefixed by 50-70-07- (50 = State of Hawaii, 70 = Island of Oahu, 07 = USGS series quad map ["Waianae, Oahu"]). These numbers and their corresponding PHRI temporary site numbers (T-#) are presented for each site in the first line of each site description in Appendix A.

SITE NO.: State: 3326 BPBM: -- PHRI: T-2  
 SITE TYPE: Wall  
 TOPOGRAPHY: Drainage  
 VEGETATION: Koa-haole, grasses, lion's ear, lantana  
 CONDITION: Fair  
 INTEGRITY: Unaltered to possibly partially altered  
 PROBABLE AGE: Historic  
 FUNCTIONAL INTERPRETATION: Agriculture  
 DIMENSIONS: 19.20 m by 2.00 m by 1.45 m  
 DESCRIPTIONS: The wall is constructed of basalt rocks 4-5 courses high. It is constructed on and modifies a natural earthen bank. Built as support for water diversion within drainage which is spanned by Site T-1 flume. Barbed wire and fence posts lie atop the site.

Associated with historic flume Site T-1. Distance between Site T-2 and Site T-1, Feature C is 25.0 m at 9 degrees.

SITE NO.: State: 3327 BPBM: -- PHRI: T-3  
 SITE TYPE: Wall  
 TOPOGRAPHY: Southeast cut bank of Kawiwi Stream which runs NE-SW; large flat is located on south side of wall; grass-covered drainage with scattered basalt rock on north side of wall; cut bank forms 90-degree angle, varies in height along the drainage.  
 VEGETATION: Grasses, kiawe, koa-haole, lion's ear  
 CONDITION: Fair  
 INTEGRITY: Unaltered  
 PROBABLE AGE: Probably historic  
 FUNCTIONAL INTERPRETATION: Agriculture  
 DIMENSIONS: 20.00 m by 4.00 m by 2.00 m  
 DESCRIPTION: A linear rock retaining wall on the SE bank of Kawiwi Stream. Wall constructed with waterworn (small to medium-sized) basalt boulders and large cobbles, 5-8 courses wide and 5-12 courses high. Wall height and width varies with the terrain. Mid-section of wall is thicker and higher than the ends of the wall. Boulders and cobbles are stacked one on top the other without mortar. Mid-section may be slightly toppled but wall remains linear and stacked. Grass is growing between some of the rocks.

Approximately nine of these boulder-/cobble-stacked reinforcement retaining walls are located on ditch banks within the project area.

SITE NO.: State: 3328 BPBM: -- PHRI: T-4 (Figure 5)  
 SITE TYPE: Complex (2 features)  
 TOPOGRAPHY: A cut bank of drainage which runs north-south in this site area

VEGETATION: Grasses, kiawe, koa-haole, weeds

CONDITION: Fair-good

INTEGRITY: Unaltered

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Agriculture

DESCRIPTION: Overall complex area measures c. 25.0 m (N-S) by 10.0 m (E-W). Site T-3 (retaining wall) is located approximately 200.0 m to the NE in the same ditch as T-4

FEATURE A: Wall

DIMENSIONS: 15.00 m by 2.75 m by 2.50 m

Rock retaining wall constructed with small waterworn basalt boulders and large cobbles; on east bank of drainage. Wall is 8-10 courses high and 5-7 courses wide. Boulders and cobbles are stacked without mortar. Site is probably related to historic agricultural use of the area. Feature B is located on opposite bank of the ditch c. 6.0 m southwest of Feature A. The retaining wall is well-stacked in areas.

FEATURE B: Wall

DIMENSIONS: 4.80 m by 1.25 m by 1.10 m (approx.)

Located on west edge of a major drainage channel. Small waterworn basalt boulders and large cobbles stacked along cut bank of drainage. Constructed 4-6 courses high and 2-4 courses wide. Feature B may have continued c. 2-3.0 m north and c. 7-8.0 m south along the cut bank but appears to have been eroded away by natural stream action. The north end of Feature B is 6.0 m west of the south end of Feature A.

SITE NO.: State: 3329BPBM: -- PHRI: T-5

SITE TYPE: Wall

(1 Feature)

TOPOGRAPHY: East southeast of linear knoll.

VEGETATION: Kiawe forest area, grasses, weeds, and koa-haole

CONDITION: Good

INTEGRITY: Unaltered

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Agriculture

DIMENSIONS: 20.00 m by 2.00 m by 0.80 m

DESCRIPTION: Two retaining wall segments c. 11.0 m from each other. Constructed across slope, fronting a flat drainage area. Both walls are constructed of large to medium waterworn basalt cobbles, with small basalt boulders stacked against the slope for soil retention. The southwest wall is c. 5.0 m long by 0.8 m wide by 0.8 m high, and is 6-7 courses high. The northeast wall is c. 3.5 m long by 0.9 m wide by 0.75 m high, and is 6 courses high.

An old barbed wire fence cuts across the wall. The fence continues along the bottom of the slope east-southeast and parallel to the wall segments.

Site T-5 was probably constructed for slope retention above the sugar cane plantings. Flat area below the retaining wall may have been previously used for taro cultivation.

SITE NO.: State: 3330 BPBM: -- PHRI: T-8  
 SITE TYPE: Ditch (1 Feature)  
 TOPOGRAPHY: Dryland forest pastureland  
 VEGETATION: Grasses, koa-haole, kiawe, lion's ear  
 CONDITION: Fair-good  
 INTEGRITY: Unaltered  
 PROBABLE AGE: Historic  
 FUNCTIONAL INTERPRETATION: Agriculture  
 DIMENSIONS: 219.70 m by 2.60 m by 0.30 m (approx.)  
 DESCRIPTION: Ditch sunk in dryland forest floor, with no appreciable bank built up. Beginning and ending of ditch is vague. The last 60.0 m curves through a horse pasture in a north and west direction. The ditch width varies from 2.5 to 4.0 m. This may be part of ditch present on May 1906 map by M.D. Monsarrat.

SITE NO.: State: 3331BPBM: -- PHRI: T-13 (Figure 6)  
 SITE TYPE: Complex (2 Features)  
 TOPOGRAPHY: A cut bank of Kawiwi Stream which runs NE-SW.  
 VEGETATION: Grasses, kiawe, koa-haole, and weeds  
 CONDITION: Fair-good  
 INTEGRITY: Altered-unaltered  
 PROBABLE AGE: Historic  
 FUNCTIONAL INTERPRETATION: Agriculture  
 DESCRIPTION: Overall complex area measures 12.5 m (N-S) by 10.5 m (E-W). There is a date of 1939 inscribed into concrete of Feature B. This site complex is a dam and diversion in Kawiwi Stream that is probably cane plantation related.

FEATURE A: Retaining wall  
 DIMENSIONS: 10.50 m by 4.75 m by 1.30 m

Rock and mortar wall on west-northwest cut bank of drainage with rock and mortar dam section extending into drainage and diversion channel. It is c. 40.0 m NE of a dairy road crossing. Constructed of large basalt cobbles and small boulders that are stacked and cemented against the natural cut bank of the drainage. It is 4-5 courses high and 2-3 courses wide. The northern wall segment curves into the berm to form a possible irrigation ditch. There is an opening of 2.0 m for this channel/diversion ditch. The western wall continues for 1.4 m to the south where a 1.2 m wide dam/spillway section begins. Most of the dam is destroyed but a section remains sticking out of Feature B (located 7.5 m across the drainage).

**FEATURE B:** Retaining wall  
**DIMENSIONS:** 3.00 m by 2.00 m by 0.80 m

Rock and mortar wall on the east cut bank of the drainage, opposite Feature A. It is constructed of waterworn basalt (small) boulders and (large) cobbles and concrete, and is 3-4 courses high and 3-4 courses wide. There is a stone and concrete dam or diversion section that extends into the drainage; this dam is opposite the Feature A dam; the two sections may have once been joined to form a complete dam across the drainage. "Dec. - 1939" is inscribed into the concrete of Feature B. There is a crack between the dash and 1939; it does not appear that the crack has obscured a day numeral.

**SITE NO.:** State: 3332 BFBM: -- PHERI: T-24 (Figure 7)  
**SITE TYPE:** Complex (2 Features)  
**TOPOGRAPHY:** Knoll above grass meadow.  
**VEGETATION:** Koa-haole, kiawe, grasses  
**CONDITION:** Fair-good  
**INTEGRITY:** Unaltered  
**PROBABLE AGE:** Prehistoric-historic  
**FUNCTIONAL INTERPRETATION:** Habitation-agriculture  
**DESCRIPTION:** Overall complex measures 67.0 m (NE-SW) by 43.5 m (NW-SE). The site is located on a fairly flat knoll with a gradually decreasing slope. Four shovel tests were excavated and resulted in a cultural deposit 0.35 m deep (maximum).

**FEATURE A:** Coral, lithic, and midden scatter with possible paving  
**DIMENSIONS:** 13.50 m by 9.00 m by 0.00 m (approx.)

Possible paving of waterworn basalt pebbles, cobbles, and boulders embedded in top soil. Fragments of branch coral, basalt flakes, and two pieces of large Conidae spp. present on possible paved surface. Feature A is located on top of a knoll. One shovel test was excavated in the center of Feature A, revealing the deposit was 35 cmbs (maximum). Two additional shovel tests were excavated in the paved areas with no cultural material observed below surface.

**FEATURE B:** Retaining wall/terrace  
**DIMENSIONS:** 24.00 m by 15.00 m by 0.95 m (approx.)

A basalt retaining wall with associated earthen terrace located on the southeast portion of a knoll. Consists of a western and eastern section. The western section is constructed of stacked large waterworn basalt boulders, 3-4 courses high by 2 courses wide. The eastern section, constructed on an incline, also consists of stacked large basalt boulders. Eastern section is 4 courses high by 4 courses wide.

The earthen terrace is approximately 4.0 m wide and partially skirts the knoll above the retaining wall. An ash-like lime deposit was visible along the edge of a cut bank.

Shovel Unit 1 (SU-1) was dug within the terrace feature. No prehistoric materials were observed, but historic items (rusted file at 25-30 cmbs and metal band fragments at 30-35 cmbs) were recovered. Thus, the retaining wall and associated terrace are probably a historic component of the site.

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AGRICULTURAL SIGNIFICANCE OF THE LANDS

ON THE

PROPOSED WAIANAE KAI

GOLF COURSE PROPERTY

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July 1988

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AGRICULTURAL SIGNIFICANCE OF THE LANDS ON THE

WAIANAE KAI PROPERTY

I. INTRODUCTION

A. Purpose of Report

The purpose of this report is to identify and discuss the agricultural significance (potential) of the Waianae Kai property, located in Waianae, Oahu, Hawaii. A complete property description is provided below. The significance of the subject lands as part of the agricultural resources of the State of Hawaii have been evaluated by examining the present and potential agricultural uses of the land. These uses have been determined by evaluating three sets of factors: (1) the physical, agronomic and environmental characteristics of the land; (2) economic variables such as the existence and locations of markets for goods that can feasibly be produced on the land, the cost of inputs required to produce the goods and the supply of similar products from other sources; and (3) the current and future demand of agricultural producers for land having the same physical, agronomic and environmental characteristics as the subject lands. Additionally, the agricultural significance of the Waianae Kai property has been examined relative to the state's "Right To Farm" Act, Hawaii Revised Statutes (HRS), Chapter 165. The Right To Farm Act is relevant as it specifies that "The preservation and promotion of farming is declared to be in the public purpose and deserving of public support" and "No court, official, public servant or public employee shall declare any farming operation a nuisance for any reason if the following have been proven:

(1) That the farming operation was not in violation of this section at its established date of operation;

(2) That the stated or implied basis for the nuisance complaint is that conditions have changed in the vicinity of the farming operation since its established date of operation;

(3) That the farm operation was lawfully in operation for at least one year prior to the nuisance complaint;

(4) That the alleged nuisance did not result from the negligent conduct or improper operation of the farming operation; or from any aspect of the operation which is determined to be injurious to public health or safety; and

(5) That the alleged nuisance does not involve water pollution or flooding."

B. Description of Proposed Project and Project Location

The developer of the Waianae Kai property is proposing to develop a 27-hole golf course on the Waianae Kai property, thereby assisting in the provision of additional recreational facilities in the area and on the island of Oahu. The proposed project also includes an associated clubhouse, driving range, nursery, parking and maintenance facility (see Figure 1). The proposed project, which would consist of three nine hole courses each averaging par 36 and 3,458 yards, would occupy approximately 244 acres. The course will be privately owned and operated with memberships and will be available for public play. Such an operation is expected to service 380 to 420 people daily. Given such a design, players can play one, two or all three nine-hole courses, thus allowing a

70  
60

variety of time spans one can spend on the course. Green fees will be comparable to those privately owned courses, available for public play. Membership and fee structure are undetermined at this time.

The proposed project property consists of approximately 250 acres located in Waianae, Oahu, Hawaii. Access to Waianae Kai is from Waianae Valley Road via the H-1 Freeway which connects to Farrington Highway about nine miles south of the site. The property is situated approximately one mile northeast (mauka) of Waianae town in the Waianae Valley, between Puu Paheehoe and Puu Kamaitienuu (see Figure 2).

The project property is rectangular, with two arms connecting to the Waianae Valley Road. Ownership of property abutting the project site is comprised of 27 individual owners utilizing their property for agricultural, residential or other uses (see Figure 3). Immediately to the north is the Waianae Agricultural Park, a development by the State of Hawaii, which is currently completing construction. The largest concentration of individual owners is to the northeast in a country zoned residential area called Wahiona Acres which has 14 owners. To the east and southeast, four residential parcels abut the property. To the south, five individual owners, involved in crop farming (green onions, etc.), front the Waianae Kai property. Southwest and west of the Waianae Kai property, the State of Hawaii, and World Union Industrial Corp., Ltd. own large vacant parcels and immediately west of the Waianae Kai property is the City and County of Honolulu Waianae Land Fill site.

The smaller land owners to the northeast (Wahiona Acres), east and southeast of the project site are potentially subject to greater effects from the proposed golf course operation, due to their close proximity and/or access roadway improvements that will be made, in comparison to the larger vacant parcels.

-4-

PROJECT SITE



C-4  
14

FIGURE 1  
WAIANAE KAI GOLF COURSE  
WAIANAE OAHU

PROPOSED MASTER PLAN

CUP EXCLUSION



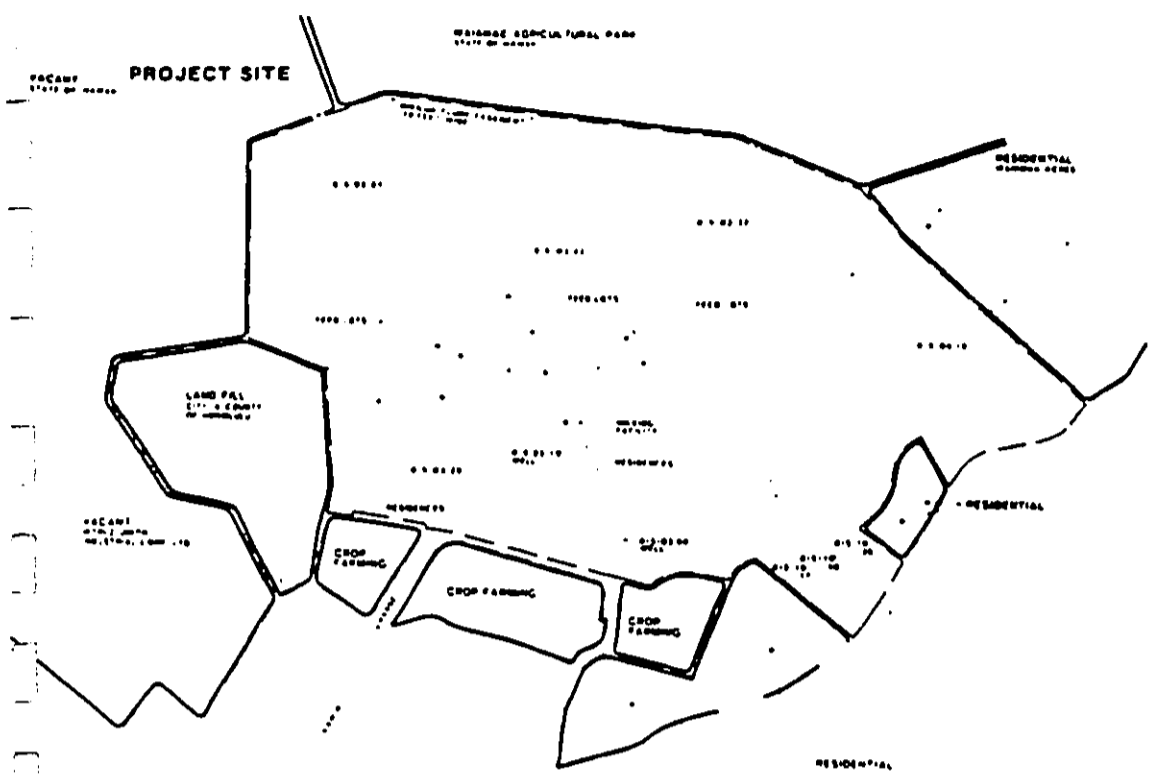


FIGURE 3  
WAIANAEO KAI GOLF COURSE  
 WAIANAEO OAHU

EXISTING CONDITIONS AND  
 SURROUNDING USES

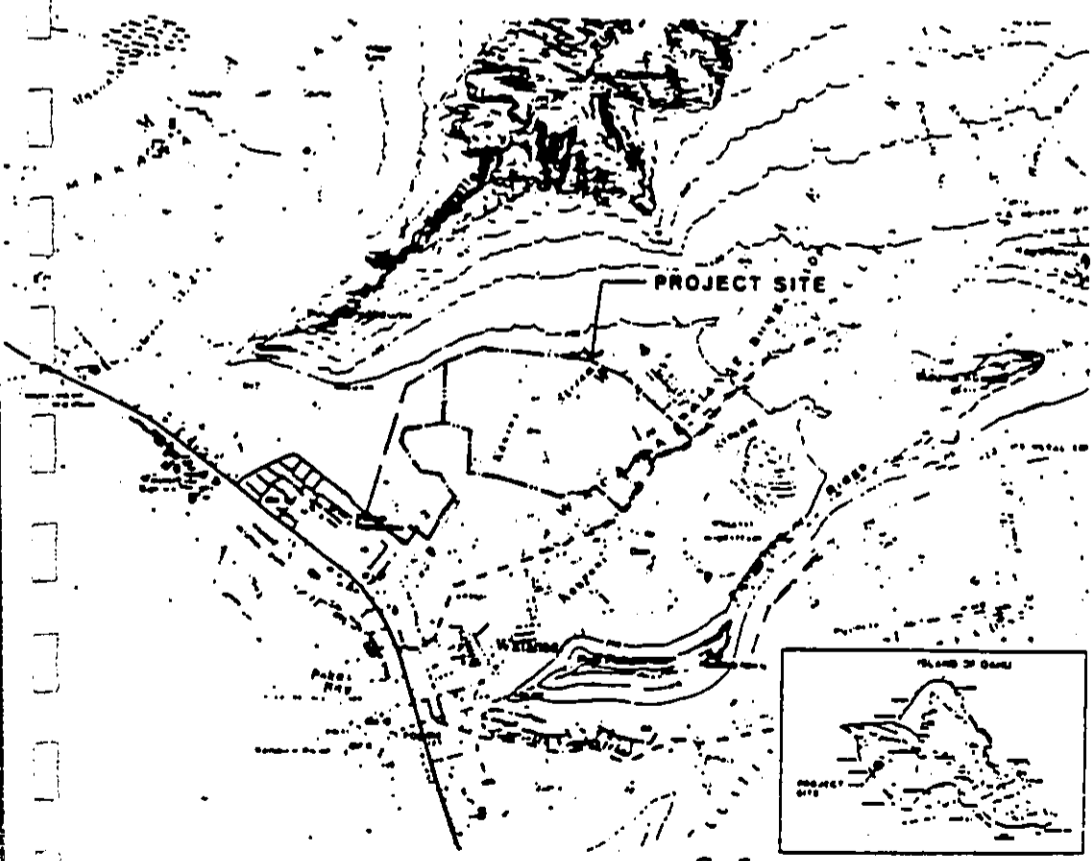
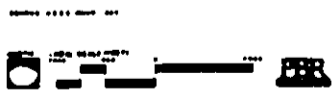


FIGURE 2  
WAIANAEO KAI GOLF COURSE  
 WAIANAEO OAHU

LOCATION MAP



C-5  
 H-5

The Waianae Kai property is owned in fee by several owners as indicated in Table 1, Land Ownership, with the Black Development Corporation and the Mountain View Dairy owning the largest portions.

TABLE 1  
LAND OWNERSHIP

TAX MAP KEY	Acres	Owner
8-5-03:09	.057	Makaha Valley, Inc.
8-5-03:10	.057	Makaha Valley, Inc.
8-5-03:29	18.907	Joseph Moon Wong
8-5-03:31	58.565	Black Development Corp.
8-5-03:32	83.816	Black Development Corp.
8-5-03:43	61.250	Mountain View Dairy Inc.
8-5-04:28	19.62	Herbert K. Horita Investment, Inc.
8-5-19:35	2.54	Black Development Corp.
8-5-19:36	2.03	Black Development Corp.
8-5-19:37	27.34	Black Development Corp.
Total:	250.062	

C 16  
F 6

11. ENVIRONMENTAL SETTING OF PROJECT SITE

A. Existing Land Use

The property is presently vacant with the exception of the Mountain View Dairy which utilizes approximately 25 to 30 acres of the site.

Existing land use classifications designate the property as Agriculture. State Land Use: Agriculture; Waianae Development Plan Land Use Map: Agriculture; and County Zoning: Agriculture (Ag-2), as shown on Figures 4 through 7. The developer is seeking to develop a 27-hole golf course permissible under the

.7.

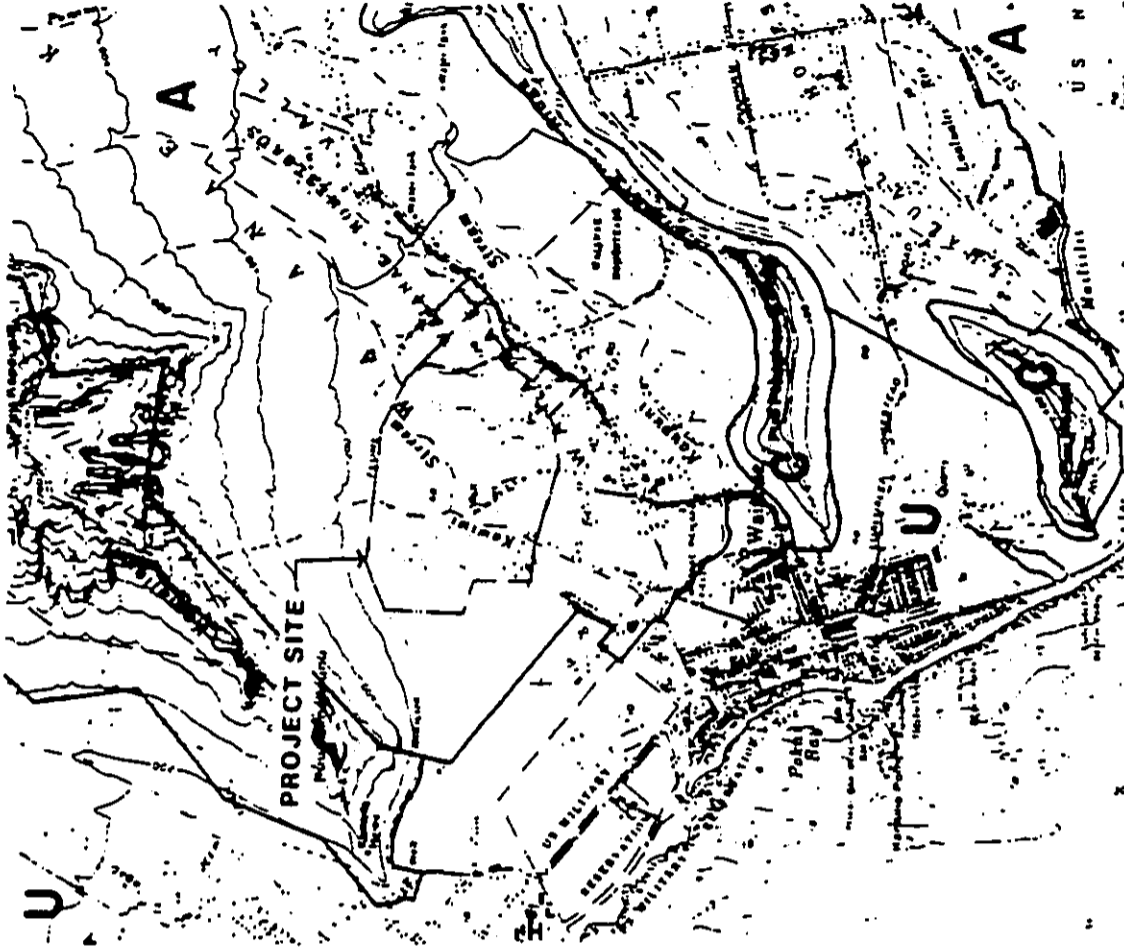


FIGURE 4  
STATE LAND USE  
WAIANAЕ KAI GOLF COURSE  
WAIANAЕ, OAHU

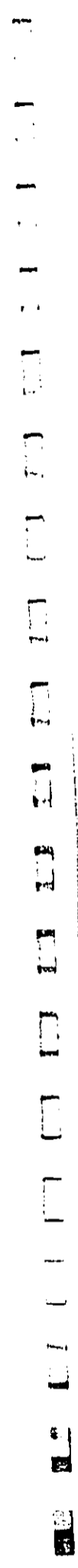
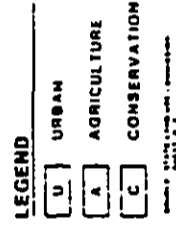


FIGURE 6  
**WAIANAE KAI GOLF COURSE**  
 WAIANAE OAHU

**WAIANAE  
 DEVELOPMENT PLAN  
 PUBLIC FACILITIES**

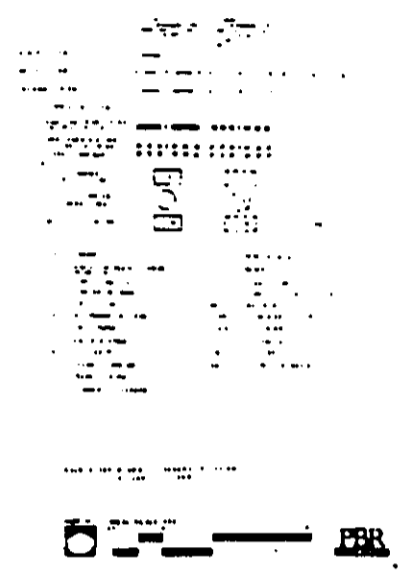
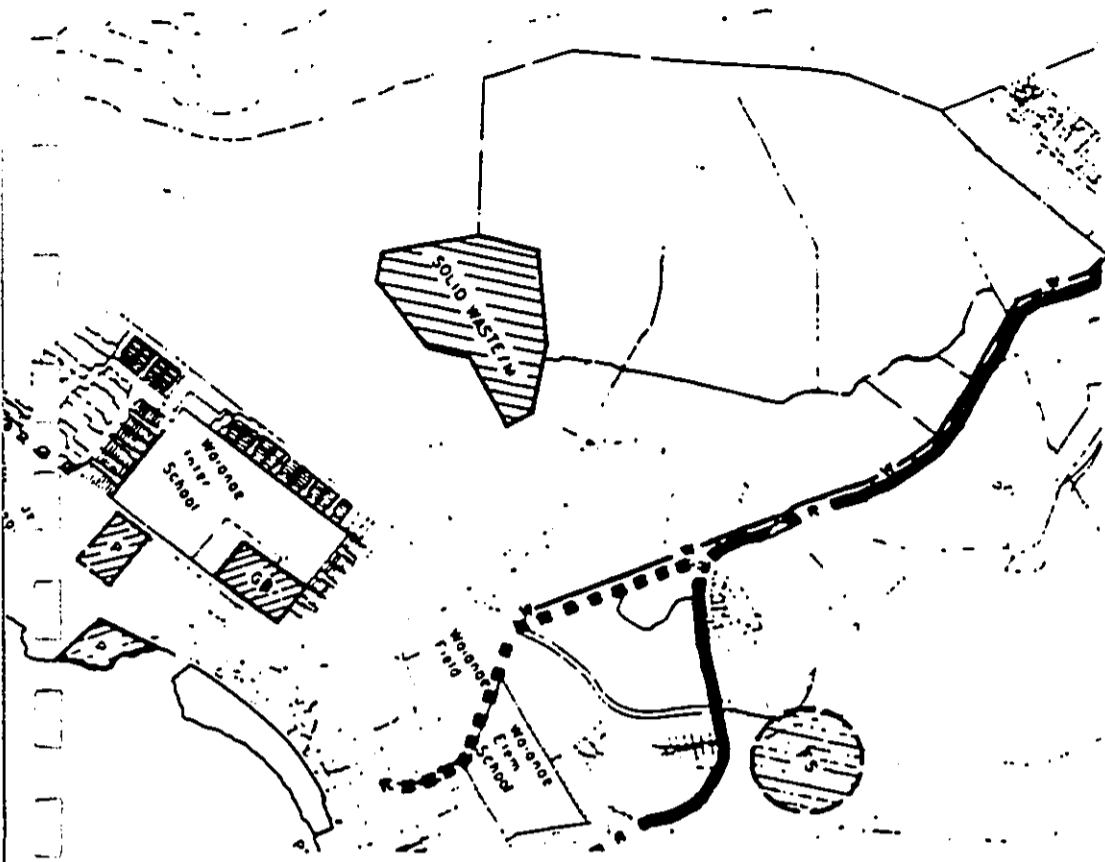
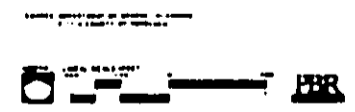
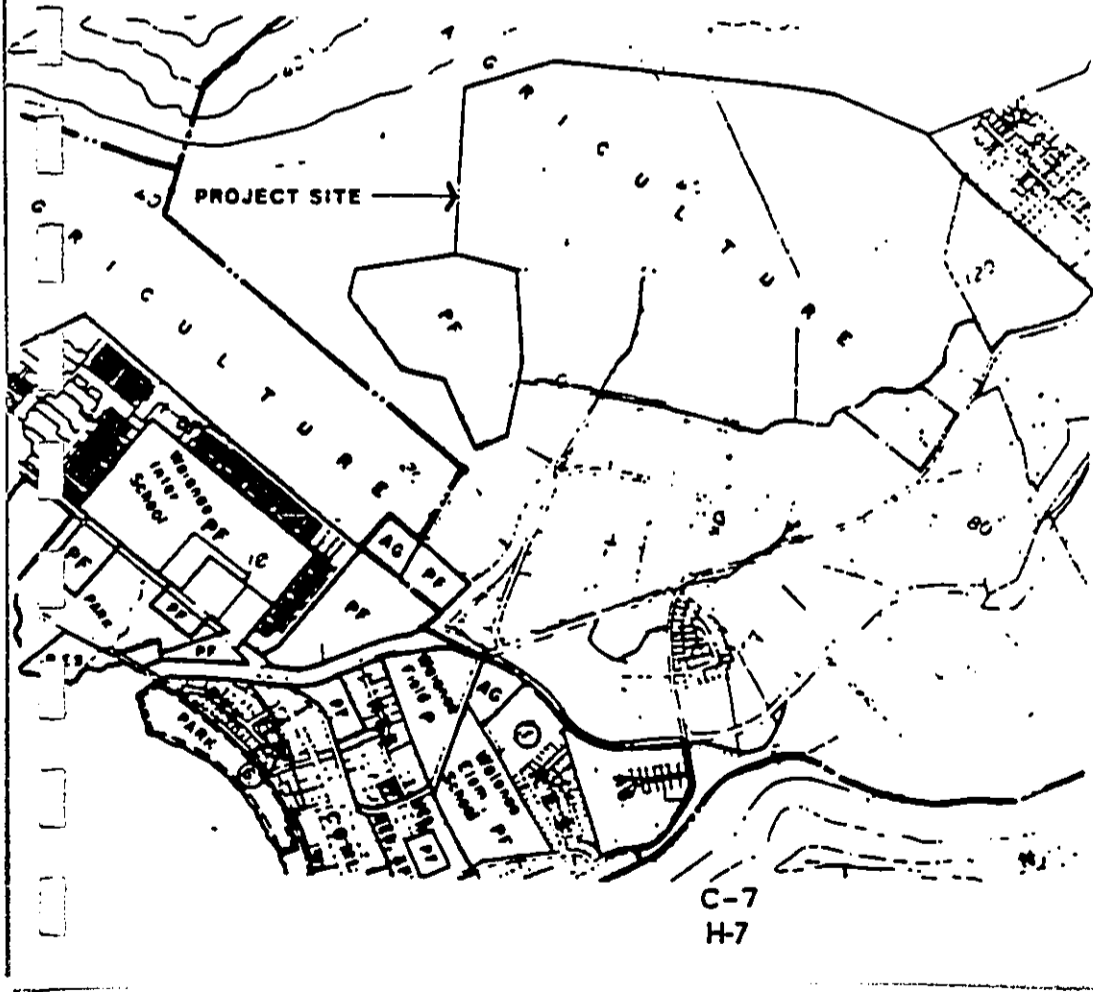


FIGURE 5  
**WAIANAE KAI GOLF COURSE**  
 WAIANAE OAHU

**WAIANAE  
 DEVELOPMENT PLAN:  
 LAND USE**



existing A-2 Zoning with the approval of a Conditional Use Permit type I.

**B. Land Use History**

The Waianae Sugar Plantation, prior to the 1940's, controlled portions of the subject property and cultivated cane supported by the Māhūia flume to the north of the property. When sugar became unprofitable, the land was returned to its vacant status, and acquired by Waianae Village Properties, Ltd. in 1950, with the exception of 19 acres (TMK: 8-5-04:28) which was owned by the F. Meyer Jr. Estate.

From the 1950's to the present, property parcels have been sold and leased as the specific ownership exchanges indicated in Table 2 describe.

The land use designations have remained in Agriculture status since the adoption of the land use policies. The Mountain View Dairy operation has been the only active agricultural operation on the entire project site since the 1950's, while the surrounding lands have remained entirely vacant.

TABLE 2

**LAND OWNERSHIP EXCHANGES**

TMK: 8-5-03:09, 10 - Parcels were owned by Waianae Village Properties, Ltd. and sold to Waianae Valley Mutual Irrigation Co., Ltd. in 1950 as well sites, deeded to Waianae Development Co., Ltd. in 1969 and deeded to Mahana Valley, Inc. in 1988.

TMK: 8-5-03:29 - Parcel owned by Waianae Village Properties, Ltd. and sold to Joseph Moon Wong in 1967.

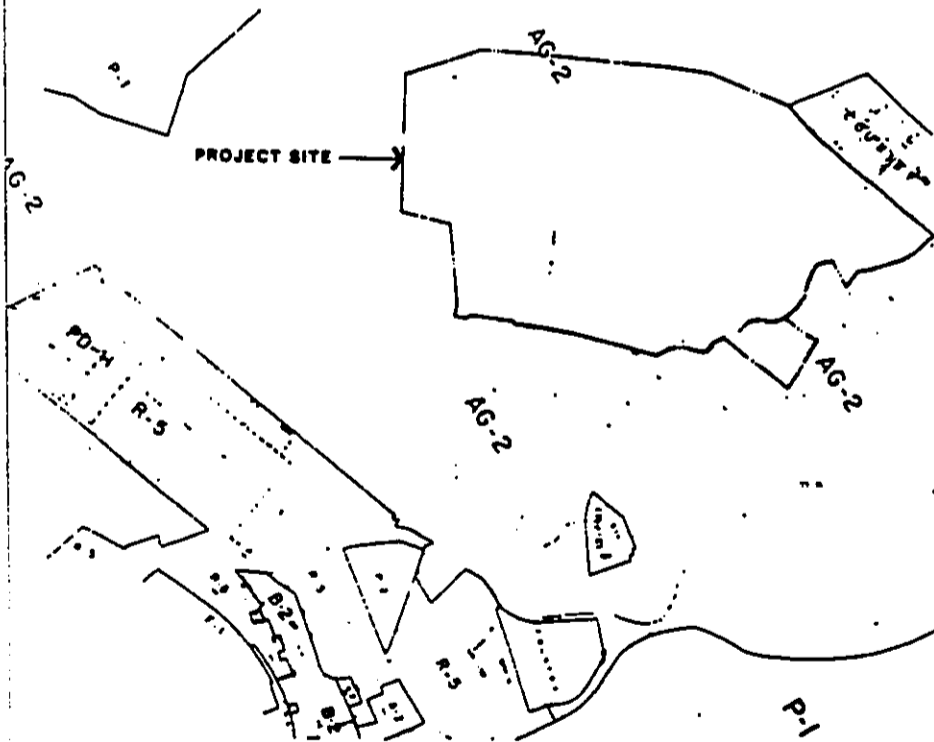


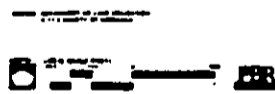
FIGURE 7  
**WAIANAE KAI GOLF COURSE**  
WAIANAE OAHU

**COUNTY ZONING**

**LEGEND**

AG-2	Agriculture
PD-M	Professional Medium Density Residential
R-5	Residential Single-Family
P-1	Public Use
AG-1	Agriculture
AG-3	Agriculture
AG-4	Agriculture
AG-5	Agriculture
AG-6	Agriculture
AG-7	Agriculture
AG-8	Agriculture
AG-9	Agriculture
AG-10	Agriculture
AG-11	Agriculture
AG-12	Agriculture
AG-13	Agriculture
AG-14	Agriculture
AG-15	Agriculture
AG-16	Agriculture
AG-17	Agriculture
AG-18	Agriculture
AG-19	Agriculture
AG-20	Agriculture
AG-21	Agriculture
AG-22	Agriculture
AG-23	Agriculture
AG-24	Agriculture
AG-25	Agriculture
AG-26	Agriculture
AG-27	Agriculture
AG-28	Agriculture
AG-29	Agriculture
AG-30	Agriculture
AG-31	Agriculture
AG-32	Agriculture
AG-33	Agriculture
AG-34	Agriculture
AG-35	Agriculture
AG-36	Agriculture
AG-37	Agriculture
AG-38	Agriculture
AG-39	Agriculture
AG-40	Agriculture
AG-41	Agriculture
AG-42	Agriculture
AG-43	Agriculture
AG-44	Agriculture
AG-45	Agriculture
AG-46	Agriculture
AG-47	Agriculture
AG-48	Agriculture
AG-49	Agriculture
AG-50	Agriculture

ORG. NO. 86-117 DATE: 10-22-86



C-8  
H-8



TMK: 8-5-03:31

Parcel owned by Waianae Village Properties, Ltd. and leased to Mountain View Dairy, Inc. in 1967. Antoine Ruiz Jr. purchased property during this time continuing to lease the land to the Dairy. E. I. Black purchased land in 1972, then sold to Queen Emma Redevelopment Corporation in 1980. In 1981 property sold to Black Development Corporation, who subdivided the parcel into parcel 43 for the Mountain View Dairy which had been leasing since the 1950's.

C. Property Topography/Slope Analysis

The property slopes from the north boundary at 150 feet mean sea level (MSL) to approximately 10 feet MSL at the southern boundary. General slope analysis (Table 3), indicates that approximately 169 acres (67 percent of the site) are of slopes ranging between 0 and 10 percent, 49 acres (20 percent of the site) are of slopes ranging from 11 and 20 percent, and the remaining 32 acres (13 percent) are of slopes greater than 20 percent as shown on Figure 8.

TMK: 8-5-03:32

Parcel owned by Waianae Village Properties, Ltd. and sold to Jimmy Au in 1950. In 1971 parcel sold to F. E. Black, Ltd. In 1980 the Queen Emma Redevelopment Corporation purchased the parcel and a year later resold to the Black Development Corporation.

TMK: 8-5-03:43

This parcel was recently created from parcel 31 and encompasses 61.250 acres sold to Mountain View Dairy Inc. in 1987 by Black Development Corporation.

TMK: 8-5-04:28

Parcel owned by F. Meyer Jr. Estate and was subdivided in 1962 to the smaller 19.698 acres deeded to Arthur Meyer. In 1981 parcel sold to Li Ize Hi (Hawaii) Inc. and sold to Herbert K. Horita Investment, Inc. in 1988.

TMK: 8-5-19:35,36,37

Parcels owned by Waianae Village Properties, Ltd. and sold to Jimmy Au in the early part of 1950. In 1971 the parcels were sold to E. I. Black, Ltd., then in 1980 to Queen Emma Redevelopment Corporation, and then to Black Development Corporation in 1981.

TABLE 3  
GENERAL SLOPE ANALYSIS

CATEGORY	Acres	TOTAL SITE Percent of Site
Less than 5%	101	40
6% to 10%	68	27
11% to 1 1/2%	26	11
16% to 20%	23	9
Greater than 20%	32	13
TOTALS:	250	100

D. Project Area Climatological Characteristics

In general, the Waianae District is characterized as semiarid. Mean annual rainfall along the coast averages 20 inches per year, 30 inches per year in the lower valleys and about 80 to 100 inches per year at the higher elevations of the Waianae range. Much of the rainfall occurs during a few severe storms, such as "Kona" storms that approach Oahu from the south or west, usually between the months of December and March.

C 1 9  
H 9

The only available wind data applicable to the proposed project site is that from Barber's Point NAS, which is located about five miles south of the Waianae District boundary and ten miles from the project site. The wind rose for Barber's Point NAS indicates that northeast trade winds occur 44.2 percent of the time with east-northeast and north-northeast winds occurring 19.1 and 12.2 percent of the time, respectively. Winds from other directions occur the remainder of the time. The greatest percentage (approximately 20 percent) of the northeast trade winds average between 8 to 12 knots. Wind speeds between 3 to 7 knots and 13 to 20 knots occur about 10 and 12 percent of the time, respectively.

Temperatures in the project area average between 72 and 80 degrees F along the low land areas, decreasing at higher elevations.

#### E. Project Area Water Resources

Existing water systems in Waianae Valley include two municipal 12-inch water mains located in Waianae Valley Road that provide water for domestic and agricultural use, as well as fire protection, as shown on Figure 9. Additionally, two private wells, located on the project site are presently used for the dairy water requirements.

The present Board of Water Supply "242" system is adequate to serve the golf course clubhouse's estimated potable average water demand of 24,000 gallons per day (gpd.). This demand is based on the average daily use of 400 persons at a rate of 60 gpd. For potable water, the developer proposes to request municipal service from the Board of Water Supply and pay the appropriate facility charge for source, storage and transmission.

PROJECT SITE —



FIGURE 8  
**WAIANAE KAI GOLF COURSE**  
 WAIANAE, OAHU

#### SLOPES/ SURFACE DRAINAGE

LEGEND	
SLOPES	
[Symbol]	SLOPES LESS THAN 5%
[Symbol]	6-10%
[Symbol]	11-15%
[Symbol]	16-20%
[Symbol]	20% AND GREATER
DRAINAGE	
[Symbol]	SURFACE DRAINAGE



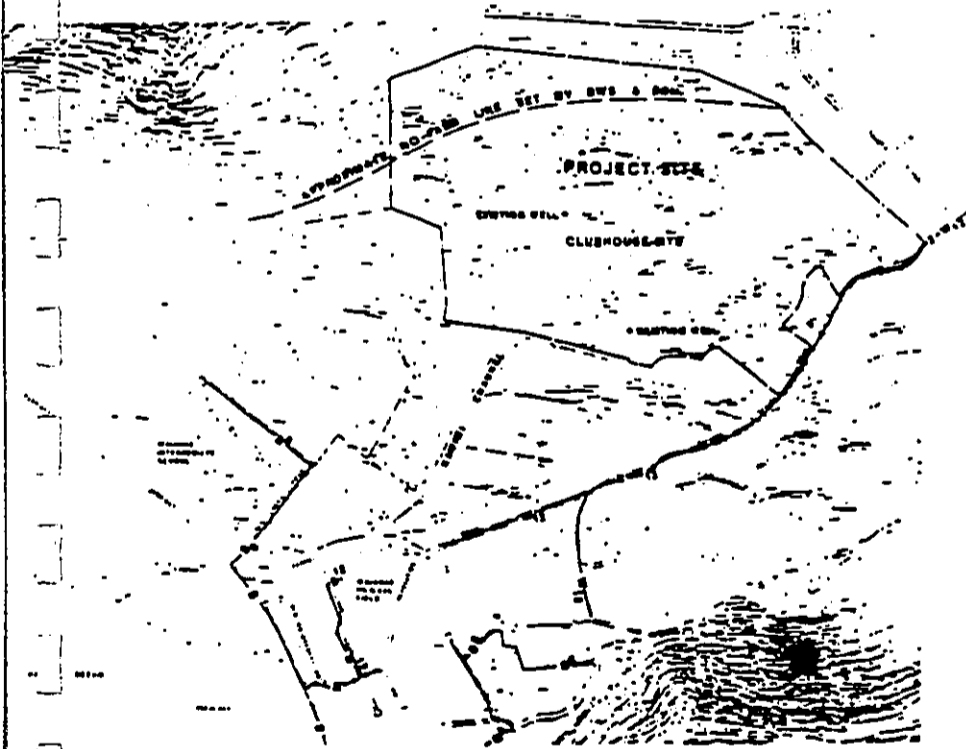
C-10  
 H-10

The developer proposes to use existing wells and develop additional private on-site wells to irrigate the golf course. The water would be stored and pumped into an irrigation pipe system from lined ponds located in the golf course. Based on 4,000 gallons per acre, the estimated average irrigation water demand is 1,000,000 gallons per day for the 250 acres. Although the water system will remain private, appropriate permits will be secured from the Board of Water Supply and/or State Water Commission for construction and use of the wells.

Monthly agricultural water rates per 1,000 gallons, as established by the Board of Water Supply (BWS), are presently \$1.11 for the first 13,000 gallons used and \$0.75 for use over 13,000 gallons. These rates will be in effect until July 1, 1988 at which time they are scheduled to increase to \$1.22 per 1,000 gallons for the first 13,000 gallons and \$0.88 per 1,000 gallons for use over 13,000 gallons. Further increases are scheduled for July 1, 1989, 1990 and 1991 with the 1991 rates scheduled to be \$1.38 per 1,000 gallons for the first 13,000 gallons and \$1.13 per 1,000 gallons for use over 13,000 gallons. The proposed BWS rate increases may be deferred, pending further resolution of rate requirements by the Board.

**F. Project Area Land Costs**

Raw land costs in the project area vary with land use type and present use. New residential use lands average between \$45,000 to \$150,000 per lot (in 1987 dollars). [Note: lot sizes and quality vary resulting in varying square foot or acre costs for land.] However, few new residential units have been constructed in the Waianae area in the past few years, thereby resulting in few comparable sales from which value can be determined. Raw land prices are estimated to range between \$50,000 to \$75,000 per acre. The Waianae Kai property is estimated to have a value of between \$60,000 and \$65,000 per acre.



**FIGURE 9  
WAIANAE KAI GOLF COURSE  
WAIANAE OAHU**

**EXISTING UTILITIES**



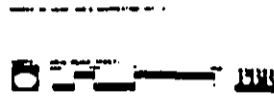
C-11  
H-11





FIGURE 11  
WAIANAË KAI GOLF COURSE  
 WAIANAË, OAHU

**DETAILED LAND  
 CLASSIFICATION**



- LPE - Luaiwai extremely stony clay, 3 to 35 percent slopes. Unified Soil Classification - Oh. Medium to rapid runoff. Moderate to severe erosion hazard. It is impractical to cultivate this soil unless the stones are removed. Capability classification Vlls, non-irrigated.
- LuA - Luaiwai clay, 0 to 2 percent slopes. Unified Soil Classification - Oh. Permeability slow. runoff slow and erosion potential slight. Capability classification IIs if irrigated, VIs if non-irrigated.
- HnA - Hanalei silty clay, 0 to 2 percent slopes. Permeability is moderate, runoff is very slow, and the erosion hazard is no more than slight. Capability classification Iw irrigated or non-irrigated.
- CR - Coral outcrop derived from coral reefs composed of cemented calcareous sand and coral. Vegetation is sparse, and suitable for urban development, and quarrying. Capability classification Vlls non-irrigated.
- rSY - Stony steep land, slopes ranging from 40 to 70 percent. Consists of massed boulders and stones. Capability classification Vlls non-irrigated.

2. Agronomic Characteristics

The Detailed Land Classification of Oahu, classifies the land as approximately 85 percent Class E (63, 64, 100, 102, 103, 104 and 112), 13 percent Class C (13), and 2 percent Class B (13.) which is for nursery purposes only (see Figure 11). The E soils are labeled as "very poor suitability" and are considered virtually impossible to work because of excessive rocks. The C rated soils are labeled as "fair to marginal suitability" and are able to produce viable crops if propagated carefully. The B rated soils are labeled as "good suitability" and can support crops. As such, these soils will be excluded from the project site for golf course usage, and will be employed as a nursery site.

Agricultural Lands of Importance to the State of Hawaii, (ALISH) Waianae map (1977) designates the property in two categories: (1) Prime Agricultural Land and (2) Other Important Agricultural Land as shown on Figure 12. Prime Agricultural Land encompasses approximately 3 percent of the site, Other Important Agricultural Land encompasses another 10 percent of the site, and the remainder is unclassified. The agricultural potential of the site lies in its ability to support above ground operations such as dairy, swine and poultry farming, provided adequate supplies of water are made available.

The land use classifications at all levels (State Land Use, Waianae Development Plan Land Use Map, County Zoning) are all Agriculture as previously mentioned. The proposed project will retain all existing designations. The subject lands constitute a small percentage of the island-wide (Oahu) inventory of Prime or Other Important Agricultural Land (Table 4). There are approximately 120,000 acres in total farm acreage on Oahu, of which about 26,000 are in sugar cane and 12,000 in pineapple production. The subject lands including the nursery site with a Prime rating account for approximately 0.01 percent of the island-wide total and those with a rating as Other Important Agricultural Lands represent approximately 0.08 percent of the island-wide total. As implied by these percentages, agricultural lands of similar or better quality are not scarce on the island.

As indicated in the discussion above regarding the soil types, the project site soils have capability classifications of Iw, IIf, IIs, VIs, VIs, VIs and VIs. The capability grouping shows, in a general way, the suitability of soils for most kinds of crops. The capability classes are designated by Roman numerals as the broadest classification. The numerals indicate progressively greater limitations and narrower choices for practical use. Class II soils have moderate limitations that reduce the choice of plants or that require moderate

C-14  
H-14

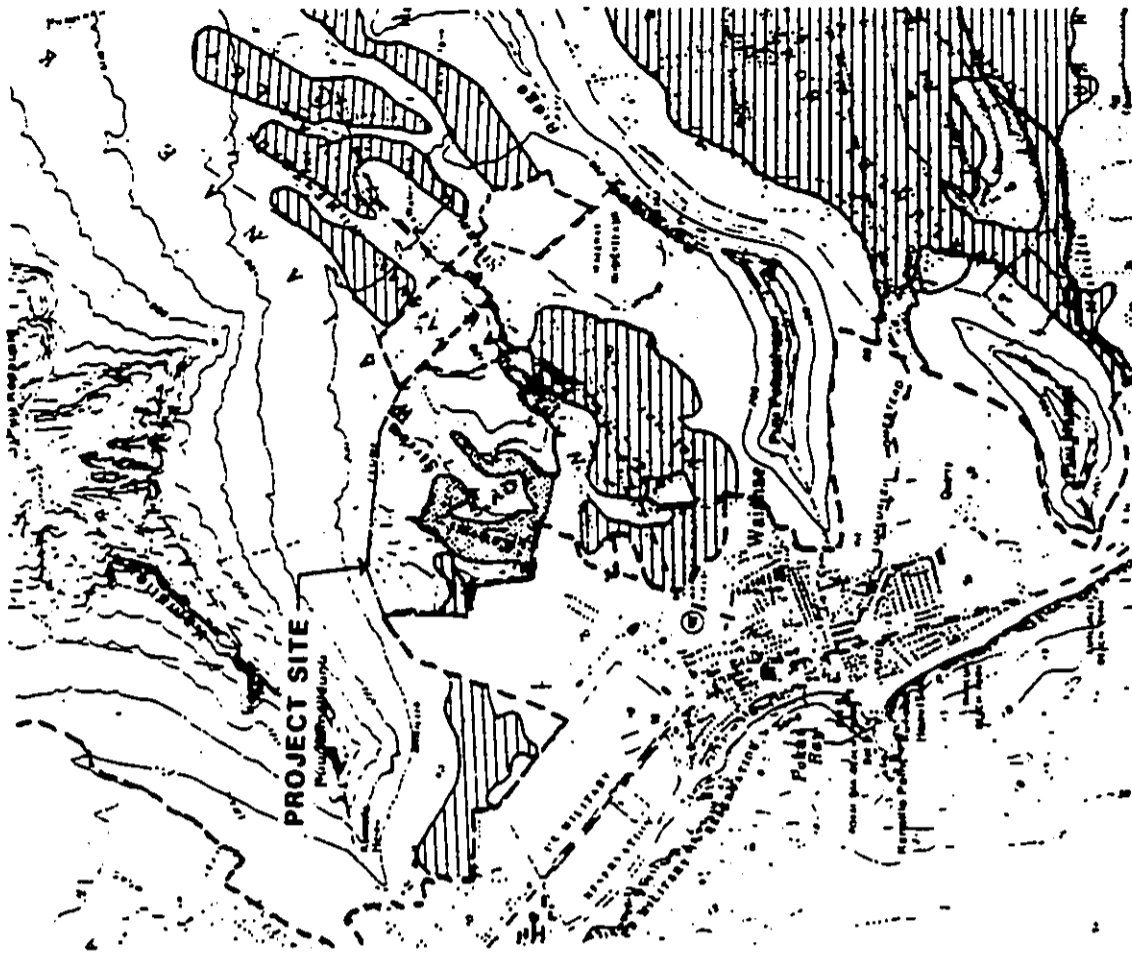


FIGURE 12

ALISH  
WAIANAE KAI GOLF COURSE  
WAIANAE, OAHU



LEGEND

- PRIME AGRICULTURAL LAND
- OTHER IMPORTANT AGRICULTURAL LAND
- EXISTING AGRICULTURAL OPERATIONS
- U.S. DEPARTMENT OF AGRICULTURE
- AGRICULTURAL LANDS OF IMPORTANCE TO THE STATE OF HAWAII

IV. PRESENT AND POTENTIAL AGRICULTURAL USES OF PROPERTY

A. Present Uses of The Property

As indicated previously, the Waianae Kai property is presently vacant with the exception of the Mountain View Dairy which utilizes approximately 25 to 30 acres of the site. The dairy operations include nine feed lots, feed storage, settling ponds, milking facility, one family and six employee houses. The operation contains a total of 1,500 head of cattle of which 920 are milked three times a day. All feed is imported in the form of grain, silage and/or hay. Average daily milk production is estimated at 6,000 gallons, or about 50,000 pounds per day, which is transported to the Mountain View Dairy headquarters in Honolulu. This represents about 15.6 percent of the total Oahu milk production per year and about 12 percent of the total state milk production per year.

The operation employs approximately 30 full-time employees. Although sales and costs figures for the operation are not available due to their confidentiality, it is estimated that the annual value of the milk produced is approximately \$3,660,000, based on 1987 prices per 100 pounds of milk produced.

The existing dairy operation has selected a more favorable location to continue its activities, and is to relocate upon final property negotiations. As such, the farming operation will continue full productivity and contribute to the Oahu Milkshed and economy, as it has in the past. The relocation of the dairy operation would result in continued benefits to the owners, employees and consumers of the milk products produced by the operation.

TABLE 4  
INVENTORY OF AGRICULTURAL LANDS  
BY ALISH CLASSIFICATION

ALISH Classification	ACREAGE		
	Waianae Kai	Oahu	State
Prime	7.5	55,500	304,300
Unique	0	9,000	31,300
Other	25.0	29,000	642,500
Unclassified	217.5	Unknown	Unknown

1. Based on 1986 data. Acreages of some classifications may have changed in recent years.

conservation practices. Class III soils have severe limitations that reduce the choice of plants, require special conservation practices or both. Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland or wildlife habitat. Class VII soils have very severe limitations that make them unsuited for cultivation and that restrict their use to pasture or range, woodland or wildlife habitat. Class VIII soils have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife habitat, water supply or to aesthetic purposes.

In addition to the general capability classification, soil capabilities are further defined by subclasses. Capability subclasses are soil groups within one class. They are designated by adding a small letter (e, w, s or c) to the class numeral. The letter "e" shows that the main limitation is risk of erosion unless close-growing plant cover is maintained. The letter "s" shows that the soil is limited mainly because it is shallow, droughty or stony and the letter "w" shows that water in or on the soil interferes with plant growth or cultivation.

#### B. Possible Crops

Given the soils characteristics of the subject lands and the general capability classifications for those soils, the project site is not considered suitable for crop type agricultural activities. The project site could be made suitable for crops such as sugar or truck crops by extending and enlarging the potable water system and the development of an irrigation system for the property. Further, the importation of top soils and the removal of stones and rocks that presently hinder machine cultivation would be required. However, the economic feasibility and the time required to implement such actions do not appear to be favorable, given the extent of work that would be required and the probable high costs of that work.

#### C. Forage Crop Production

Large amounts of grains are imported into the state as livestock feeds. The production of feed grains has not proven to be economically viable in Hawaii. However, the production of forage crops for green chop has some potential. For example, corn for green chop has been produced on the North Shore of Oahu. The principal market for the green chop and other forage crops on Oahu is the dairy industry, a significant percentage of which is located in the Waianae area. Additionally, if forage crops could be produced at the project site, the feedlot at Campbell Industrial Park would also be a potential customer.

The subject property does not appear to be particularly well suited to the production of forage crops for the same reasons it is not suitable for other types of crops. That is, the soils of the site do not lend themselves to machine cultivation nor is there an established irrigation system, both of which would be a necessity to produce forage crops economically.

#### D. Seed Production

The project property does not appear particularly well suited for the production of seed for crops such as corn for the same reasons that it is not suitable for crops or forage crops. That is, the soils of the subject property do not lend themselves to machine cultivation and the lack of water, which would be required for seed production to be economically feasible.

#### E. Floral and Nursery Products

The floral and nursery industry in the state has been expanding rapidly over the past several years. For example, in 1975 there were 465 "farms" raising flowers and nursery products. The value of those products was \$9,767,000. In 1986 there were 590 "farms" producing about \$49,000,000 worth of flowers and nursery products. The industry, however, produces these large volumes of highly valued products from a very small land area (approximately 1,700 acres state-wide) and does not require large acreages. The average size of all floral and nursery operations in the state is under three acres. For these crops, climate is typically more important in choosing a site than land quality or quantity. Current expansion of the industry is limited only by market availability and management capability, not by the availability of land. As such, the proposed golf course, which would utilize approximately 244 acres of the 2,250 acre parcel, would not initially limit the possibility of a floral or nursery products operation being established in the nursery area of the proposed project site. However, water availability and land availability at economically viable costs may restrict the establishment of a new floral or nursery operation.



F. Livestock

1. Cattle

At present (based on 1986 data), there are 84 farms encompassing some 27,873 acres of pastureland and rangeland on Oahu. There are also 75 cattle operations producing approximately \$1,730,000 worth of cattle sales including out-of-state sales of slaughter cattle and feeder calves. Given the type of vegetation existing on the subject property (Kiawe, Koa hiale, various grasses and weeds) and the need for extensive land for pasture and grazing land, it does not appear that the subject property of 250 acres would serve as suitable land for grazing purposes. Additionally, grazing operation returns are low on a per acre basis.

The site, however, could possibly serve as the site of another dairy operation if one were required. At present (1987) there are some 20 dairy operations on Oahu, 14 of which have 10 or more cows. These operations produced 156.2 million pounds of milk valued at approximately \$31,660,000 in 1987. The number of dairy operations on Oahu has been fairly constant over the past five years, thereby indicating that a new operation probably is not required or that a new operation probably would not be economically competitive. A new dairy operation would probably require the importation of feed and would require the construction of barns and installation of milking equipment and support facilities. The costs of the required investments in plant and equipment and the generally higher cost of locally produced milk over imported milk indicate that the establishment of another dairy operation on Oahu is unlikely and probably would not be economically competitive. As such, it does not appear economically feasible to consider the subject lands as a viable site for added dairy operations on Oahu. As noted previously, the present dairy operation located on the Waianae Kai property

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will be relocating to another site, thereby continuing production at present levels.

2. Hogs

Hog farming is presently occurring in the vicinity of the Maui area and, as such, it is possible another hog farm operation could be developed and compete with these established farms. At present (1987), approximately 310 hog operations on Oahu produce approximately \$6,690,000 in hog sales from about 6,460,000 pounds of dressed weight pork. The number of hog farms on Oahu has decreased from 360 in 1982 to the present 310 operations. Hog farms require less land than dairy or grazing operations but it does not appear that the industry would be limited if the subject lands were not available for use as hog farms. That is, the present availability of suitable agricultural lands on Oahu that could be used for piggeries, the decreasing number of piggeries on Oahu and the relatively high costs of production (labor, water, land), tend to indicate that a new piggery would not be price competitive with existing operations and/or imported pork products. It is also doubtful that a hog farm could provide the owners of the land with the rate of return that other types of uses could provide, and it is unlikely that a potential hog farmer could afford to buy the land and/or that the land owner would be willing to sell off just a portion of the land for a hog farm, thereby possibly restricting other possible uses of the remainder of the property. Additionally, the Waianae Agricultural Park, immediately to the north of the proposed project, is to provide agricultural lots with the necessary infrastructure for hog farming, should a lessee desire to enter into that type of operation. At present, there are no known plans for a hog farming operation in the Ag Park.

### 3. Poultry

Poultry farming is another possible operation that could be established on the subject lands. However, for the same reasons as cited above for hog farming, it would appear that the establishment of another poultry farm on the subject lands would be subjected to the same constraints. That is, it does not appear that the poultry business suffers from a lack of land but that the costs of establishing a new operation would not be economically feasible. Available statistics indicate a relatively stable poultry industry on Oahu with the number of operations remaining fairly constant over the past five years. Production has increased from 184 million eggs in 1980 to 189.7 million eggs in 1986, but the value of sales have decreased from approximately \$13.91 million in 1980 to approximately \$13.45 million in 1986. Similar reductions in the volume and value of sales of broiler chickens have occurred over the past five years.

Based on the preceding, it does not appear that additional poultry operations on Oahu are either needed, would be economically feasible or would be price competitive with existing Oahu poultry operations. However, as noted above for potential hog farming, the Waianae Agricultural Park could possibly support poultry farming if a lessee desired to develop such an operation.

### G. Relevance of Hawaii's Right To Farm Act

Although the present dairy operations clearly fall within the definitions of a farming operation that is protected by the state's Right To Farm Act, it would appear that any new farming operation on the Waianae Kai property would need to be in operation for at least one year for the benefits of the Right To Farm Act to apply. That is, adjacent landowners or residents may file complaints against any new farming operation within the first year of operation of that new farm and the nuisance

protection provisions of the Right To Farm Act would not be applicable. It is possible that a new "farming" operation on the Waianae Kai property could be a nursery or above the ground crop type operation that would not generate nuisance complaints. However, given the constraints noted previously regarding the availability of water and land costs as well as the climatic factors affecting the property, it does not appear likely that a nursery or crop type farming operation would be suitable or economically viable on the property. Regardless of the type of farming venture that might be possible on the property, the state's Right To Farm Act is in effect and its provisions are applicable.

### V. CONCLUSIONS

Based on the analyses performed for this report, the following factors seem apparent:

1. The subject lands are not suitable for in-the-ground crops due to the types of soils that exist on-site. The costs to either replace the existing soils and/or remove the rocks found in the existing soils appear to be prohibitive.
2. Although sufficiently sized water transmission lines to the site for agricultural purposes exist, an irrigation system within the site would have to be installed. The detailed costs for these improvements are not known, however, it is estimated that they could cost over \$1 million, which would be required prior to any farming operations taking place. Following installation it is not certain that the costs of the water could be borne by agricultural operations while still maintaining a viable and competitive economic posture.
3. It is not the lack of available land that is limiting to the establishment of cattle, hog or poultry operations on-site.

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but the costs of the land and the investment costs in new plant and equipment for new operations that are limiting.

4. The availability of other, better suited lands on Oahu and the growth of agricultural operations on other islands, indicate that increased agricultural activities on the subject lands, given the constraints noted above, do not appear favorable.

5. The state's Right To Farm Act is applicable to existing and/or new farming operations on the property.

The subject lands have some agronomic potential as is demonstrated by present dairy farming operations and the lands show potential for continuing to be productive for this purpose. However, their marginal value as productive agricultural lands for new crops, cattle, hog or poultry operations, and the availability on Oahu and in the state of sufficient superior quality lands to meet current and projected future agricultural needs indicates that more productive, non-agricultural uses of the lands would be better land use.

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