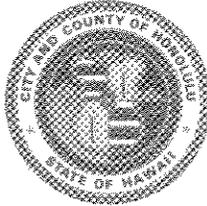


DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU FILE COPY
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4492

HANK F. FASI
MAYOR



JOHN P. WHALEN
DIRECTOR

(BWM)

March 31, 1986

Ms. Letitia Uyehara, Director
Office of Environmental Quality Control
Kekuamoa Building, Room 115
465 South King Street
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Final Environmental Impact Statement
Proposed Watercress Development Project
Prepared by AECOS, Inc. for Watercress of Hawaii, Inc.
Tax Map Key: 9-6-03: 4, 5, 26-29, 31-34, and 36-38

We are notifying you that the above has been found to be an acceptable document by the Department of Land Utilization, pursuant to the requirements of the Special Management Area Ordinance No. 84-4, as amended. Please publish a notice of this determination in the "OEQC Bulletin" under the Register of Shoreline Protection Act Documents.

Permits and approvals will be required in order to implement the proposed project. These are listed in Section E.2 of the EIS.

A copy of our Acceptance Report and the Final EIS are attached. If there are any questions, please contact Bennett Mark of our staff at 527-5038.

Very truly yours,

Handwritten signature of John P. Whalen in cursive.

JOHN P. WHALEN
Director of Land Utilization

JPW:s1
0018B

RECEIVED
DEPARTMENT OF LAND UTILIZATION

attachs.

APR 1 1986

cc: Eric Guinther, AECOS

APR 1 1986

ACCEPTANCE REPORT: CHAPTER 343, HRS
FINAL ENVIRONMENTAL IMPACT STATEMENT (EIS)
(FEBRUARY, 1986)
PROPOSED WATERCRESS DEVELOPMENT AT WAIAWA, OAHU
AECOS, INC. FOR WATERCRESS OF HAWAII, INC.
WAIAWA, PEARL CITY, OAHU, HAWAII
TAX MAP KEY; 9-6-03: 4, 5, 26-29, 31-34, and 36-38

A. BACKGROUND

Watercress of Hawaii, Inc. proposes a development on 36.9 acres of land zoned AG-1 Agriculture, most of which is wetland. The purpose of the development is to expand existing wetland agricultural use of the site.

About 27 acres would be altered. Of this area, five acres are presently utilized for watercress production, and an additional 15 acres would be developed over a 10-year period. The basic cropping system of the additional 15 acres would be for watercress. A total of 20 acres or 54% of the site would eventually be put into watercress production.

Other cropping systems, auxiliary roads and barriers, flood plains, process servicing units, and housing facilities complete the overall land-use plan.

Summary of Proposed Land Uses

<u>Land Use</u>	<u>Acres</u>
A. Cropping Systems	
Watercress	20.0
Water Chestment, Lotus Root (Hasu), Taro (wet/dry), and Ung Choi	4.4
Vegetable Crops (dryland)	1.0
B. Flood Control Corridor (may be used for experimental crops)	5.0
C. Water Distribution Center	1.5
D. Processing Facilities	1.5
E. Tenant/Employee Housing	<u>3.5</u>
TOTAL	36.9 *

- * Total property area, not all of which is included in the proposed alterations.
-

The project entails: (1) the utilization of artesian spring water from three major springs on the property, (2) raising the elevation from four to seven feet and (3) terracing the 20-acres for proposed watercress development. The project is designed to achieve water flow requirements and decrease salt water intrusion. The project will require extensive dredging, landfilling, and other earthwork over a period of 10 years. The applicant has applied for a Special Management Area Use Permit (SMP).

B. PROCEDURE

1. The DLU assessed the project under the provisions of SMA Ordinance No. 84-4, and determined that the project required an EIS.
2. The EIS Preparation Notice (EISPN), was published in the "Office of Environmental Quality Control (OEQC) Bulletin" of September 23, 1985, under the Register of Shoreline Protection Act documents. This was distributed to all interested Federal, State, City and County agencies, as well as community interest groups.
3. Comments from consulted parties and requests to be a consulted party were received until October 23, 1985. Thirteen (13) parties made replies to the EISPN or the EA. The applicant made responses on all substantive comments, and included these in the Draft EIS.
4. The Draft EIS was received and subsequently distributed by OEQC. The deadline for public review was set for January 22, 1986. The Draft EIS review period notice was published in the "OEQC Bulletin" of December 23, 1985.
5. Twenty-two (22) parties made replies to the Draft EIS. The applicant made point-by-point responses to all substantive comments submitted before the deadline in the Final EIS. Comments from the State Department of Land and Natural Resources (DLNR), and the State Department of Hawaiian Home Lands were received after the January 22, 1986 deadline. These late comments were published in the Final EIS even though the applicant was not obligated to do so. Also the applicant was not obligated to make a specific response to these late comments, and did not. However, the concerns raised duplicated those already made, and so were addressed in the Final EIS.
6. The Final EIS was submitted to the DLU on February 6, 1986.

In conclusion, the DLU finds that the applicant has complied with the EIS filing, distribution, and public review procedures in accordance with Chapter 200 of Title II, Environmental Impact Statement Rules, Subchapter 7, Sections 11-200-20, 21, and 22.

C. EIS CONTENT

The Final EIS consists of a single volume, containing the EIS, the comments, the responses, and two technical appendixes covering a "Bird and Mammal Report" and an "Archaeological Reconnaissance."

The Final EIS includes revisions and corrections. These were primarily concerned with:

1. Subsurface soil characteristics from a well drilling log.
2. Groundwater hydrology, including information on the springs and flow measurements.
3. The Ewa Branch Trunk Sewer, including its depiction on a map.
4. The State Department of Transportation's Energy Corridor easement and its alignment.
5. Hog rearing pens, their location, and their anticipated removal for health reasons.
6. Mitigative measures to protect springs and wells.
7. Land fill and dredging impacts upon the Energy Corridor and the Ewa Branch Trunk Sewer.
8. An indication that the State Archaeologist (DLNR) will be notified if dredging reveals items of potential archaeological significance.
9. Acknowledgment that the project is located within the Pearl Harbor Groundwater Control Area (PHGWCA) administered by the State Department of Land and Natural Resources.
10. Acknowledgment that no water is being pumped from the ground for current watercross cropping, and that the wells utilized are artesian and free flowing.

The Final EIS responded to other comments by letter, but did not reflect these changes in the text. These included:

1. Provision that no sanitation facilities would be added at the project site.

2. The potential for Leptospirosis and Liver Flukes.
3. The use of Bacillus thuringiensis to control the diamond back moth.
4. An acknowledgment that the size of the project (for watercress cropping) would be dependent upon the availability of artesian water, and that no additional other sources of water would be sought.
5. Plans to improve a portion of Parcel 26, as a waterbird habitat, under the direction of the U. S. Fish and Wildlife Service (USFWS). This would involve increasing water depth in specified areas.
6. Recommendations that the proposed flood channel and siltation basins be designed and managed for an endangered waterbird habitat.

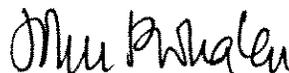
The EIS fulfills the content requirements for a Final EIS in accordance with Chapter 200 of Title II, Environmental Impact Statement Rules, Subchapter 7, at Section 11-200-18.

D. RESPONSE TO COMMENTS

The applicant made point-by-point responses to all comments submitted before the deadline. These are reproduced in Appendix D of the Final EIS. The EIS fulfills the public review requirement in accordance with Chapter 200 of Title II, Environmental Impact Statement Rules, Subchapter 7, at Section 11-200-22.

E. DETERMINATION

The Final EIS is determined to be acceptable under the procedures established in Chapter 343, HRS and in satisfaction of the requirement of SMA Ordinance No. 84-4, as amended. This determination in no way implies a favorable recommendation on the application for any subsequent permits required by this department for this project, where applicable.



JOHN P. WHALEN
Director of Land Utilization

JPW:s1
2744A

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APR 11 1984

FINAL
ENVIRONMENTAL IMPACT STATEMENT
FOR A PROPOSED WATERCRESS DEVELOPMENT
PROJECT AT WAIAWA, O'AHU

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DEPT. OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU

FILE COPY

Prepared For:

Watercress of Hawaii, Inc.
P.O. Box 146
Aiea, Hawaii 96701

Prepared By:

AECOS, Inc.
970 N. Kalaheo Ave., Suite A300
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February 1986

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SECTION A.

INTRODUCTION AND SUMMARY STATEMENT

A.1.1 Watercress of Hawaii, Inc. is proposing alterations and improvements on approximately 27 acres of agriculture, marsh, and wasteland for the purpose of expanding watercress production for Waiawa watercress growers. The property (TMK 9-6-03: 4,5,26-38, excl 30,35) is land leased from B.P. Bishop Estate, located between Middle Loch of Pearl Harbor and Leeward Community College (Figure 1). More specifically, the land lies between the old railroad right-of-way (Federal property skirting the northern end of Pearl Harbor) and Waiawa Road in Pearl City (Waiawa) on O'ahu (Figure 2). The land is designated for agriculture use (Unique Agricultural Land) by the State of Hawaii, and general planned for agriculture by the City and County of Honolulu.

A.1.2 Watercress acreage would be expanded on an incremental basis from an existing 5 acres to 20 acres over a period of about 10 years. Because of the low elevation, most of the property would produce stagnant water conditions were it only cleared for wetland fields. Such conditions are not suitable for watercress cultivation, nor could full advantage be taken of the water resources available on site. By elevating portions of the land to promote the flow of water across fields, watercress cultivation can be expanded. Another important consideration involves potentially serious flooding of the site by Waiawa Stream. Improvements in land drainage address this problem by providing a flood corridor across the property.

A.1.3 Because the purchase of soil and/or quarry fill for a landfill project would not be economically feasible for water-cress development, Watercress of Hawaii, Inc. has sought alternative sources of fill material. Landsend, Inc. has proposed to manage the landfill utilizing land-clearing debris. Only rock, soil, coral, concrete, and boulders would be accepted to comply with the City's grading ordinances for land filling, because a solid waste management permit could not be obtained for this wet site. Watercress of Hawaii, Inc. would achieve its goal of expanding watercress acreage without substantial development costs, because these costs would be borne by the hauling firms providing the fill. Landsend, Inc. would bring experience in operating a landfill to the project. Filling of the lowland areas by any means requires a Department of the Army permit under federal regulations because the lowland would fit the definition of a wetland.

A.1.4 The impacts identified include the conversion of a natural, although of generally poor quality, wetland to agricultural use; noise, traffic, and dust problems associated with transport of fill to the site; as well as potential pollution from expanded agriculture that could enter upper Middle Loch of Pearl Harbor. Adherence to restrictions on the kinds of fill material acceptable for a wet site would avoid any serious problems with potentially detrimental leachates. The new agricultural land would be devoted to wetland crops, and the overall nature of the proposed cropping and water distribution systems (including a flood corridor) could, on balance, improve the quality (from a

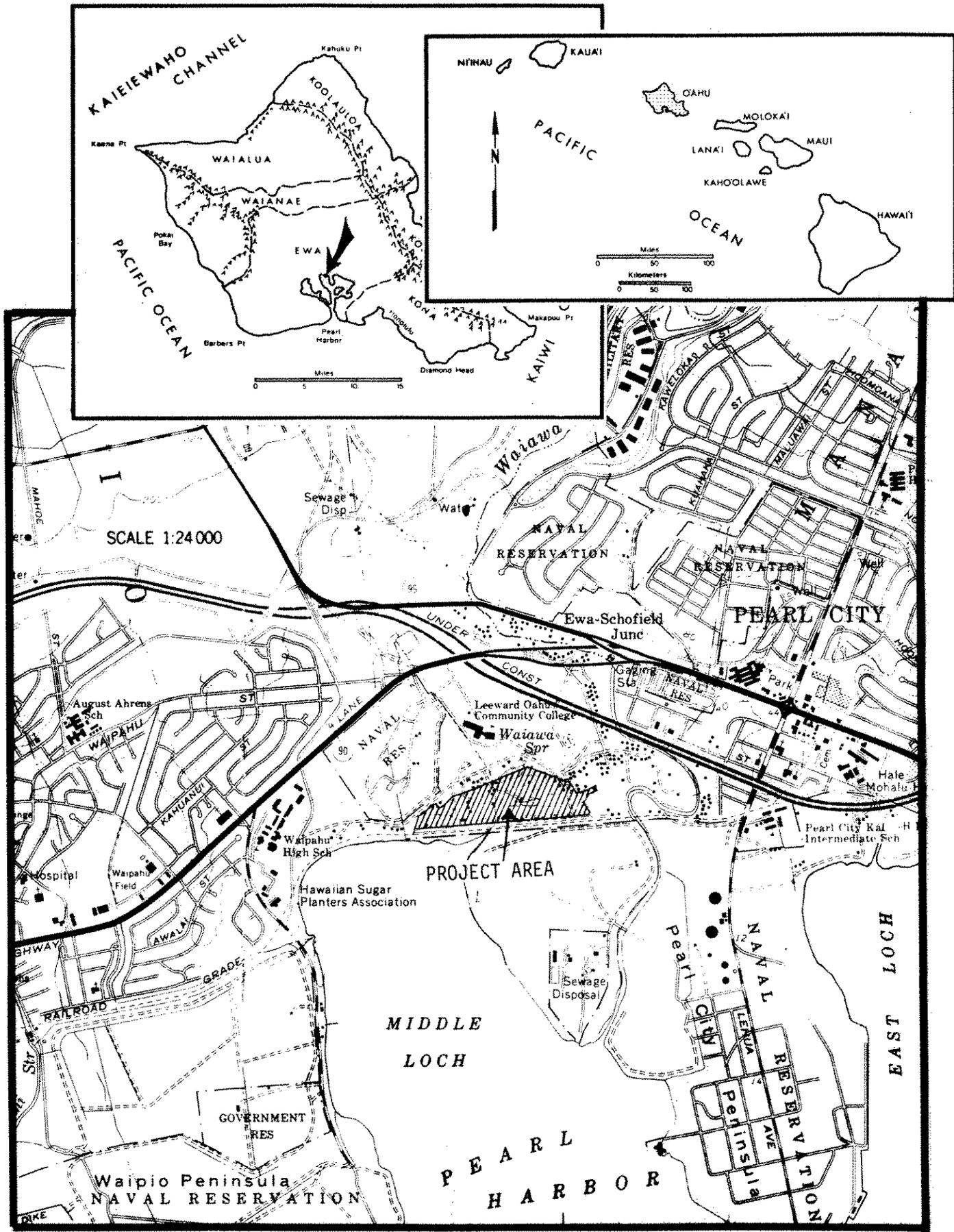


Figure 1. Watercress Project Location Map

natural environment standpoint) of the wetlands within the project area. A portion of the wetland would be improved (primarily by removal of exotic vegetation and dredging) and devoted to wildlife use.

SECTION B.

PROJECT DESCRIPTION

B.1 WETLAND AGRICULTURE DEVELOPMENT

B.1.1 Watercress of Hawaii, Inc. proposes a development on 36.9 acres of (mostly) wetland environment. The purpose of the development is to expand existing wetland agricultural use of the site. The proposed project is located on TMK 9-6-03: parcels 4,5,26-38 (excluding 30 & 35). Only about 27 acres would be altered, and of this area, five acres are presently utilized for watercress production while the remaining acreage is in mostly non-productive uses. An additional 15 acres would be developed over a 10-year period, the basic cropping system of the expanded developed acreage would be centered upon watercress. Thus, a total of 20 acres or 54% of the site would eventually be put into watercress production. Other cropping systems, auxiliary roads and barriers, flood plains, process servicing units, and housing facilities complete the overall land-use plan (Table 1). Actual selection and/or expansion of suggested cropping systems (other than watercress) will depend upon such factors as water requirements, capital requirements and labor usage, crop behavior to various salinity levels, as well as marketing and market demand.

Table 1. Summary of Proposed Land-Use Pattern

<u>Land-Use</u>	<u>Acres</u>
A. Cropping Systems	
Watercress	20.0
Water Chestnut)	
Lotus Root (Hasu))	
Taro (wet/dry))	
On Choi)	4.4
Vegetable Crops (dryland)	1.0
B. Flood Control Corridor	5.0
(may be used for experimental crops)	
C. Water Distribution Center	1.5
D. Processing Facilities	1.5
E. Tenant/Employee Housing	3.5

TOTAL	36.9*

* Total property area, not all of which is included in the proposed alterations.
=====

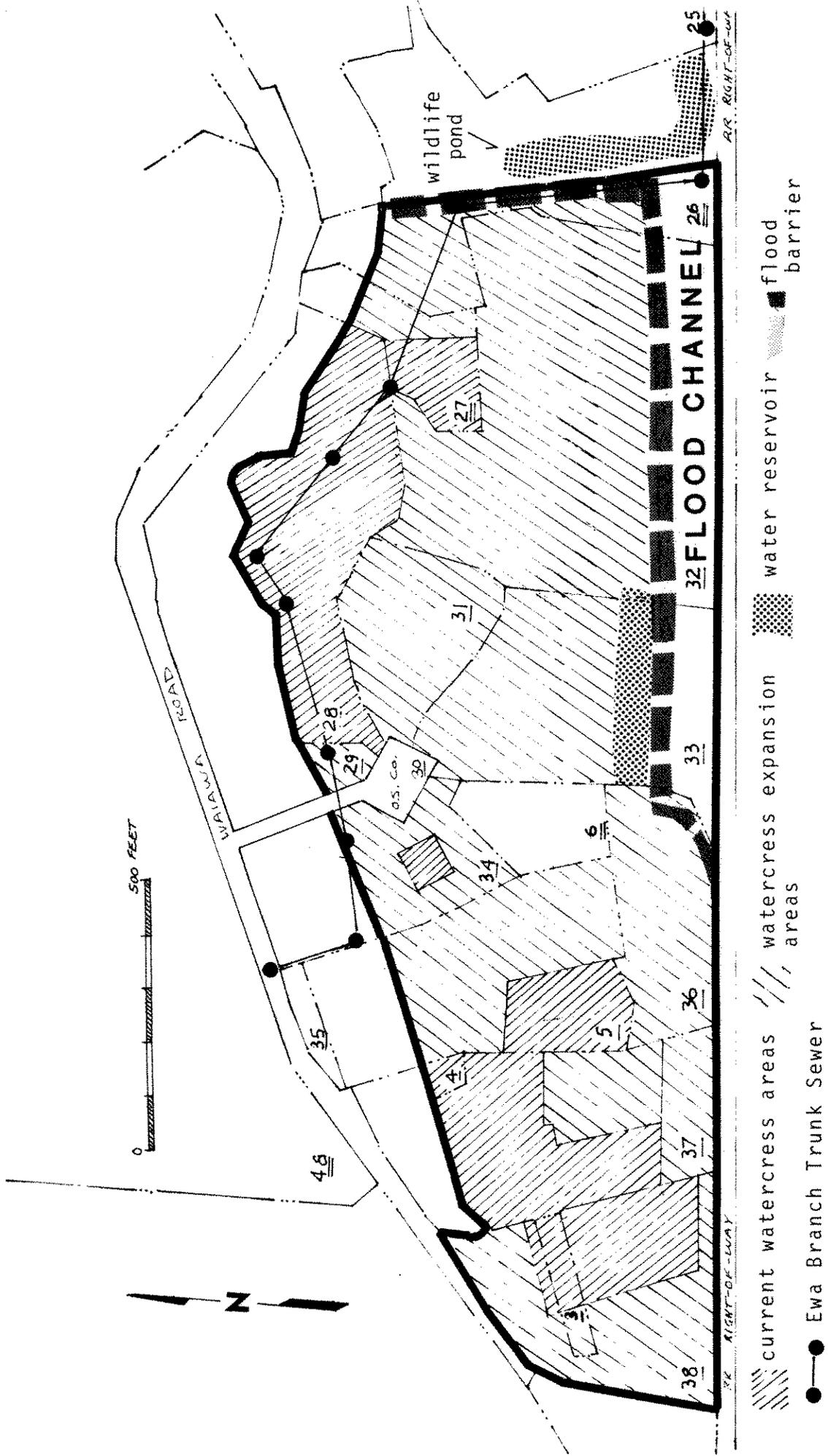


Figure 2. Existing and Proposed Land Use Patterns.

B.1.2 The site is particularly well-suited to watercress cultivation because of the availability of artesian spring water from three major springs located on the property (see Section C.4). However, watercress cannot be grown in the existing wetland after clearing, because the low elevation of the marsh is not conducive to the water flow requirements of watercress and the lowland would be susceptible to salt incursion. The existing 5 acres in watercress production is distributed around the north and west sides of the wetland at elevations which allow the fields to drain into the marshland. Thus, field preparation, consisting principally of raising the elevation of the 20-acre watercress unit, will be required. This task must consider 1) that current watercress production will not be disrupted; 2) that the quality and quantity of spring water remain constant; and 3) that land filling, grading and bedding, and drainage follow prescribed standards and government regulations.

B.2 LANDFILL REQUIREMENTS AND METHODS

B.2.1 Tentative estimates place the required fill material at between 100,000 and 200,000 cubic yards over approximately 20 acres of the property. Watercress of Hawaii, Inc. will be responsible for approval of fill material. Management of the landfill operation will be provided by Landsend, Inc. by agreement with Watercress of Hawaii, Inc. Landfill materials will be derived primarily from land clearing/excavation, and would be limited to soil, rock, and concrete. That is, NO garbage, industrial wastes, hazardous wastes, building rubble, demolition debris, or asphaltic material would be accepted. The material can be characterized as consisting of approximately 25% concrete, 25% rock, and 50% soil. The projected time frame for the landfill operation is from two to ten years in keeping with the agricultural development schedule (Figure 3). The anticipated schedule is presented in Table 2, although actual progress of the fill will be dependent upon type and kind of available land-fill materials, timeliness in terms of delivery schedules, and the actual volume of material required.

 Table 2. Approximate Schedule of Development Phases.

Phase	Incremental Year	Lot #	Acres
I	01 to 03	26,27,32	3*
II	03 to 05	27,32	5*
III	05 to 08	28,29,31,32	4*
IV	08 to 09	5,34,36	4
V	09 to 10	4,37,38	4

* Landfill portion, excluding flood corridor portion
 =====

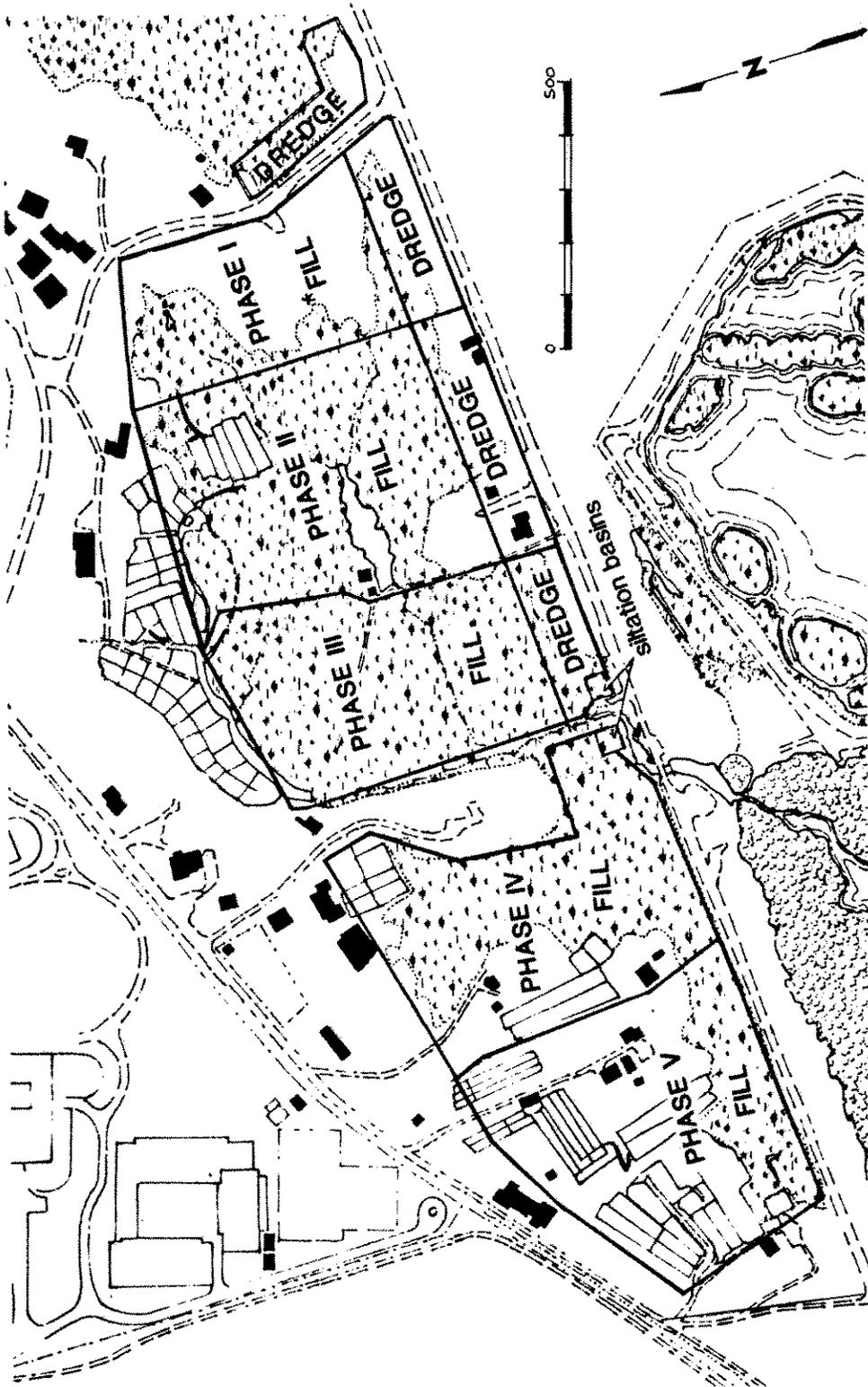


Figure 3. Site development schedule showing areas to be dredged or filled.

B.2.2 The procedure for developing lowland areas for watercress would follow this sequence: 1) The marsh would first be cleared and dredged to a depth of 1 to 2 feet. The dredged spoil would be set aside for use in the landfill. 2) Fill obtained from land-clearing off-site and dredged material from on-site would be placed to a thickness of approximately 1 to 4 feet (on average about 2 feet higher than the existing marshland). 3) A 4 to 6 inch cap of crusher waste (a silt, sand, and gravel quarry mix) would be placed on top of the fill. 4) Low dikes of mostly concrete masonry tile would complete construction of the cropping areas. These dikes would be placed to define the pond terraces and enable the ground to be flooded for wetland crops. The watercress fields would be graded to a 1/2 percent slope.

B.2.3 A barrier composed of concrete and stone derived from the fill material would be placed across the lower end of the landfill during phases I through III to separate the landfill from a flood control corridor (see Section B.4; also Figure 4). This barrier would extend along the east side of the Phase I fill as well (see Figure 2). The top of the barrier would be above the level of the lowermost watercress terrace. The barrier would be porous, allowing for drainage from the fields. Its purpose would be to prevent destruction of the fields by flood waters. As designed, the barrier can not be expected to prevent flooding of the watercress when nearby Waiawa Stream overflows its banks, but should reduce the damage to crops and fields caused by the flood surge.

B.2.4 Landsend, Inc. will provide security and control over the site. A security fence and gate have already been provided, and will be maintained to prevent unauthorized dumping. Additionally, an on-site field office (temporary structure to be removed upon completion of the landfill) will be manned to oversee fill operations. Fill material will be brought to the site by semi-trailer and received between the hours of 07:00 and 17:00, Monday through Sunday except for recognized holidays.

B.2.5 Silt control will be accomplished by siltation basins. These would be established at the low (south) end of each area being filled (Phases I through III) by dragline dredging of a part of the flood corridor. This dredging would also establish a clear channel around the landfill in the event of a major flood occurring from Waiawa Stream before the flood corridor becomes fully operational. An additional basin would be established near the drainage outlet located midway along the southern property boundary. This basin would be shifted between Phases III and IV to insure that it always lies between the current fill area and the stream outlet into Middle Loch. Accumulated silt from the basin(s) will be removed by dragline as required and placed in the landfill. A flood water channel will be maintained around the siltation basin as practicable. On-site drainage would always be towards the natural stream outlet located near the middle of the south property boundary (Figure 5). Dust on the property access road will be controlled by a water truck. Upkeep to road surfaces will be undertaken as necessitated by use.

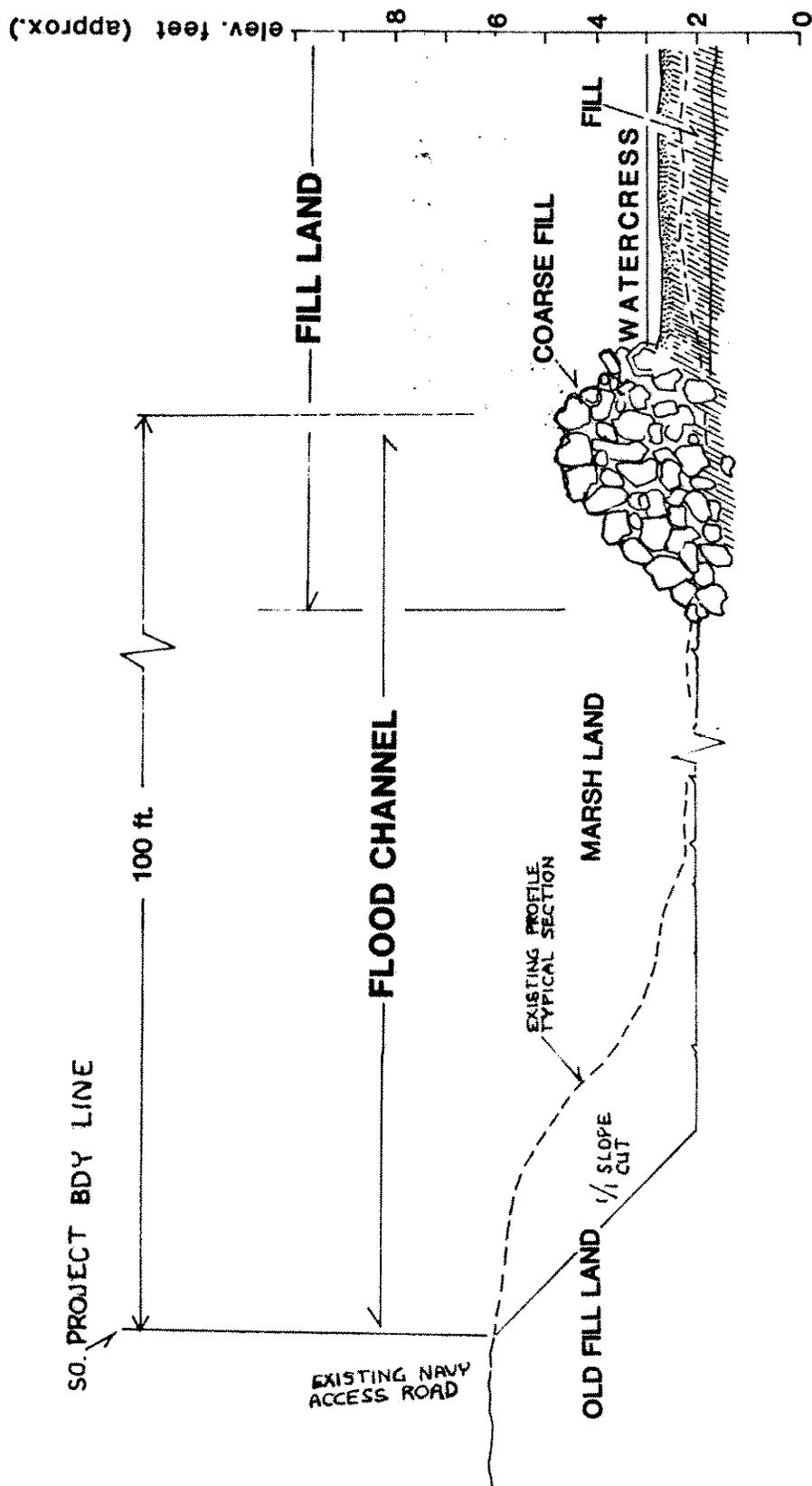


Figure 4. PROJECT: WAIAWA WATERCRESS FARMS
FLOOD CORRIDOR OR CHANNEL, PLAN AND SECTIONAL VIEWS

B.3 WATER DISTRIBUTION SYSTEMS

B.3.1 In addition to landfill, each watercress area will need to have retaining embankments (low dikes), bedding material (quarry crusher waste), and a water distribution system. When completed, the 20-acre unit will have a centralized water distribution system from the three artesian springs (Figure 5), and an overhead sprinkler system that can meet the needs of all tenant farmers in the program. The overhead sprinkler system, a technical innovation developed by John McHugh of Sumida Farm (and a consultant to Watercress of Hawaii, Inc.) is turned on periodically to disrupt the breeding cycle of the principal pest on watercress, the diamond-back moth. This procedure dramatically reduces the need for heavy pesticides applications, and is largely responsible for the improved economic outlook for watercress culture in Hawaii.

B.3.2 A portion of the effluent water from the watercress plots to be located in the central part of the property will be collected in a catchment basin for reuse in plots in the western part of the project site. The catchment basin would be located behind the flood-control barrier. This distribution system will be required because all of the major springs are located in the eastern part of the site. Existing watercress plots in the western area utilize water from shallow wells, and this water tends to be saltier than the spring water (therefore, poorly suited for agriculture use). Recycling a portion of the spring water would enable full development of the property as outlined in the project plans. This "recycled" water would drain off the western fields into the general drainage from the site. Thus, at a maximum, a portion of the water derived from the springs would be utilized twice. Continuous recycling would not be used because salt buildup becomes detrimental to the healthy growth of the crop.

B.4 FLOOD CONTROL

B.4.1 Five acres of the parcel will be slightly lowered (one to two feet) in elevation to form a flood corridor along the southern portion of the property. This corridor will be approximately 100 feet wide and 1000 feet long, separated from the landfill by a barrier of loosely placed rock and concrete. The rationale for developing a flood corridor is discussed in Section C.4. This area would not be used for commercial crops, but might be used to test and develop wetland species of plants for possible commercial production elsewhere. Some of the corridor would be allowed to develop in a natural (wetland) state. Flood waters from Waiawa Stream would be directed towards the outlet of the waters presently draining the springs and marshland.

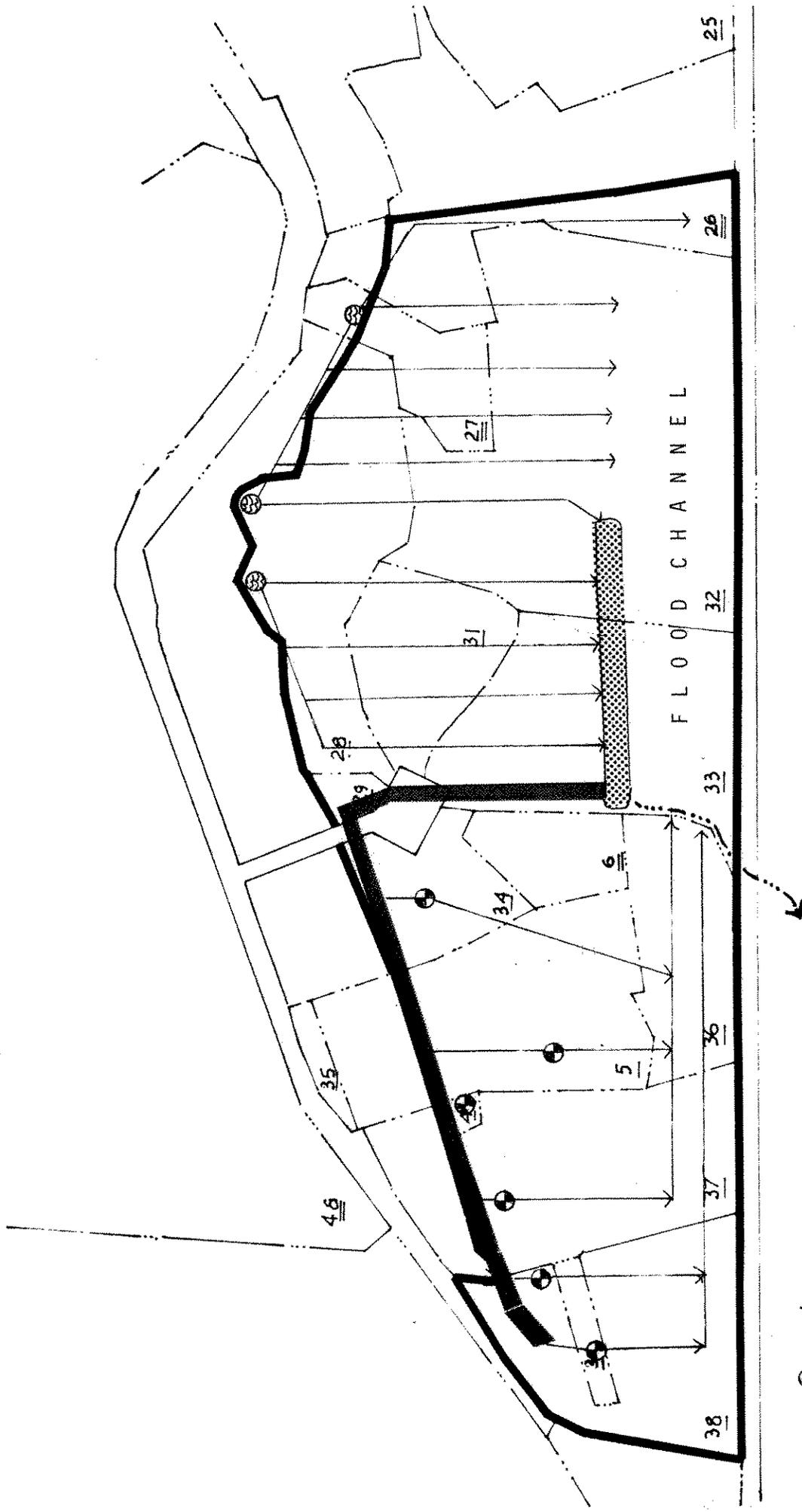


FIGURE 5. WATER DISTRIBUTION SYSTEM

SECTION C.

ENVIRONMENTAL SETTING

C.1 CLIMATE

C.1.1 The project site is located on the leeward side of O`ahu in a drier part of the island. Median annual rainfall is on the order of 30 inches (Taliaferro, 1959; Schroeder and Meisner, 1981). Nineteen years of records for a rain gauge nearby (PRI-HSPA No. 752.2) had a median annual rainfall of 32.5 inches (Taliaferro, 1959).

C.1.2 Prevailing winds are those of the northeast trades, as modified by the leeward location. Prevailing air flow is from the more mauka (north to east) developed areas toward undeveloped lands along the northern part of Pearl Harbor (Middle Loch).

C.2 REGIONAL GEOLOGY

C.2.1 Pearl Harbor has had a complex geological history, but the present day arms or lochs of the embayment are remnants of drowned stream valleys. These valleys formed when sea level stood some 300 feet lower than it does today. In the Waiawa/Waipahu/ Pearl City area the valleys cut through layers of alluvial material washed down from the Ko`olau Range and marine and terrigenous sediments deposited when sea level stood above present day level. Although much of the outer or southern part of the Harbor is surrounded by remnants of a coral reef formed during the +25-foot stand of the sea (over 38,000 years ago), the northern part consists of sediments deposited behind this reef and other material carried to the area by streams.

C.2.2 Most of the property lies at a low elevation and, with the exception of some old man-made fill areas, has little topographic relief. Along the northern boundary, the land rises steeply, and Leeward Community College, just across Waiawa Road and at an elevation of 80+ feet, has a commanding view of the West Loch area. The proposed development is located on an "old" shoreline of Pearl Harbor. On a geological time scale, however, this former shoreline is probably not very old. It is believed that the present sea level is at or near the maximum attained since the last ice age (some 17,000 years ago), although some (notably Stearns, 1974) have suggested that evidence exists around O`ahu and elsewhere in the Pacific of a relatively "recent" drop in sea level. The drop followed a slightly higher level (perhaps +2 feet) reached during the climatic optimum (warmer period) some 4000 years ago. Although a slight drop in sea level would help explain the formation of the low shelf along the northern margin of Pearl Harbor (the shelf now occupied by wetlands), the duration of the last sea level maximum was probably too short to have produced conspicuous shoreline features (Macdonald and Abbott, 1970).

C.2.3 The wetland located on the property is one of several in the Pearl Harbor area which probably have similar geologic origins. These wetlands are fed either by the numerous springs which surface in the Pearl City area, or streams which drain the western slopes of the Ko'olau. In the natural course of events, brackish wetlands developing around the relatively quiet waters of Pearl Harbor would tend to expand into the lochs aided by the shoaling of the inner embayments from accumulation of stream borne sediments. Marshlands, which may begin as open water ponds or in deltaic deposits at stream mouths, usually progress toward dry land. A number of factors arising from human activities and actions have increased the rate at which open water areas change into marshlands and then into dry lands at this location as elsewhere on O'ahu. These factors are discussed in Section C.6.1.

C.3 SOILS

C.3.1 With the exception of the more elevated, mauka portion of the property (area around Waiawa Road), the soil of the lowland, low sloping, marshy areas are classified as Pearl Harbor clay. The mauka portion is classified as Waipahu silty-clay (Foote, et al., 1972). Pearl Harbor clay (Ph) is described as a very poorly drained soil on nearly level coastal plains, developed in alluvium overlying organic muck or peat. Permeability is very low. Erosion hazard is no more than slight. Water capacity is 1.4 inches per foot in the surface layer and subsoil. This soil is neutral in the surface layer and mildly to moderately alkaline in the subsoil, probably because of the incorporation of calcareous debris (shells, coral fragments, etc.). These soils are described as very wet and very plastic, with high shrink-swell potential and poor workability.

C.3.2 Waipahu silty clay (WzC) belongs to a soil series consisting of well-drained soils on marine terraces, developed in old alluvium of terrigenous material (igneous origin). The soil is a dark brown silty-clay. Permeability is moderately slow. Runoff and erosion hazard are slope dependent, being, respectively medium and moderate on 6 to 12 percent slopes. Land in this soil classification is, for the most part, outside of the project area.

C.3.3 The log for a well drilled in 1957 (USGS No. 3-2359-05) in parcel 9-6-03:37 at an elevation of 9 feet above sea level revealed 9 feet of soil overlying swamp mud and clays to a depth of -46 feet (relative to present sea level). Below this level various strata consisted of soft to hard, red to gray, rock. The well terminates 150 feet below the ground surface in "very hard gray rock".

C.3.4 Several areas of former marshland are fill land. Included are Parcel 6, the pigery, not included in the project; a portion of Parcel 26, over which the access road passes; and part of Parcel 32, a finger of land off the south access road, pre-

sently a junk yard for derelict automobiles. When the railroad was built over a century ago, the road-bed was built on fill land which parallels the south property boundary, ending at the stream outlet into Middle Loch. Only the fill on a small portion of Parcel 32 will be substantially involved in the proposed project. This fill presently diverts flood waters to the north into the existing watercress plots, and lies within the proposed flood corridor. Thus, this old fill will be removed during Phase II to avoid creating a restriction as the flood barrier is constructed. The old fill will be placed in the new landfill.

C.4 SURFACE HYDROLOGY

C.4.1 Several natural artesian springs feed the wetlands located on the property. These springs (there are three major springs, the largest being Waiawa Spring) provide approximately 15 million gallons of water per day. In addition, there are seven free-flowing wells scattered widely within the property. It is the availability of the spring water that allows for watercress production on the site.

C.4.1 No streams draining upland areas feed into the marshland, although Waiawa Stream passes close to the marshland to the east of the project area and drains into Middle Loch along the western shore of Pearl City Peninsula. During periods of high rainfall, some drainage may enter the property from a swale located west of Leeward Community College. The location of Waiawa Stream in relation to the property is more than one of close proximity. Serious flooding has occurred in the past when Waiawa Stream has overflowed its banks.

C.4.2 A major problem with regard to development of the agricultural potential of the property concerns the threat of flooding which can occur whenever outflow from Waiawa Stream becomes excessive. Flooding of the marshland at such times is reportedly a regular occurrence, and may be a consequence of the natural geography and/or the result of restrictions on peak flow capacity imposed by bridges constructed across Waiawa Stream. Waiawa Stream watershed occupies an area of 26.4 square miles and includes the tributary Manana and Waimano Streams. The flood in October 1981 has been documented in a study by the Soil Conservation Service (U.S.SCS, 1981) and reported by the State Department of Natural Resources (DLNR, 1982). The flood height during this particular event, as measured at the Farrington Highway stream gage station on Waiawa Stream, peaked at 22.46 feet. Peak discharge was estimated at 26,000 cubic feet per second. The recurrence interval, or the average interval within which a flood of this magnitude will be exceeded once, is 25 years. However, the DLNR report notes that there "have been many floods [in Waiawa Stream] through the years, ... records show that ... three were reported which shows (sic) damages -- May 1963...November 1965...January 1969". (The report cites the previous recorded record flood stage of 23,400 cfs for Waiawa Stream was in January 1968 -- therefore, the January 1969 flood reported in the text

may be a typographical error). A report by U.S. Soil Conservation Service (1982) indicates that in the tidal estuary of Waiawa Stream (from Farrington Highway to Middle Loch), "the stream, made shallow in this area by the accumulation of sediment, overflows its banks as often as six times a year."

C.4.3 Figure 6 shows the relationship between the project area and the 1981 flood. Restrictions at the point where the old railroad (built on a dike) crossed Waiawa Stream, result in excess flood waters flowing westward across the marshland to the vicinity of the small stream outlet of Waiawa Spring. The dike terminates at this point where, presumably, the railroad was supported on a trestle (no longer present). However, the mouth of this small stream, like that of Waiawa Stream below the railroad crossing, is overgrown with mangroves, which serve to retard flood waters to some extent.

C.4.4 This "stream" was recently studied by the U.S. Army Corps of Engineers (1982) for the Department of Land Utilization, as part of the Flood Insurance Zone revisions. All of the low elevation land south of Waiawa Road and across the Federal land to the south has been designated part of the 100-year flood plain (FIRM Zone A4). All of the marshland from Waiawa Stream to Middle Loch was designated a "Floodway" (See Figure 7).

C.4.5 The 1981 flood caused considerable damage to agriculture in the area. The proposed project would expand into areas of even greater flood hazard. However, the proposed increase in land elevation for the plots would not substantially reduce the flood hazard, requiring that some sort of barrier be placed to reduce flood erosion of the plots (see paragraph B.2.3). To insure that the development does not have the effect of shifting potential flood hazard to other areas, a 5-acre strip of land paralleling the south boundary of the property would be slightly lowered (see Section B.4) by dredging and maintained as a flood corridor (Figures 2 and 3). At the present time, a former landfill in this area has the effect of diverting flood waters toward the existing watercress fields before the flood stream swings back toward Middle Loch across the Navy Access Road. This former landfill would be removed to provide floodwaters a more direct route across the property. The flood corridor would be maintained in a natural wetland state, or partly used for development of experimental wetland crops.

C.5 GROUNDWATER HYDROLOGY

C.5.1 The largest spring on the property is Waiawa Spring, located at the northern edge of the site near the middle of the eastern half of the property (see Figure 5). The U.S. Geological Survey measures the flow from this spring two or three times a year; however, flow is measured at a point (near Sta. B in Figure 8; USGS Sta. 16214000) which represents combined flows from other sources (that is, some or all of the major springs in the eastern half of the property and a number of minor springs as well).

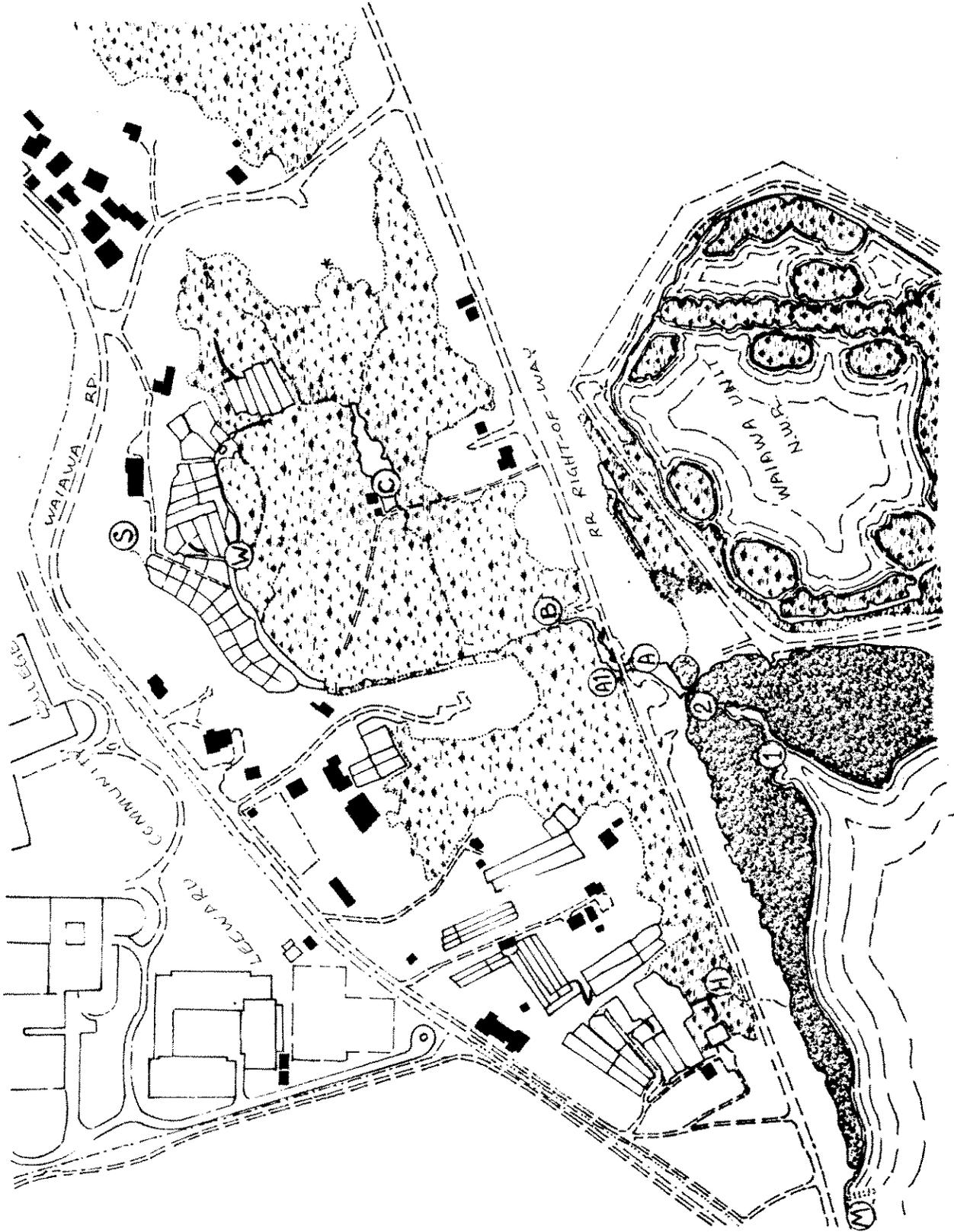


Figure 8. Waiawa wetland showing marsh, mangrove forest, watercross plots, and water quality sample stations.

Between 1973 and 1985, the flow ("Waiawa Spring at outlet") varied between 9 and 16 mgd (with an average flow for the period of record of 12.14 mgd). Water quality parameters are not measured at this station by the U.S.G.S. However, several of the water samples collected on the site in March 1985 pertain to this water. The Station "S" sample (see Table 3 and paragraph C.6.5) was collected directly from Waiawa Spring.

C.5.2 The U.S. Geological Survey monitors a well in the western portion of the site (see C.3.3). All of the wells in this area tap an artesian source and are thus free-flowing (water is not pumped from the ground). The dynamic head of this well (U.S.G.S. No. 3-2359-05) located 9 feet above sea level was measured several times between 1953 and 1958 at between 15.61 and 17.38 feet. Water flow, measured only a few times (1965-66) varied from 1.22 to 1.44 mgd.

C.6 WATER QUALITY

C.6.1 Water samples were collected from several different aquatic environments representative of the project property and surrounding area. Salinity readings were made in the field with a field refractometer. Samples returned to the laboratory were analyzed for nutrients, pH, and turbidity. Results of the analyses are presented in Table 3. Sample station locations, identified by a number or letter, are indicated in Figure 8.

C.6.2 The sample stations included three in Middle Loch of Pearl Harbor: Station M - off the "beach" west of the property; and Stations 1 and 2 - in the mangrove "estuary" between the property and Middle Loch. The salinity in Middle Loch (Station M) was 28 ppt, or slightly brackish. At Station 1, the salinity was 10 ppt; and at Station 2, 3.5 ppt. (about 10% seawater). Station A was also on this estuary, behind the mangrove belt and immediately below the bridge along the Federal right-of-way. The salinity here was 3 ppt.

C.6.3 Sample station A1 represents water draining off the marshland immediately above the bridge. The salinity of this water was measured at 2 ppt. Station B also represents water draining the marsh, but from a stream to the northeast of the bridge (immediately upstream of an old water control structure). The salinity at the time was between 2 and 4 ppt. Station C represents the small pond near the center of the eastern part of the marsh. Two samples were collected from water draining off existing watercress fields: Sample H (2 ppt salinity) was a small stream draining watercress at the extreme western end of the property; Sample W was water draining fields near Waiawa Spring. Water collected from this spring was designated Sample S and was found by refractivity to be fresh (0 ppt).

C.6.4 From the salinity data it would appear that the stream channel between Middle Loch and the bridge (portion below the property boundary) is a tidal estuary. However, the outflow of

water from the property is sufficient to maintain nearly fresh water conditions at and above the bridge. The salinity here was essentially the same as that draining off the marsh, and is probably attributable to salts in the groundwater and well-water, rather than tidal water entering from Middle Loch.

 Table 3. WATER QUALITY SURVEY RESULTS [AECOS Lab No. 390]

STATION	Nutrients					pH	Turb NTU
	NO2+NO3	NH4	TOTAL N	PO4	TOTAL P		
	-----mg/L (ppm)-----						
Spring water							
S	0.797	0.008	1.24	0.057	0.053	7.09	0.44
Drainage from watercress areas							
W	0.513	0.035	0.943	0.032	0.032	7.20	2.4
H	0.399	0.069	0.552	0.015	0.037	6.90	6.3
Marsh pond							
C	0.004	0.018	0.051	0.019	0.019	6.83	0.80
Drainage from marshlands							
A1	0.550	0.044	0.624	0.039	0.066	6.75	12.0
B	0.042	0.035	0.075	0.034	0.033	7.10	1.2
Mangrove "estuary"							
A	0.586	0.040	1.16	0.046	0.068	6.90	6.5
2	0.578	0.060	1.64	0.037	0.044	7.17	3.4
1	0.460	0.089	0.565	0.033	0.051	7.47	5.0
West Loch, Pearl Harbor							
M	0.072	0.038	0.148	0.022	0.045	8.03	5.0

=====

C.6.5 If we take the spring water sample (S) as typical of the fresh water entering the marsh, which then flows either directly into the marsh (excess flow) or into the watercress fields (represented by Samples H and W), the following generalizations can be made. The spring water is relatively high in inorganic nitrates and phosphates, which account for essentially all of the total N and total P in the water (that is, dissolved and particulate organic matter is low). The turbidity of the spring water is also low. A reduction in nitrates and phosphates appears to occur as the water passes through the watercress, although the

ammonia concentration in the water flowing off the fields is elevated over that found in the spring water. On balance, the watercress appears to be removing inorganic nutrients from the irrigation water, but the efficiency is not high (less than half of the inorganic nutrients present in the spring water are removed). The low efficiency is understandable considering that the residence time of the water in the watercress field is relative short (watercress requires flow rates across the plants which are high compared with other kinds of aquatic horticulture, such as taro).

C.6.6 The results of the analysis at Station B are interesting because this water comes from a stream draining the eastern marshland. The marshland vegetation is apparently effective at removing inorganic nutrients, particularly nitrates, from the water. This is demonstrated as well by the sample from Station C representing the water in the central pond. With respect to nutrients, this pond water showed the lowest concentrations of all the samples analyzed.

C.6.7 The Station A1 sample also represents water draining the marshland, collected at a point immediately above the bridge. However, this water is nearly identical in character with the water at the bridge (Station A) and in the mangrove estuary (Stations 1 and 2). The nitrate value is seen to be high. The Middle Loch sample (Station M), on the other hand, is more typical of marine embayments with respect to inorganic nutrient concentrations (although ammonia is somewhat elevated). Thus, the source of the high nitrate concentrations in the mangrove estuary is not Pearl Harbor (this should follow from the low salinities in the estuary at the time of the sampling). If the mangrove areas are generating the nutrients, the similarity in water quality characteristics between Samples A and A1 might be explained by describing Sample A1 as tidal water draining off the marshland from a high tide several hours previous to the survey. This explanation requires more tidal effect than seems possible at this location. An alternative explanation is that Sample A1 truly represents water draining the west-central marsh area and the water quality in the mangrove estuary is the result of this input from land drainage. If this is the case, the nutrient loading of the west-central marshlands is considerably greater than that measured to the east (Samples B, C, and W).

C.6.8 The State of Hawaii Water Quality Standards for streams are presented in Table 4. The water issuing from Waiawa Spring does not meet the standards for nitrate or total nitrogen. The spring water probably does meet the standards for total phosphate. The results of the water quality survey indicate that both the watercress plots and the existing marshland affect reductions in inorganic nutrients. However, the existing small watercress plots do not reduce the total nitrogen content sufficiently to meet water quality standards for this parameter. A notable exception to the reduction in nutrients measured within the marsh appears to involve water draining the vicinity of a pigery, located on high ground near the center of the property

and not under lease to or control of Watercress of Hawaii, Inc.

 Table 4. State of Hawaii, Water Quality Standards for Streams.

	Nitrate	Total N	Total P
	dry/wet	dry/wet	dry/wet
MEAN	0.03/0.07	0.18/0.25	0.03/0.05
90%	0.09/0.18	0.38/0.52	0.06/0.10
98%	0.17/0.30	0.60/0.80	0.08/0.15

Given are values (in mg/L) not to be exceeded 50%, 90%, and 98% of the time during dry and wet seasons respectively.
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C.6.9 The U.S. Geological Survey monitors the water flowing from a well drilled in parcel 9-6-03:37 (see C.3.3). Like all of the wells on the site, this one is free-flowing, although the record shows a period of no water flow (between June and November, 1973). Water temperature, specific conductivity, and usually chlorides concentration are measured six or seven times a year. Specific conductivity of this water has varied since 1972 between 1350 and 3350 umhos. Most recently (1984-85) the specific conductivity varied between 2000 and 2600 umhos. Chlorides, measured between 1953 and 1983, have varied between 221 and 1000 ppm.

C.7 THE WETLAND ENVIRONMENT -- FLORA

C.7.1 The natural processes by which a wetland "converts" to a non-wetland environment have, at the project location, continued unchecked into historical times and have been encouraged by the intervention of human activities. The construction of fishponds by the early indigenous population, and the later abandonment of these structures has hastened the reclamation from what may have been an estuarine or marine environment to a fresh water marshland. In this century, the introduction of mangroves to the area has further encouraged the process of sediment accumulation along the shore, and the prominence of extensive mangrove swamps along the nearby Middle Loch shore has served to further isolate the wetlands from the influences of the marine realm. This isolation has promoted the growth of freshwater aquatic vegetation, which is an important step in the conversion process. Agricultural development on the uplands has contributed to the process by increasing the silt carried into Pearl Harbor by streams that drain the western slopes of the Ko'olau and the central plateau of O'ahu.

C.7.2 An additional problem of uncertain but probably harmful

impact on wetlands in Hawai'i has to do with the introduced grass, *Brachiaria mutica*. Known as "California grass", this plant has become well established in lowland areas around O'ahu, but is most prolific in wet areas where dense, often monotypic, stands are produced. This grass grows so prolifically in wet soil, that adjacent open-water areas, if less than a foot or so deep, can be quickly covered and obscured. Many, if not most wetlands on O'ahu have become "overgrown" with California grass to an extent which must have a detrimental impact on utilization of these environments by waterbirds, which generally require some open water areas for movement from place to place.

C.7.3 A striking characteristic of the wetlands in the Waiawa area is the dominance of California grass. Even though a number of species of wetland plants are present, the marshlands are for the most part completely overgrown with California grass. Open water areas are rare, and access by foot to any part of the marsh is possible over the dense mats of this grass. This growth must preclude use of the marsh by most wetland birds and perhaps a number of other species as well.

C.7.4 A vegetation survey was conducted on March 18, 1985. Although much of the property was traversed during the survey, dryland areas were found to be greatly disturbed environments supporting a variety of introduced, weedy species. For the most part, these species have been ignored in the discussion of survey results. Three, or perhaps four, general types of environments occur on the property. In order of most to least area involved these are: 1) marshland dominated by California grass; 2) disturbed areas including fill lands, roadway fill, and areas occupied by houses and appurtenant agricultural structures (sheds, pens, etc.); 3) watercress plots and associated water control structures (ditches, berms, etc.); and 4) an upland area which was not surveyed and would be mostly type 2), but which may contain some undisturbed areas. These lands would not be involved in the proposed development, and therefore were not surveyed. A prominent environment type found adjacent to the property, is the mangrove forest.

C.7.5 Results of the vegetation survey are summarized in Tables 5 and 6 -- the flora observed in the area of the proposed project. The list has been divided into mostly dryland species (Table 5), from areas that would not be substantially impacted by the project, and wetland (obligate and facultative species) plants (Table 6) in habitats that would be impacted. References to abundance (rare, occasional, common) relate to a qualitative assessment for this site; no rare, endangered, or threatened plants occur in the survey area.

 Table 5. Dryland species of plants noted (mostly) along the
 makai (south) boundary of the property and other species
 noted in adjacent areas.

PALMAE (palms)		
	<u>Cocos nucifera</u>	Coconut palm
CYPERACEAE		
	<u>Cyperus maritimus</u> L. var <u>paludosus</u> (A.Nels)Kuk.	
GRAMINAE (Grasses)		
	<u>Brachiaria mutica</u> (Forsk.)Stapf.	California grass
AMARANTHACEAE		
	<u>Amaranthus spinosus</u> L.	spiny amaranth
LEGUMINOSAE (Bean Family)		
	<u>Prosopis pallida</u> (Humb. & Bonpl. ex Wild) HBK	kiawe, algaroba
	<u>Leucaena leucocephala</u>	koa-haole
EUPHORBIACEAE		
	<u>Ricinus communis</u> L.	castor bean
MALVACEAE (Hibiscus Family)		
	<u>Thespesia populnea</u> (L.) Sol.	milo
	* <u>Hibiscus tiliaceus</u>	hau
BATIDACEAE		
	* <u>Batis maritima</u>	
AIZOACEAE (Carpet-weed Family)		
	<u>Sesuvium portulacastrum</u> L.	`akulikuli
	<u>Tetragonia expansa</u> Murr.	New Zealand spinach
RHIZOPHORACEAE		
	<u>Rhizophora mangle</u> L.	red mangrove
	exotic, obligate aquatic; abundant (off site)	
APOCYNACEAE (Periwinkle Family)		
	<u>Nerium indicum</u> Miller	sweet-scented oleander
SOLANACEAE (Tomato Family)		
	<u>Lycopersicon esculentum</u> Mill.	tomato
	<u>Solanum nigrum</u> L.	popolo
COMPOSITAE (Sunflower Family)		
	<u>Bidens pilosa</u> L.	beggar tick
	<u>Conyza canadensis</u> (L.)Cronq.	fleabane
	<u>Pluchea indica</u> (L.)Less.	Indian pluchea
	<u>Pluchea odorata</u> (L.)Cass.	sour bush

Table 5 (continues)

<u>Verbesina encelioides</u> (Cav.) Benth. and Hook	golden crown-beard
* <u>Youngia japonica</u>	oriental hawksbeard

 *species not seen in the present survey but reported in Elliot and Hall (1977) from the upper Middle Loch wetlands.
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 Table 6. Aquatic Vegetation of the Marsh and Watercress Fields, Waiawa Spring, Waipahu, Oahu.

FILICINAE (Ferns)

SALVINIACEAE

* <u>Azolla filiculoides</u>	azolla
exotic, obligate aquatic	

ARACEAE (Arms)

* <u>Colocasia esculenta</u>	taro
indigenous, facultative aquatic, cultivated; rare	

CANNACEAE

* <u>Canna indica</u>	ornamental canna
exotic, facultative aquatic; rare	

HYDROCHARITACEAE

<u>Vallisneria</u> sp.	
exotic, obligate aquatic; abundant nr spring	

TYPHACEAE

<u>Typha angustata</u> Bory & Chau	cattail
exotic, obligate aquatic; occasional	

MUSACEAE (Banana Family)

<u>Musa</u> sp.	banana
facultative aquatic, cultivated; occasional	

CYPERACEAE

<u>Cyperus alternifolius</u> L.	umbrella sedge
exotic, facultative aquatic; occasional	
<u>Cyperus laevigatus</u> L.	makaloa
exotic, obligate; rare	
<u>Cyperus polystachyos</u> Rottb.	
exotic; occasional	
* <u>Eleocharis geniculata</u>	
obligate aquatic; rare	
<u>Scirpus californicus</u> (C.A. Meyer) Steud.	bulrush
exotic, obligate aquatic; occasional	

Table 6. (continues)

	<u>Scirpus lacustris</u> L. ssp. <u>validus</u> (Vahl) Koyama	
	exotic, obligate aquatic; common	
LEMINACEAE (Duckweed Family)		
	<u>Lemna minor</u>	duckweed
	exotic, obligate aquatic; common nr spring	
GRAMINAE (Grass Family)		
	<u>Brachiaria mutica</u> (Forsk.) Stapf.	California grass
	exotic, facultative aquatic; abundant	
	<u>Cynodon dactylon</u> (L.) Pers.	Bermuda grass
	exotic	
	<u>Coix lachryma-jobi</u> L.	Job's tears
	exotic, facultative aquatic; occasional	
	* <u>Echinochloa colona</u>	jungle rice grass
	* <u>Echinochloa crusgalli</u>	barnyard grass
	* <u>Eragrostis pectinacea</u>	Carolina lovegrass
	<u>Saccharum officinarum</u> L.	sugar cane
	exotic, escaped cultivar; occasional	
COMMELINACEAE		
	<u>Commelina diffusa</u> Burm. f.	honohono
	exotic, facultative aquatic	
MORACEAE (Fig Family)		
	<u>Ficus retusa</u> L.	Chinese banyan
	exotic; rare	
CONVOLVULACEAE		
	<u>Ipomoea aquatica</u> Forsk.	ong choi
	exotic, obligate aquatic; occasional	
CRUCIFERAE		
	<u>Nasturtium officinal</u> Boenn.	watercress
	exotic, obligate aquatic; cultivated	
HALORAGACEAE		
	<u>Myriophyllum brasiliense</u>	parrots feather
	exotic, obligate aquatic; rare	
ONAGRACEAE		
	<u>Ludwigia octovalvis</u> (Jacq.) Raven	primrose willow
	exotic, obligate aquatic; occasional	
	<u>Ludwigia</u> sp.	
	exotic, obligate aquatic; common near spring	
RHIZOPHORACEAE		
	<u>Rhizophora mangle</u> L.	red mangrove
	exotic, obligate aquatic; abundant (off site)	

Table 6 (continues).

SCROPHULARIACEAE

Bacopa monniera (L.) Pennel water hyssop
exotic, obligate aquatic; common

*species not seen in the present survey but reported in Elliot and Hall (1977) from the upper Middle Loch wetlands.
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C.8 THE WETLAND ENVIRONMENT -- FAUNA

C.8.1 A survey of the animals inhabiting the project area was conducted on March 18, 1985. A bird and mammal report, written by Dr. Andrew J. Berger, is summarized here and appended in its entirety at the end of the report.

C.8.2 The aquatic fauna of the marshland proved extremely difficult to observe because of a dense growth of California grass. Open-water environments were limited to the estuary just south of the property, several small streams draining the marsh and/or watercress fields, a small pond near the center of the eastern part of the property, and the watercress fields and their water distribution system.

C.8.3 The dominant fish in most areas was the tilapia (Sarotherodon cf. mossambica). This fish was particularly common in the estuarine area and in the open-water areas of the marsh and water-distribution channels. Common within the marsh and watercress areas were small poeciliid minnows (Poecilia reticulata and possibly P. mexicana and Gambusia affinis). In areas of flowing water around the watercress fields, the snail, Thiara granifera is very abundant. This snail was also seen within the marsh. No endemic aquatic species were seen, although these would most likely occur (if present) in the drainage streams from the watercress plots and springs.

C.8.4 Many of Hawaii's endemic birds are classified as threatened or endangered by the U.S. Fish and Wildlife Service and by the State Division of Forestry and Wildlife. Most of the endangered birds, however, are forest birds and there is no suitable habitat for any of these species for many miles from the project site. In fact, very few endemic forest bird species still occur on O`ahu. Four species of endangered waterbirds: Koloa or Hawaiian duck (Anas wyvilliana), Hawaiian gallinule (Gallinula chloropus sandvicensis), Hawaiian coot (Fulica americana alai), and Hawaiian stilt (Himantopus mexicanus knudseni) have populations on O`ahu. No suitable habitat for any of these endangered waterbirds occurs on the project site, despite the fact that much of the project area is a wetland.

C.8.5 Included in the category of indigenous birds are some 22 species of sea birds, the Hawaiian black-crowned night heron, and

a number of migratory species that spend their winter or non-breeding season in the islands. Two black-crowned night herons or `auku`u (Nycticorax nycticorax hoactli) were flushed from watercress farms during the survey. None were seen in the marshland, which is too overgrown with California grass to be suitable habitat for these birds. Herons feed predominantly on aquatic insects, fish, frogs, and mice, and will sometimes prey on the downy young of terns and other marsh birds.

C.8.6 Two indigenous species of winter residents were recorded: the lesser golden plover (Pluvialis dominica fulva) and the wandering tattler (Heteroscelus incanus). The plover were seen along the road which borders the southern edge of the property. The wandering tattler (a single individual) was observed in the watercress beds. The presence of these two species in the project area is not regarded as significant.

C.8.7 More than 170 species of alien birds have been intentionally introduced to the Hawaiian Islands by man since 1796 (Berger, 1981). Table 7 is a list of species identified from the project area. Each of these species is discussed in greater detail in Appendix A. Most of the species were common in the project area, and none is dependent upon the marshlands found there, or wetlands in general.

Table 7. Introduced or alien birds in the project area.

Ardeidae (Herons)	<u>Bubulcus ibis</u>	cattle egret
Columbiformes (Pigeons and doves)	<u>Streptopelia chinensis chinensis</u>	lace-necked dove
	<u>Geopelia striata</u>	zebra or barred dove
Pycnonotidae (Bulbuls)	<u>Pycnonotus cafer</u>	red-vented bulbul
Turdidae (Thrushes and bluebirds)	<u>Copsychus melabaricus</u>	shama
Zosteropidae (White-eyes)	<u>Zosterops japonicus</u>	Japanese white-eye, mejiro
Sturnidae (Mynas and starlings)	<u>Acridotheres tristis</u>	common Indian myna
Ploceidae (Weaverbirds)	<u>Estrilda troglodytes</u>	red-eared waxbill
	<u>Lonchura punctulata</u>	spotted munia, ricebird
	<u>Passer domestica</u>	house sparrow
Fringillidae (Cardinals, buntings, sparrows)	<u>Paroaria coronata</u>	red-crested cardinal
	<u>Cardinalis cardinalis</u>	cardinal
	<u>Carpodacus mexicanus frontalis</u>	house finch

C.8.8 The only endemic land mammal in the Hawaiian Islands is the Hawaiian bat (Lasiurus cinereus semotus), a subspecies of the North American hoary bat. This bat is not found on O`ahu. All of the introduced species of mammals which have become naturalized in the islands has proven to be a detriment to man, his buildings, products, agricultural crops, and/or to the native forests and endemic wildlife.

C.8.9 With the possible exception of the house mouse (Mus musculus), all of the smaller introduced or alien mammals prey on birds, their eggs, and young. These small mammals include the roof rat (Rattus rattus), Polynesian rat (R. exulans), Norway rat (R. norvegicus), small Indian mongoose (Herpestes auropunctatus), feral cat (Felis catus), and feral dog (Canis familiaris). It is reasonable to assume that all of the rodents occur in the Pearl Harbor area (Tomich, 1969; Kramer, 1971). The diurnal mongoose does occur throughout the project area. Wallows and trails of feral or loose domesticated pig (Sus scrofa) also occur in the marshland area.

C.9 LAND USE AND OWNERSHIP

C.9.1 The property encompassing the proposed project is owned by the Bernice P. Bishop Estate. Watercress of Hawaii, Inc. is the project developer, and has entered into a long-term lease agreement with the owner for the 36.9 acres bounded by Waiawa Road (Ewa) and the Railroad Right-of-way. Existing lease lots within the designated area, including current watercress acreages, are part of the long-range development plan. Current lessees who remain will become a member of and shareholder in Watercress of Hawaii.

C.9.2 The majority of the property is presently in wetland and not used. The north and west portions are presently in watercress cultivation (about five acres); a portion of the center of the marshland has been filled and is used for pig farming. This parcel is not part of the proposed project. Approximately sixteen dwelling units and a similar number of ancillary structures incidental to agricultural uses, are dispersed throughout the site, mostly along the west and north parts of the property. Areas of older fill, mostly adjacent to the old railroad right-of-way and the Navy road, have been used in the past for unauthorized dumping of abandoned vehicles and other refuse, and to raise hogs in makeshift pens. The recent construction of a fence and gate across the access road to this area from Waiawa Road has curtailed unauthorized use of this area.

C.9.3 The Ewa Branch Trunk Sewer passes across the northern and eastern portions of the project area (see Figure 2). Where this City and County project passes along the north edge, the pipe is buried beneath existing watercress fields (and the manholes stand as conspicuous 5+ foot towers in the fields). Care will have to be taken with regard to manholes where the sewer line parallels the flood barrier and crosses the flood channel and wildlife pond

on the eastern edge of the site. The pipe itself is buried over 10 feet below the surface, well below any dredging anticipated for either the flood channel or the wildlife pond.

C.9.4 Leeward Community College and a portion of a U.S. Navy Reservation stand above the project area to the north. Lands to the east have been developed in low density residential housing. Multiple-residential developments nearby include College Gardens (120 units), an existing project along Waiawa Road (east of Leeward College), and the proposed Waterfront Manor (863 units) which borders the project to the west fronting Middle Loch.

C.9.5 An energy corridor easement (State of Hawaii, Dept. of Transportation) skirts the project site. The alignment follows Waiawa Road to the north of the project, then turns southward just outside or along the extreme western edge of the property.

C.9.6 Waiawa Peninsula to the southeast, across the U.S. Navy Access Road along the south boundary of the project area, is general planned Public Facility, Parks, and Industrial. The Public Facility designation encompasses the Pearl City Sewage Treatment Plant. At one time, the Navy operated a large landfill project in this area. Approximately 24.5 acres of the federal use lands are part of the Waiawa or Pearl City unit of the Pearl Harbor National Wildlife Refuge (Shallenberger, 1977).

C.9.7 The Waiawa Unit of the Pearl Harbor National Wildlife Refuge (NWR) is located south of the project across the Navy Access Road (see Figure 8). The refuge is physically separated from the proposed project by a high berm (the old Oahu Railway roadbed) and, to the west, the mangrove forest, which should mitigate impacts on wildlife in the refuge arising from truck traffic and dredging/filling operations. At the present time, make-up water for the refuge is obtained from the estuary draining the project site (where U.S. Fish and Wildlife maintains a small pump station -- located between sample stations "A" and "2" as shown in Figure 8). Any adverse impacts on the quality of the water draining the watercross areas could have an impact on the water quality of the refuge.

C.10 HISTORIC AND ARCHAEOLOGICAL SITES

C.10.1 An archaeological reconnaissance of the site was conducted by Cultural Surveys Hawaii on March 18, 1985. Their report is summarized here, and included as Appendix B. The field survey located no prehistoric or significant historic features.

C.10.2 Two Hawaiian fishponds are believed to have been located within the project boundaries or on adjacent lands. The two fishponds are Loko Mo`o and Loko-kahailoko, sites 120 and 119, respectively, as listed by McAllister (1930). Loko is a Hawaiian term referring to a pool, pond, lake, or other enclosed body of water (Apple and Kikuchi, 1975). These two ponds were possibly of the type termed loko wai, which is "an inland freshwater

fishpond which is usually either a natural lake or swamp which can contain ditches connected to a river, stream or the sea and which can contain sluice gates." (Apple and Kikuchi, 1975:7). These types of fishponds would be ali'i fishponds and would be owned by paramount chiefs. Loko Kuhialoko, "was called after Kuhia, one of the butlers or purveyors to Ka'ahupahau, the shark queen of Ewa." (Sterling and Summers, 1978:17). And as "Polea and Kuhia were konohikis in Ewa, there are places on the shore named after Polea and Kuhia" (Sterling & Summers, 1978:18). The term konohiki refers to a resident land manager of an ahupua'a who would be appointed by the landlord chief.

C.10.3 These two fishponds, recorded in the 1930's, were not in evidence by the 1950's. The area was described by Sterling in 1957 as follows (Sterling & Summers, 1978:48):

Loko Mo'o fishpond (filled in) just north of the railroad track in Waiawa. It formerly covered 13 acres, but is now a very small pond. (Saw taro, watercress and lotus patches, may be former fishpond).

Loko Kuhialoko fishpond is described as being at Waiawa on the southwest side of the Pearl City Peninsula and on the sea side of the O'ahu Railroad. This would place it south of the project site. It is shown on property tax maps as being the area now occupied by the Waiawa Unit of the Pearl Harbor N.W.R. The area marked in Figure 9 is the probable location of the former Loko Mo'o fishpond.

C.10.4 Aerial photographs from 1955 were studied, and these showed no discernible fishpond or other pre-historic structures within the project area. A long-time resident of the property, who had lived there for about 45 years, could not recall any fishpond structure in the immediate area.

C.10.5 The Oahu Sugar Co. has a pumping station and dam with a sluice gate located about in the middle of the project area. The marsh at one time was utilized as a reservoir for water which was pumped to cane fields in the area. The earthen berm and sluice gate are in good condition, but apparently not in use. The use of the area as a reservoir may have marked the end of the former fishpond.

C.11 INFRASTRUCTURE

C.11.1 The existing roadway system serving the project is shown in Figure 10. Kamehameha and Farrington Highways are the principal arterials; Waiawa Road and Ala Ike Street serve as collector streets. Although in close proximity to Interstate Route H-1, the project site can neither be gained from this expressway nor can the expressway be accessed from the project site.

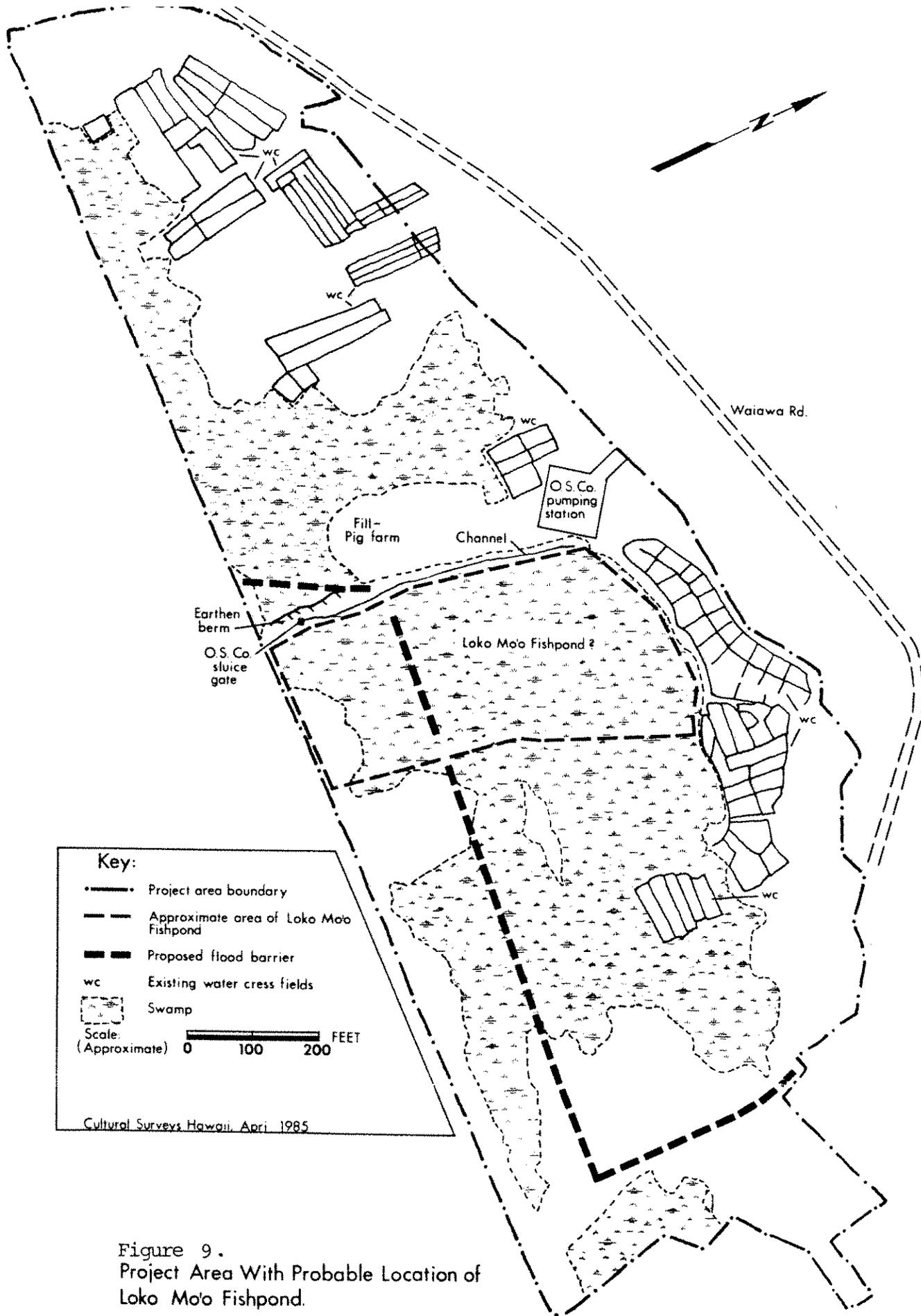


Figure 9.
 Project Area With Probable Location of
 Loko Mo'o Fishpond.

C.11.2 Located makai (seaward) of Leeward Community College, the primary access to the development is off Waiawa Road, a one-mile long, two-lane, two-way local street which can be described best as a "disjointed" roadway. It is bisected by three intersections (Kamehameha Highway, Farrington Highway, and Ala Ike Street); about one-half of its length is built to standard street widths with curbs, gutters, and sidewalks; whereas the remainder is substandard in dimensions; and it is both a public and private road.

C.11.3 In the vicinity of Leeward Community College, traffic flows are served by Kamehameha and Farrington Highways. Kamehameha Highway, a one-way, two-lane thoroughfare, serves westbound traffic. A left turn movement from a through lane is required to gain Waiawa Road. Farrington Highway, a one-way, two-lane thoroughfare, serves eastbound traffic. At Waiawa Road, a two-phase traffic signal controls the intersection. A single channeled right-turn lane (about 80-100 feet long) accommodates makai bound traffic turning onto Waiawa Road and two lanes accommodate through traffic.

C.11.4 Ala Ike Road, a two-lane, two-way roadway serves Leeward Community College/West Oahu College and residential developments nearby. At Waiawa Road, the "T" intersection is controlled by a two-way stop arrangement on Ala Ike. Left and right turn movements from Waiawa Road onto Ala Ike for makai bound traffic are not controlled by stops.

C.11.5 Between Farrington and Kamehameha Highways, Waiawa Road measures approximately 90 feet long. Only left turn movements onto Kamehameha Highway are permitted for outbound traffic and movement is controlled by a stop sign. A traffic signal controls movement at Farrington Highway. The road pavement in this section is substandard in width and in deteriorating condition.

C.11.6 From Farrington Highway, Waiawa Road meanders uphill over the H-1 Freeway. At its intersection with Ala Ike Street (which begins at the intersection) Waiawa Road turns east then south and seemingly terminates in a cul-de-sac along the east boundary of the College Gardens development. However, the road continues in a westerly direction makai (seaward) of the college and serves residential and agricultural uses sprinkled along its one-half mile length. The right-of-way has not been determined, but the 10-17 foot wide a.c. pavement is in fair condition. This 1/2 mile section is privately owned and lacks curbs, gutters, and sidewalks. Access to the project site shall be taken approximately 700 feet west of the cul-de-sac. An existing earthen road shall connect the project area with Waiawa Road.

C.11.7 In the early 1970's the State of Hawaii proposed a second roadway entrance to Leeward Community College. The plan was to connect Waipio Point Access Road with the section of Waiawa Road makai of the college campus (D.A.G.S., 1974). The plan has yet to be implemented.

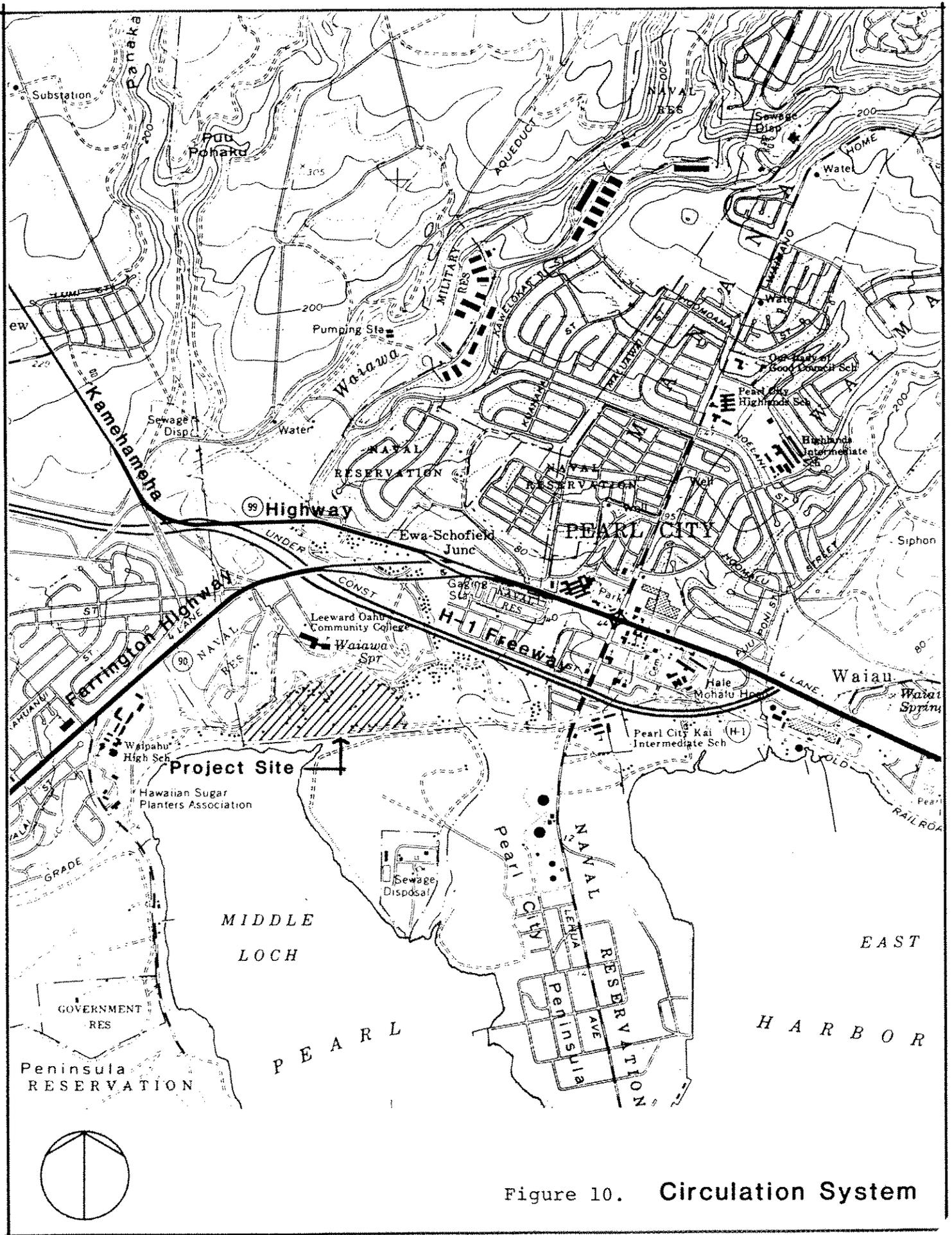


Figure 10. Circulation System

C.11.8 An unpaved U.S. Government roadway fronting Middle Loch borders the property to the south. Lying within a 40-foot right-of-way, the compacted dirt road maintains an 8-12 foot width. Large piles of junk, mostly abandoned automobiles, line both sides of the road. Use is restricted and locked gates preclude complete through access. The road follows a historic railroad grade from Aiea Bay (Pearl Harbor, East Loch) to well beyond Waipahu town. The right-of-way is identified on several plans (PUC Public Facilities Map; Waipahu 2000) as a corridor for future transit needs. Access to this road can be gained from Waipio Point Access Road through a gate controlled by Oahu Sugar Company (the gate accesses cane-haul roads in the area).

C.11.9 The Ewa Branch Trunk Sewer passes through the property along the north and east portions of the project site (see B.1.1).

C.12 TRAFFIC

C.12.1 Traffic volume information was obtained from the State Department of Transportation and supplemented with field observations and manual counts (see Tables 9 and 10).

C.12.2 Traffic has increased an average of 6% on Kamehameha and Farrington Highways over two years. The counts show a modest decrease (7%) in traffic headed in the direction of Leeward Community College and an increase in traffic departing the college (12%). Manual counts reveal that about 75% of the vehicles entering the Ala Ike and Waiawa Road intersection during morning hours are bound for the college. During afternoon hours, half the traffic entering the intersection is outbound from the college. Rapid movement through the intersection is the norm. Not all vehicles on Ala Ike heed the posted stop signs prior to turning onto Waiawa Road as turning movements are rapidly executed at slow speeds.

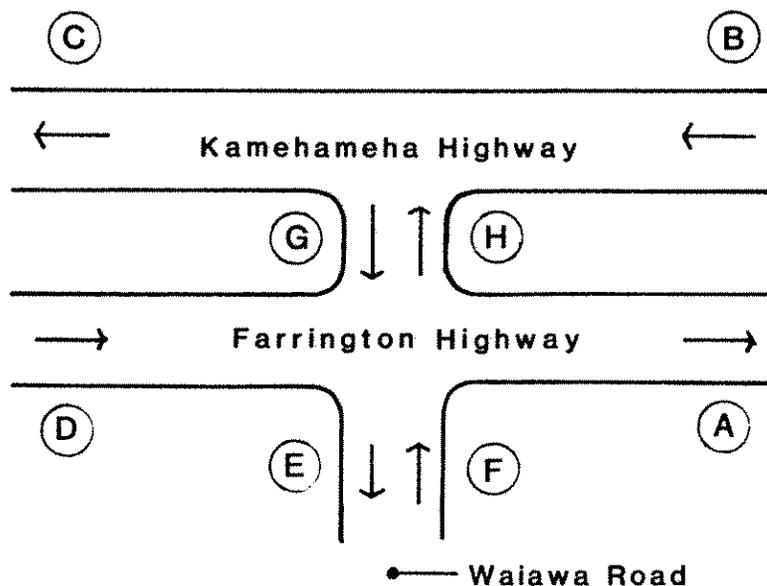
C.11.3 A congestion problem exists on Waiawa Road between Farrington and Kamehameha Highways. Long queues were observed when vehicles from the Honolulu direction make left turn movements onto Waiawa Road. The short length of road and traffic signal delay backs up vehicles on Kamehameha Highway. Through traffic is then restricted to a single lane for short periods of time. During afternoon hours the situation is reversed and ewa bound traffic backs up on Waiawa Road mauka of Farrington Highway.

C.11.4 Some stacking of the right turn lane on Farrington Highway was observed. The problem is not as great as that occurring on Kamehameha Highway. Through traffic delays are considered minimal.

TABLE 9

24-HOUR ACCUMULATION TRAFFIC COUNT

(Farrington Highway at Waiawa Road)



STATION	1982 (Volume)	1984 (Volume)	AM PEAK (7:15 - 8:15)	PM PEAK (4:30 - 5:30)
A	16,507	17,009	1,265 *	1,242
B	15,350	16,859	1,132 *	1,608
C	14,032	14,313	445 **	1,254
D	15,937	16,072	2,033 **	1,125
E	5,629	5,212	968	225 ***
F	4,881	5,487	147	665 ***
G	N/A	3,497	526	1,235
H	N/A	1,826	54	872

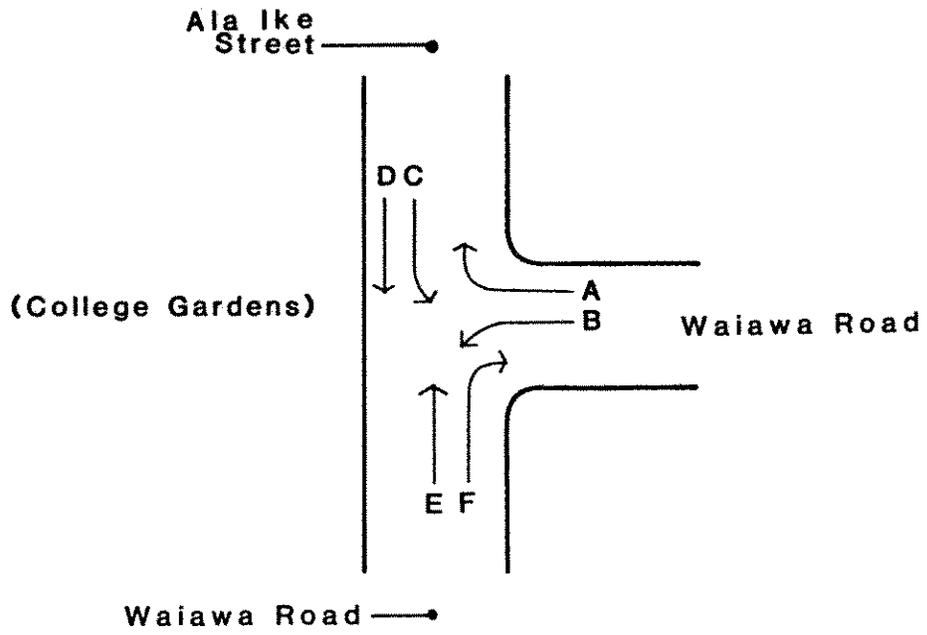
- * 7:00 - 8:00 Peak hour
- ** 6:15 - 7:15 Peak hour
- *** 1:15 - 2:15 Peak hour

Note: 1982 Counts taken September 13-14, 1982.
1984 Counts taken September 24-25, 1984.

Source: State Department of Transportation, 1984.

TABLE 10
TRAFFIC COUNT

(Waiawa Road at Ala Ike Street)



	AM (7:30 - 8:30)	PM 3:00 - 4:00)
A	385	60
B	22	63
C	69	189
D	1	0
E	2	2
F	41	30
Total	520	344

Source: Manual Traffic Count, April 11, 1985.

C.12 ECONOMIC CONSIDERATIONS

C.12.1 Although watercress has been grown in Hawaii for many years to satisfy local needs, supply in recent years has steadily declined. Production output averages now around 1.4 million pounds, far below the 1958-62 period of 3 million pounds annually (DOA, 1982; letter, Jack Suwa, Hawaii State DOA), but considerably more than during the period 1981-82 when the industry suffered from infestations of the diamond back moth (see Paragraph B.3.1). Statewide, watercress acreage is about 35 acres. Local demand is believed to be close to the 1958-62 period production level (Maretzki, 1981). Marketing of watercress outside of the State of Hawaii is considered a viable long-range goal for the late 1990's and beyond. The proposed project is a commercial venture, intended to earn a profit for the participants in Watercress of Hawaii, Inc. In addition, however, the expansion of watercress production on the property would be beneficial to the economy from the standpoint of generating additional agricultural jobs and contributing to the overall diversification of agriculture in the State.

SECTION D.

PROBABLE IMPACT OF THE PROPOSED PROJECT ON THE ENVIRONMENT

D.1 IMPACTS ON AIR QUALITY

D.1.1 This agricultural project is not expected to have any adverse impacts on air quality. All of the significant crop areas (mostly watercress) would be in submerged lands. Neither dry field tilling nor burning are required. Moisture content of the air over the fields and immediately downwind would be elevated due to the regular use of sprinkler systems intended to disrupt the breeding of the diamondback moth, a serious pest species on watercress. This action is not anticipated to have any detrimental consequences on adjacent properties.

D.1.2 Landfill operations will produce some dust, primarily from trucks traversing unpaved access roads during dry periods. The landfill operator (Landsend, Inc.) will take appropriate measures (watering-down roads and active fill sites as required) to mitigate dust problems. An adequate supply of water would be available on site to substantially reduce or eliminate dust generation. Most of the time, prevailing winds would carry any dust generated in the direction of the mangrove forest along the shore of Middle Loch. At these times, neither residential areas nor populated areas of any kind would be effected. No detrimental impacts on the mangrove forest are anticipated. Light dusting over a long period of time, if not relieved by rainfall, could at times reduce the rate of production (i.e., growth and reproduction) of the mangrove trees. This forest is of no direct commercial value and is little used by man. Although the mangrove in Hawai'i is generally regarded as a pest species, mangrove forests provide valuable refuge for a variety of small brackish and marine organisms, including the juveniles of species found offshore as adults. This function of the forest would not be impaired or adversely impacted by dust generated from the project.

D.1.3 Given that no flameable materials would be placed in the landfill and the wetness of the site, no fire hazard is anticipated. Adequate water exists on site to prevent or put-out fires. Neither toxic fumes nor foul odors would be generated by the land-clearing debris to be deposited as fill. However, hydrogen sulfide gas may, on occasion, be released by dredging activities or produced in temporary stagnant pools resulting from dredging activity. If dredging activity is limited to periods of normal tradewinds, any hydrogen sulfide gas will be harmlessly dispersed away from inhabited areas. Odors emanating from temporary pools of standing water can be reduced or eliminated by shunting excess spring water into the area to encourage mixing. Some methane gas generation might result from the breakdown of vegetation buried in the landfill, but this gas generation would probably be no more than is presently produced by organic decomposition in the existing marshland.

D.2 IMPACTS ON SURFACE WATER QUALITY

D.2.1 Some pesticides are used in watercress culture, although the application rates have steadily declined in recent years primarily because of the use of overhead sprinkler systems to disrupt the breeding cycle of the principal pest on watercress, the diamond-back moth. At the present time methomyl, diazinon, and malathion at application rates of 0.5 lbs/acre (0.5 to 1.0 for methomyl) are typically used to control pests. Applications are made once every 4 to 6 weeks. Considering that the stream areas around and immediately downstream of the watercress plots were noted in the March 18, 1985 survey to have a greater diversity of aquatic life (as compared with the marshlands), impacts of pesticide applications appear to be minor. Mr. Sumida, of Sumida Watercress Farm, believes that small fishes and invertebrates were far more abundant in the waters of his farm in Pearl City after the installation of sprinkler heads (and subsequent reduction in pesticides use) than before.

D.2.2 The plan to recycle a portion of the water draining the eastern fields does not mean that some fraction of the overall water requirements of the project would be water recycled many times. Wetland watercress requires a substantial flow of water over the fields, producing significant dilutions of any nutrients and pesticides systematically added to the crop. Water taken from the drainage of the eastern fields would be used to supplement the sometimes saltier water derived from wells in the western part of the property. This supplemented water would not be reused -- that is, water draining the western fields would not be directed or pumped into the catchment basin.

D.2.3 At the present time two hog rearing pen areas occur in the vicinity of the proposed watercress expansion areas. For health reasons, these facilities would not be compatible with watercress cropping, particularly if drainage from the pens cannot be isolated from the cropping areas. It is anticipated that these operations will be removed from the area prior to expansion of the watercress growing areas into adjacent parcels.

D.3 IMPACTS ON GROUND WATER

D.3.1 Water which percolates through solid waste or other landfill formations is termed leachate, for it may contain dissolved or suspended materials extracted or "leached" from the solid waste. Obviously, the potential for contamination of ground and/or surface waters is dependent upon the nature of the materials contained in the solid waste. A number of other factors are important to consider as well. Generally, the more water that flows through the deposit, the more likely that chemicals will be leached out (Fenn, et al, 1975). Ideally, landfills are placed to minimize percolation, within the constraints imposed by the local balance between precipitation and evapotranspiration. It is now standard practice to divert runoff water around sanitary landfills.

D.3.2 The proposed project landfill, located beneath watercress plots, would be subject to substantial infiltration of water from above (dependent upon the permeability of the compacted crusher waste), and perhaps some spring water infiltration from below. The Waiawa site is located close to sea level in soils with a low permeability. Flooding of the watercress plots will result in a constant potential head above the landfill, and the potential for leachate generation seems unavoidable. Therefore, care will need to be exercised to prevent placement of material in the fill which could potentially result in the generation of a harmful leachate. The material proposed to be used as landfill in the Waiawa marshland would be land-clearing debris only. The landfill would not be operated as a sanitary landfill or for demolition debris, and general refuse would not be accepted. The fill would not contain the variety of potentially detrimental substances characteristic of general refuse dumps (so-called "sanitary" landfills), or material (particularly wood) from demolition debris likely to include chemicals used against termites, or petroleum hydrocarbons in the form of asphalt surfaces and roofing paper would not be utilized.

D.3.3 Groundwater movement in the area would be southward, away from existing or potential supply wells. Further, the valuable groundwater in this area moves towards the surface (artesian). The movement of water through the fill and beyond will be determined by rates of flux out of the formation. In as much as the flood channel barrier would have a high permeability relative to the native soils (silt/clay deposits), water entering the landfill will move laterally rather than vertically (downward). This means that the potential for impacts on groundwater resources would be slight or non-existent. However, any leachate generated would move into the surface waters draining the site to the south.

D.3.4 A considerable volume of fresh water will be input to the system (nearly 15 mgd). The majority of this must move across the land (i.e., through the watercress plots) as opposed to through the fill, otherwise a depth of water could not be maintained on the terraces. The daily volume of irrigation water which passes through the landfill will depend upon the permeability of the least permeable formation (flood barrier, fill, compacted crusher-waste cap) through which the percolating water must pass. It is anticipated that this volume will be small relative to the total outflow from the system, resulting in considerable dilution of any leachate formed.

D.3.5 Wherever landfill impinges on springs or wells, these features will be protected by constructing a vertical box around the structure. The thickness of the landfill will not exceed the dynamic head of any free-flowing springs or wells.

D.3.6 The project site is located between the Board of Water Supply's "no pass" and "pass" zones, requiring soil boring data to accompany applications for sanitation waste disposal on site. However, no sanitation facilities are anticipated to be added for

the proposed project. Figure 11 shows the relationship between the project location and groundwater resources on O`ahu. Although the landfill operation as proposed would not be classified as a "sanitary landfill", the site is within an area where impacts detrimental to existing or potential ground water sources are not expected.

D.4 IMPACTS ON WILDLIFE

D.4.1 If the proposed actions are carried out, destruction of much of the marsh is unavoidable. The wild marshland would be converted to wetland agriculture, with the exception of parts of the flood corridor. The present condition of the marshland, which is nearly entirely overgrown with California grass, provides relatively poor habitat for most kinds of wetland animals. Open water areas are limited to a few sections of the streams which drain the springs and watercress plots, and a pond of perhaps no more than 100 square meters in extent at the center of the marsh. Plant and animal diversity was notably greater in and around the watercress plots than in the marsh itself.

D.4.2 The 13 species of introduced birds and all of the introduced mammals in the general project area at Waiawa are irrelevant to an environmental assessment both because the proposed project will have no important impacts on the populations of these animals and because many of these exotics are pestiferous animals, causing considerable damage to agricultural crops (e.g., rats to sugarcane, bulbuls, white-eyes, and house finches to fruit crops).

D.4.3 The major concern about birds in the Pearl Harbor region deals with the four endangered waterbirds mentioned in paragraph C.7.4 -- that is, the gallinule, coot, stilt, and Hawaiian duck. However, there is now almost no suitable habitat for any of these birds in the project site. By suitable habitat is meant habitat for feeding, resting, and nesting. Therefore, filling in the lower portion of the site to an elevation that is suitable for watercress farming and for reducing the danger from flooding will have no effect on any of the endangered Hawaiian waterbirds.

D.4.4 The project site is not included in "waterbird habitat" as defined by the Hawaiian Waterbirds Recovery Plan (Walker, et al., 1978). According to Shallenberger (1977:298) "Coots find far less suitable habitat in the Pearl Harbor wetlands than do stilt. No more than three coots have been reported on individual counts at Honouliuli refuge unitGreatest numbers in the Pearl Harbor area have generally been found in small fish ponds in the Waikele area." One can conclude that the general Pearl Harbor region does not provide optimal habitat for the feeding and nesting of the Hawaiian coot.

D.4.5 Nor does the region provide good habitat for the Hawaiian gallinule. Shallenberger (1977) wrote: "Hawaiian Gallinule are even less common in Pearl Harbor areas than are coots. No more

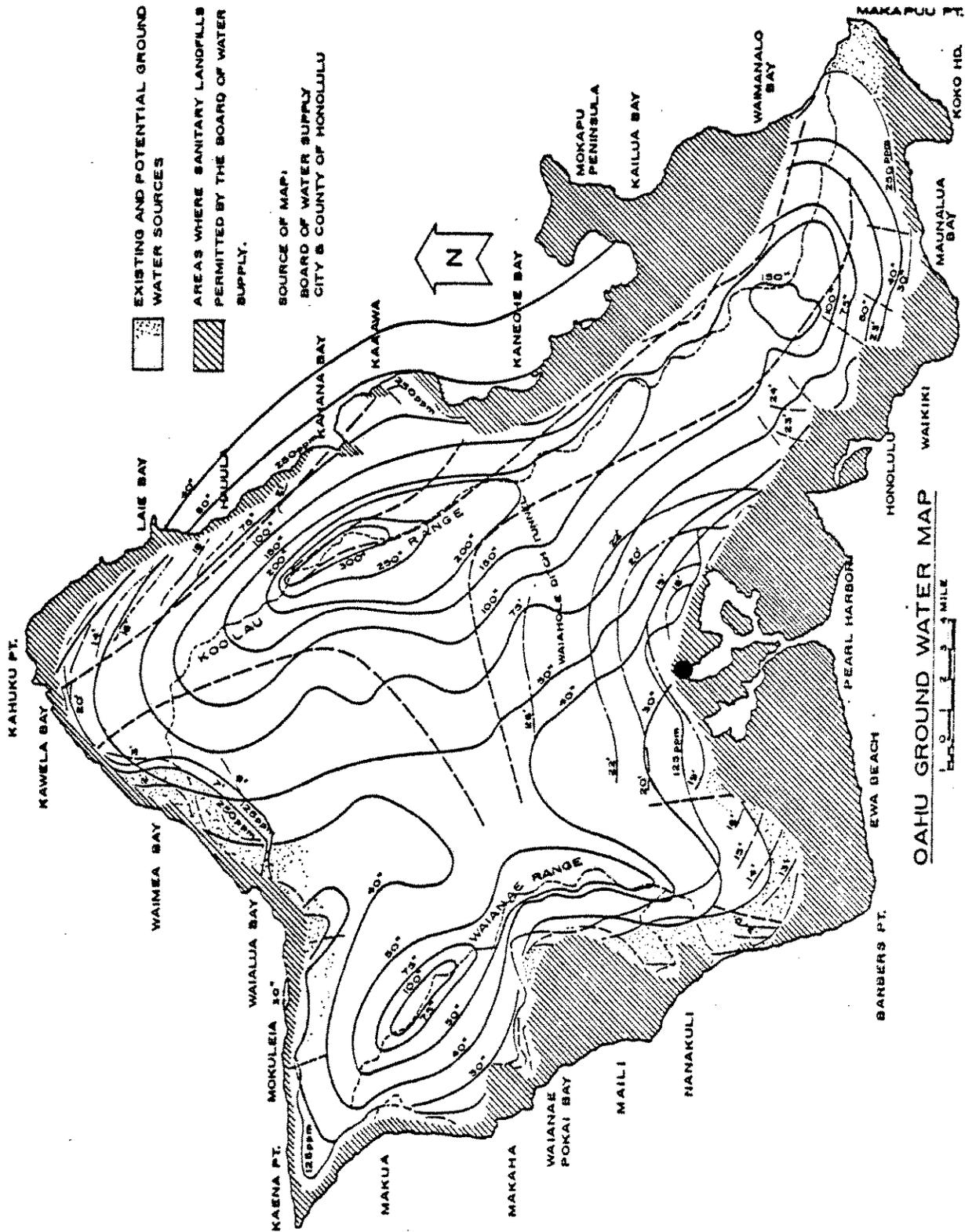


Figure 11. Location of project in relation to areas on O'ahu where landfills (sanitary) would and would not be permitted.

than two birds have been reported in the Honouliuli refuge unit in recent years." Moreover, the gallinule prefers fresh or brackish water so that it is doubtful that the Pearl Harbor region will ever provide habitat for any large number of birds.

D.4.6 It also seems certain that the Pearl Harbor area can never be a good habitat for the Hawaiian duck. Apparently this duck became extinct on Oahu during the 1950's. A Koloa restoration project was initiated by the State Division of Fish and Game in 1972. As of April 1979, 347 Koloa have been released on Oahu in an attempt to reestablish the species on this island: 199 birds were released in Kawainui Marsh; 103 at Waimea Falls Park; and 45 at Nuupia Pond on the Kaneohe Marine Corps Air Station. "Although release of cage-reared Koloa began on the windward side of Oahu in 1969, we can find no reports of the species in the Pearl Harbor area until 7/18/76, when two birds were counted on the ponds at Waipio peninsula. Since that time, they have also been observed at the Honouliuli refuge unit. Because of the distance involved, it is questionable whether or not birds from the windward side will successfully disperse in greater numbers to this area." (Shallenberger, 1977:299). Moreover, much more is involved than a "greater dispersment." It seems doubtful that the Pearl Harbor area offers the necessary food and safe nesting sites required by the Hawaiian duck. I know of no documented records of this duck nesting in the vicinity of salt water.

D.4.7 The island of O`ahu supports nearly one-half of the Hawaiian stilt in the state (Landgraf, et al., 1984). The limiting factor for most, if not all, of the endangered Hawaiian waterbirds is a lack of safe breeding habitat, especially safe from predators, such as mongooses and feral cats and dogs. Stilt prefer nesting habitat that is close to fresh or saline water ponds or mudflats, where the downy young also are subject to predation by bullfrogs and herons. Open water areas in the marshland are too deep for stilt, and lack accessible shoreline and mudflat areas attractive to this species. On the other hand, stilt will likely visit the watercress plots which appear to harbor an abundance of small fish and invertebrates, and have a depth of water comensurate with the feeding behavior of this shorebird.

D.4.8 "Numerous fishponds and a 31 acre salt evaporation pond were found on the west shore of West Loch (Honouliuli) early in this century. At the suggestion of Federal and State biologists, the salt pond was set aside as a wildlife sanctuary by the U.S. Navy in 1971. More recently, this site was selected as one of two areas to be developed as waterbird refuges to compensate for 186 acres of silted coral mudflats that were lost in the construction of the reef runway at Keehi Lagoon" (Shallenberger, 1977:292). The second of these refuges was established as the Waiawa unit. This Pearl City pond "was modified by diking, nest island construction, development of a fresh water source and fencing. The 24.5 acre site became the Waiawa or Pearl City Unit of the Pearl Harbor National Wildlife Refuge in 1976. At the time of our survey [in 1977], USF&WS personnel were having diffi-

culty pumping sufficient water to maintain desired levels in the pond... It is apparent that some selective vegetation control and possibly judicious planting of other marsh vegetation may be desirable in the future."(Shallenberger, 1977:296).

D.5 LAND USE IMPACTS

D.5.1 The proposed project will not affect existing land use designations but would have temporary effects on agricultural uses. Recently negotiated leases between the farmers and the landowner commit the land to active agricultural use for 25 years hence. During the first 10 years some existing watercress areas (no more than a few acres at any given time) shall be removed from production to accommodate filling activities. When the desired fill elevations are achieved, the reclaimed land would then be placed in watercress production and another area filled. However, no net decrease in acreage under production is anticipated because the first increment (Phase I in Figure 3) to be filled is presently not used for watercress. The three acres of watercress proposed for this parcel would be in production before the second incremental fill operation (Phase II) is undertaken. Thus, acreage in watercress would be increased faster than decreases caused by temporary removal to accommodate land alterations.

D.5.2 The land area to be used for flood control purposes is presently overgrown by vegetation and visually blighted with junk and derelict automobiles. Old landfill areas occur in parts of the marshland. At one time squatters raised pigs in the area, but the pens have since been abandoned and declared a fire hazard by the Honolulu Fire Department. Owing to its non-agriculture use, committing this area to flood control would benefit the more productive agricultural lands, and can be anticipated to have benefits to other properties located between the project area and the lower reaches of Waiawa Stream by reducing the flood hazard in these areas somewhat.

D.5.3 The proposed project would not have any adverse impacts on existing or development planned uses of surrounding parcels. Preservation in agriculture and wetland, and the maintenance of a flood corridor should prove beneficial to adjacent properties. Sumida Farm, located adjacent to Pearl Ridge Center in Aiea, demonstrates the compatibility of watercress cropping with urban/residential development. The project, once developed, should provide environments attractive to waterbirds, and would be beneficial to the nearby Waiawa Unit of the Pearl Harbor National Wildlife Refuge.

D.5.4 The proposed landfill and dredging activities will not have adverse impacts on either the energy corridor easement (State of Hawaii, Department of Transportation) or the Ewa Branch Trunk Sewer (City & County of Honolulu). Care will need to be exercised with respect to dredging and heavy equipment use in general to avoid damage to sewer line structures.

D.6 IMPACTS ON HISTORIC AND ARCHAEOLOGICAL SITES

D.6.1 The reconnaissance of the property showed severe modern modification and no traces of archaeological sites or features of historical significance. The natural silting processes of wetlands, the use of the site as a sugar company reservoir, and modern land usage, have erased all traces of a former fishpond. The proposed project will not impact archaeological resources, and there appears to be no need for further archaeological investigation. Care will be taken during dredging of the flood channel, on the chance that stone structures might be found which could be helpful in confirming the location of the former Loko Mo'o fishpond. The State Archaeologist (DLNR) will be notified in the event that dredging reveals any structures or materials of potential archaeological interest.

D.7 TRAFFIC RELATED IMPACTS

D.7.1 The gradual expansion of watercress acreage is not anticipated to produce any changes in local or area traffic. Traffic related impacts result from the delivery of fill material during the development phases of the project. Applicant anticipates daily variations in truck traffic. Traffic is estimated to range between 0-10 vehicles per day upon start-up. Over time, traffic is projected optimistically at 0-40 trucks per day. Whether the latter estimate is reached (or exceeded on occasion) depends in part on economic factors affecting construction (e.g., savings in transportation costs), user fees established by applicant, and general acceptability for a privately operated facility.

D.7.2 The traffic to be generated by the proposed project amounts to less than one (1) percent of traffic moving in the direction of Leeward Community College. It is anticipated that traffic to the fill site will not always coincide with peak traffic hours but occur during non-peak hours when traffic volumes are relatively low. From Kamehameha Highway to the cul-de-sac near the College Gardens housing development, Waiawa Road is of sufficient width to accommodate both truck and automobile traffic. From the cul-de-sac to the disposal site, only one-way traffic can be accommodated when debris trucks are passing.

D.7.3 Truck traffic may delay traffic movement on the short stretch of Waiawa Road between Farrington and Kamehameha Highways. Sight distance is adequate for inbound and outbound vehicles. However, the longer debris trucks will reduce by 2-3 vehicles what little storage capacity now afforded by Waiawa Road. Slightly longer queues for in-and-out bound traffic may occur. Thus, the time to move through the intersection may increase but the slight increase in traffic should not adversely affect existing conditions. Waiawa Road is flanked by multiple and single-family residences near the entryway to the project site. The multiple residential project is set back about 50 feet from the road in comparison to little or no setbacks for the single family

residences. Residents could be annoyed by intermittent noise from passing trucks which may range between 70-85 dBA. Driving at slow speeds (less than 25mph) and properly operating mufflers may reduce some noise, but will not effectively mitigate intrusive sound levels. All vehicles must comply with noise standards contained in Chapter 42, Vehicular Noise Control for Oahu.

SECTION E.

RELATION OF THE PROJECT TO PUBLIC LAND USE AND ENVIRONMENTAL POLICIES AND CONTROLS

E.1 LAND USE DESIGNATIONS

E.1.1 The project area is designated Agricultural by the State Land Use Commission, general planned Agriculture (Central Oahu Development Plan, Ord. No. 83-7), and zoned AG-1, Restricted Agricultural District. Consistent with these designations, the land is presently used expressly for agricultural purposes. Although predominantly marshland, 5 acres along the the north and west portions are presently in watercress cultivation.

E.1.2 State Department of Agriculture, Agricultural Lands of Importance to the State of Hawaii (ALISH) maps classify the area "Unique Agricultural Land". This classification, which is second in importance to prime agricultural land, is defined as "land that has the special combination of soil quality, location, growing season, moisture supply, and is used to produce sustained high quality and/or high yields of a specific crop when treated and managed according to modern farming methods."

E.1.3 Leeward Community College and a portion of a U.S. Navy Reservation stand above the project area to the north. These lands are designated Public Facility and zoned AG-1. Lands to the east are generally designated Residential, zoned R-6, and developed for low density residential use. Multiple-residential developments nearby are general planned Medium Density and zoned Medium Density Apartment (A-2).

E.1.4 Waiawa (Pearl City) Peninsula, which fronts the U.S. Government Road makai or south of the project area, is general planned Public Facility, Parks, and Industrial. The Public Facility designation encompasses the Pearl City Sewage Treatment Plant at the tip of the peninsula west of Waiawa Stream and is zoned AG-1. Areas designated Industrial and Park are zoned for federal use (F-1). The old railroad right-of-way is designated as a transit corridor.

E.1.5 The Flood Insurance Rate Map (FIRM) for the area (see Figure 7; from U.S. ACOE, 1982) places all of the lowland portion of the property (essentially all of the developed and proposed watercress areas) within the 100-year floodplain of Waiawa Stream (Flood Zone A4). A narrow strip of land designated Zone B borders the Zone A4 land. The remainder of the property (immediately makai of and along Waiawa Road) is designated Zone C, "areas of minimal flooding". FIRM Zone A areas may be subject to Ordinance No. 80-62 relating to the City & County of Honolulu, Flood Hazard Districts.

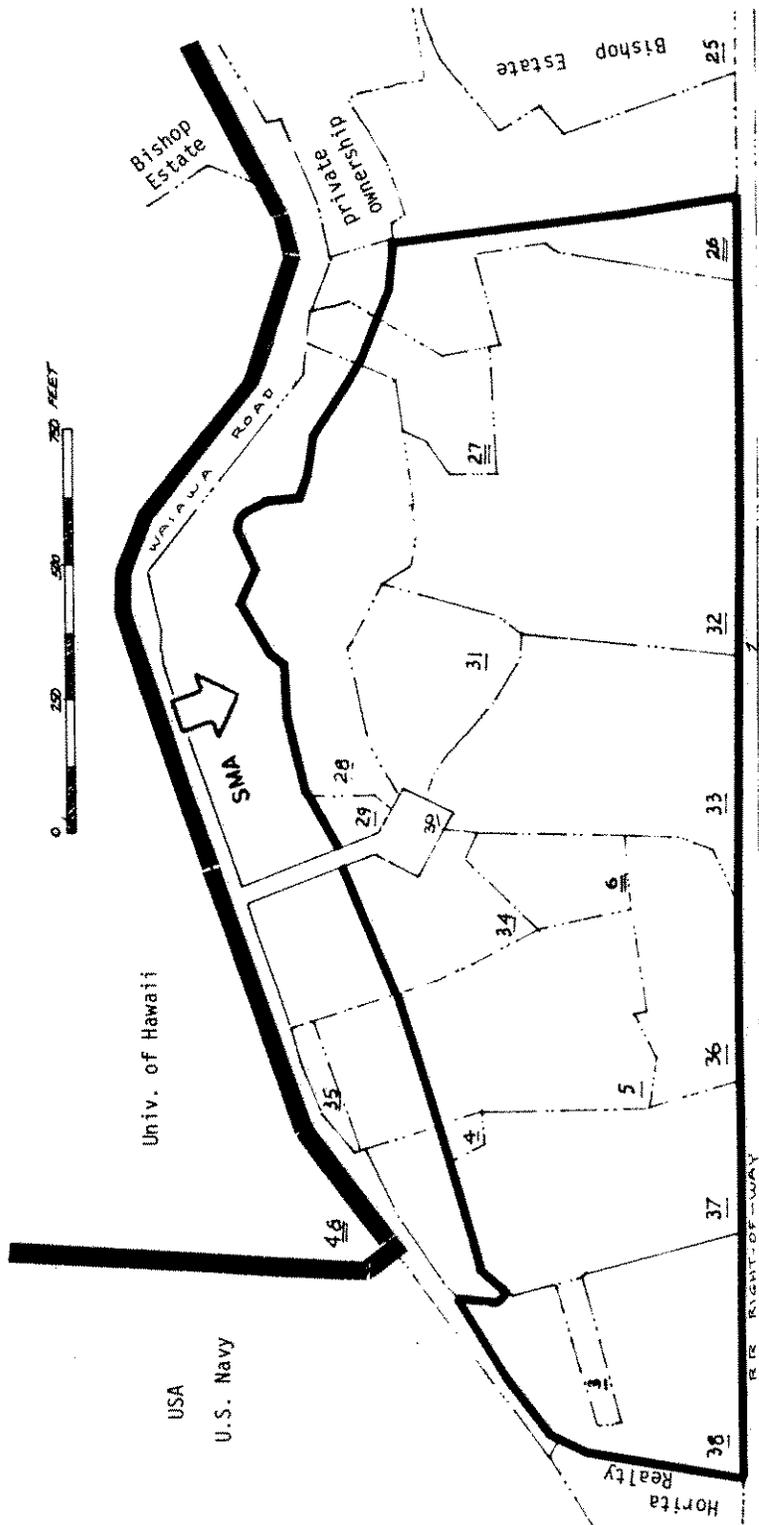


Figure 12. Relationship of the project boundary and the SMA boundary. Also shown are parcels (TMK: 9-6-03) involved and land ownership of surrounding parcels.

E.2 PERMITS AND APPROVALS

E.2.1 The U.S. Army Corps of Engineers has regulatory jurisdiction over aquatic and wetland environments. Much of the area for the proposed landfill would be defined as a wetland. A Department of the Army permit is required under Section 10 of the River and Harbor Act of 1899 and Section 404 of the Clean Water Act (33 U.S.C. 1344) prior to any dredging and filling within the designated wetland area. A statement of consistency must be filed with the Coastal Zone Management Program, State of Hawaii Department of Planning and Economic Development, for public review.

E.2.2 Although expansion of the area to be put into watercress and/or other wetland crops is consistent with the agricultural zoning of the property, consistency with respect to the landfill aspect of the proposed project is dependent upon interpretation of land use regulations. A Special Use Permit from the County Planning Commission is required for use of agricultural land for other than an agricultural or rural use. However, the landfill may qualify as an "unusual and reasonable" use within the Agricultural District. Most of the property is unsuited for agricultural use without some level of dredging and filling. The proposed landfill would not be contrary to the objectives of the Agricultural District since the purpose is to make the land suitable for watercress cropping; surrounding property would not be affected adversely (subject to interpretation of environmental assessment); and the landfill would not unreasonably burden public agencies to provide roads, sewers, drainage, etc.

E.2.3 Construction of a flood control channel would require review and approval by the City and County of Honolulu, Department of Public Works.

E.2.4 The project area lies within the County delineated Special Management Area (Ordinance No. 84-4) (Figure 12). Agricultural development would be exempt from SMA provisions, but a landfill activity of the magnitude proposed, might not be. The project is subject to County and public review and cannot commence unless a SMA Use Permit is granted.

E.2.5 The project is consistent with the Hawaii State Plan, adopted in 1978; particularly the parts of that document which emphasize development of diversified agriculture and aquaculture [see Section 10, Policy (b)(1)].

E.2.6 The project is located within the Pearl Harbor Groundwater Control Area administered by the State of Hawaii, Dept. of Land and Natural Resources. Disturbance or modification of any of the artesian springs and wells are regulated by the DLNR's Administrative Rules, Chapter 166 of Title 13.

SECTION F.

PROBABLE ADVERSE ENVIRONMENTAL EFFECTS
WHICH CANNOT BE AVOIDED

F.1 LOSS OF NATURAL WETLAND

F.1.1 Conversion of much of the natural marshland to watercress cropping areas is the primary intention of Watercress of Hawaii, Inc. Thus, the loss of natural wetlands cannot be avoided.

SECTION G.

ALTERNATIVES TO THE PROPOSED ACTION

G.1 ALTERNATIVES TO FILLING EXISTING MARSHLAND

G.1.1 The purpose of raising slightly the elevation of the land which at present is marshland is to enable development of watercress "ponds" with adequate drainage. Construction of a flood corridor and flood barrier is intended to prevent or reduce potential losses at times of severe flooding from Waiawa Stream. Ostensibly, clearing without filling might allow some expansion of the present acreage in watercress, although the limitation becomes the slight slopes which exist between the existing watercress fields and the drainage from the property. A barrier or dike could be constructed to reduce the flood hazard, independent of any landfill for cropping areas. The integrity of such a barrier would be difficult to maintain for a system which requires an outflow of water; that is, a completely effective dike would need to close off the outflow area, requiring that the considerable volume of drainage water be pumped over the dike. This pumping would not be economically feasible.

G.1.2 Expansion of watercress plots and/or construction of a flood control dike without raising the elevation of the land, while perhaps accomplishing some of the goals of the project, would not alter or mitigate impacts on the existing natural wetland with the exception that a smaller area of the marshland would be subjected to alteration. Thus, this alternative would have the effect of substantially reducing the economic success of the venture, without reducing direct impacts on the existing wetland. This alternative would have the advantage that abandoned watercress areas should revert back to marshland without active management. Most short-term and long-term impacts associated with the landfill operation would be avoided.

G.1.3 The alternative of expanding watercress without any fill would be preferable to Watercress of Hawaii, Inc., because of the reduced capital costs of land development. However, the economic feasibility of the project would be jeopardized such that all economic benefits would be lost.

G.2 ALTERNATIVE FILL MATERIALS

G.2.1 Presumably, Watercress of Hawaii could exercise various options to obtain the required volume of fill material, including outright purchase of suitable quarry material or soil. The cost to Watercress of Hawaii, however, would be prohibitive when balanced against the return on agricultural land. For suitable locations, fill requirements for development of housing, industrial space, and/or high-rise buildings can be accommodated within the overall costs of construction and expected return on investment. For agriculture and aquaculture, the costs of land development are critical to success of the venture. In essence, the

expected return from watercress sales would not finance the costs of select fill material.

G.2.2 Watercress of Hawaii, Inc., with or without Landsend, Inc. acting in a supervisory capacity, could open the site for non-selective dumping of materials, or restrict dumping to demolition and land-clearing debris. However, this alternative would not mitigate any environmental impacts, and could increase the adverse impacts if the fill were to become contaminated with potentially hazardous materials. This alternative was addressed in the Environmental Assessment (AECOS, 1985), in which the use of demolition debris was proposed. However, due to the wetness of the site, and the probable generation of leachate from termite treated woods, fumigated soils, and petroleum-based building materials, this alternative would not be acceptable to the government agencies involved in providing permits for the project (see Appendix C).

G.2.3 Landfill material either has value (must be purchased) or entails costs to dispose of. A range of types of material from land-clearing debris to hazardous wastes exists within the latter category. However, realistically, solid waste categories are dependent upon the systems established for the collection and transportation of such materials. Because land-clearing and demolition debris are traditionally collected and transported separate from "sanitary" wastes (i.e., garbage), the separation of these two categories between disposal sites can be readily affected. Further segregation, particularly between land-clearing or grubbed material and demolition debris is possible, although would involve either additional expense or substantially reduced rates of supply. The selection of land-clearing debris exclusive of demolition debris to meet the landfill requirements of the Waiawa watercress project represents the best economic alternative at the lowest environmental cost.

G.3 ALTERNATIVE OF NO ACTION

G.3.1 The alternative of no action, that is foregoing development of agriculture on the site, would eliminate both short-term and long-term impacts on the Waiawa wetlands. This alternative would not enable Watercress of Hawaii to achieve any of its goals to expand watercress cropping in Hawaii. Sites ideally suited to watercress are exceedingly rare in the islands, requiring first and foremost a ready supply of clear, fresh water. The proximity of several large freshwater springs on the property make this location ideal for wetland crops. Similar circumstances are to be found almost no where else. Because the majority of the property is marshland, alternative uses of the land would not be of interest to Watercress of Hawaii, and the corporation would seek to terminate its lease on the property or encourage alternative commercial use of the site. It is difficult to conceive of a commercial alternative use of the land that would avoid filling and/or dredging. The value of this wetland as a habitat for endangered or threatened species would seem predicated on some

degree of management of the environment for such purpose. Un-
managed, the site has limited natural value, and these values
will continue to deteriorate from sedimentation, encroachment of
exotic weedy plants, and unauthorized dumping.

SECTION H.

MITIGATION MEASURES PROPOSED TO MINIMIZE IMPACTS

H.1 WETLANDS RESTORATIONS

H.1.1 The marshland on the property could serve as additional feeding habitat for waterbirds attracted to the Waiawa Unit of the N.W.R. which is located close by (see Figure 8). However, utilization of the marshland at the present time appears to be low, due to the poor condition of the habitat. The proposed project is expected to improve this habitat by providing a substantial increase in the area of shallow, open water environment attractive to wading birds. Portions of the 5 acre flood corridor would be modified into an environment more suitable for endangered waterbirds than that which presently exists on this land.

H.1.2 In addition, the proposed water reservoir will provide significantly greater open water environment than presently exists on site. Given the location and water source for this feature, the pond is expected to be a freshwater body with little or no fluctuation in water level.

H.1.3 At the suggestion of the U.S. Fish and Wildlife Service, a portion of parcel 26, located mostly east of the access road crossing the property between Waiawa Road and the Navy Access Road, would be cleared and dredged to provide additional waterbird habitat. Modification would involve dragline dredging of as much of the parcel as could be reached from the roads bordering the west and south sides of the area. Dredging would be subject to approval by the Board of Water Supply, which has expressed some concern about the impact any dredging in the area might have on the outflow of water from springs.

H.3 NOISE AND DUST FROM LANDFILL ACTIVITIES

H.3.1 Landfilling activities, including equipment and vehicular sources of noise, will comply with the provisions of Title II, Administrative Rules Chapter 42, Vehicular Noise Control for Oahu and Chapter 43, Community Noise Control for Oahu. Permits will be obtained if noise levels exceed the allowable levels for the proposed activities.

H.3.2 Mitigation of dust problems associated with equipment and vehicles operating around the site are discussed in paragraph D.1.2.

SECTION I.

ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION

I.1 LANDFILL

I.1.1 The proposed project would utilize landfill materials obtained from offsite. These would be mostly soil and rock from unrelated land clearing activities elsewhere, and would be utilized as they become available. Quarry crusher waste would be purchased to use as a cap over the landfill and a base for the watercress pond.

I.2 WETLANDS

I.2.1 The creation watercress cropping areas represents a conversion of wetlands from a natural condition to a cultivated state. For the most part, the "reclaimed" land could still be designated as a wetland. Typical wetland vegetation will be removed from most areas, but certain physical characteristics, spring water flow for example, would not be affected. The proposed flood corridor would revert, in part, to a natural wetland. The catchment basin for the water distribution system would constitute an open water environment substantially larger than the existing open water pond situated in the middle of the eastern part of the wetland. Thus, on balance, the proposed alterations would result in a wetland of equal or greater quality than that which presently exists.

I.2.2 The conversion to cultivated land, by itself, would not represent an irreversible commitment of wetland resources. The addition of fill to raise the elevation of the land could irreversibly alter the nature of the site. The wetlands at this location are fed by numerous springs, both large and small, which are artesian. The fill would not elevate the land above the artesian head. If the watercress areas were subsequently abandoned, reversion of most or all of the area to natural wetlands could be accomplished, although might require some management of waterflow and water diversions.

SECTION J.

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LANDSEND, INC.
WAIAWA WATERCRESS FARMS
BIRD AND MAMMAL REPORT

By Andrew J. Berger, Ph.D.

This report on the birds and mammals of the Waiawa Watercress Farms was prepared at the request of Eric Guinther, of AECOS, Inc. Our initial site visit was made on March 18, 1985.

Topography and General Vegetation

This lowland, swampy area has undergone extensive disturbance during the past 200 years and there is no semblance of any endemic ecosystem. In the past, the area was used for cattle grazing, and, at present, the upper, higher ground is used for watercress farming. The lower ground is clogged with introduced grasses, plus (especially along the road at the lower boundary of the tract) a wide variety of introduced plants: e.g., bulrush, haole koa, ragweed, vines, castor bean, fleabane, banana, and a few scattered palm trees. A great deal of trash, including automobiles, has been dumped along the edges of the lower road. Indeed, any change in the vegetation and the cleanup of trash would be a significant improvement of the entire area.

The Birds

Three general groups of birds occur in the Hawaiian Islands: endemic, birds that are unique to the Hawaiian Islands and do not occur naturally in any other part of the world; indigenous, birds that occur in Hawaii but whose range includes other parts of the Pacific Basin; and introduced or alien, birds that have been brought to islands by man (since 1796, in the case of birds; Berger, 1981).

I. Endemic Birds

Many of Hawaii's endemic birds are classified as threatened or endangered by the U.S. Fish and Wildlife Service and by the State Division of Forestry and Wildlife. Most of the endangered birds, however, are forest birds and there is no suitable habitat for any of these species for many miles from the project site. In fact, very few endemic forest bird species still occur on O'ahu. Four species of endangered waterbirds: Koloa or Hawaiian duck (Anas wyvilliana), Hawaiian gallinule (Gallinula chloropus sandvicensis), Hawaiian coot (Fulica americana alai), and Hawaiian stilt (Himantopus mexicanus knudseni) have populations on O'ahu. No suitable habitat for any of these endangered waterbirds occurs on the project site, despite the fact that much of the project area is a wetland.

II. Indigenous Birds

In the category of indigenous birds are some 22 species of sea birds, the Hawaiian black-crowned night heron, and a number of migratory species that spend their winter or nonbreeding season in the islands.

1. Black-crowned night heron or `Auku`u (Nycticorax n. hoactli)

The `Auku`u is considered to be an indigenous bird, rather than endemic, because the Hawaiian birds have not been recognized as subspecifically distinct from the North American birds. Hence, it is not classified as threatened or endangered even though its fate depends upon the preservation of suitable wetlands. I flushed two herons from watercress farms during the survey, but none were seen in the dense California grass in the lower portion of the project area, and such habitat is not suitable for these birds. Although the herons feed predominantly on aquatic insects, fish, frogs, and mice, they also sometimes prey on the downy young of terns and other marsh birds. The proposed raising of the wetland elevation in the lower portion of the area will have no adverse effects on the herons.

2. Winter residents

I recorded two species of winter residents, neither of which is of any significance for the proposed project.

A. Lesser golden plover (Pluvialis dominica fulva)

I saw two birds along the road at the lower boundary of the site. In the Hawaiian Islands, these birds winter from sea level to about 10,000 feet elevation on Hawaii and Maui. The birds frequent lawns in residential areas, golf courses, weedy pastures, open areas in mountains, and mud flats along beaches.

B. Wandering tattler (Heteroscelus incanus).

This shorebird breeds in Alaska and northwestern British Columbia. It is a regular visitant in Hawaii, usually being seen as single birds rather than in large flocks as are some of the other wintering shorebirds. I saw one bird in the watercress beds.

III> Introduced or Alien Birds

More than 170 species of alien birds have been intentionally introduced to the Hawaiian Islands by man since 1796 (Berger, 1981). I identified the following on the watercress site and in the adjacent vegetation.

A. Order Ciconiiformes

b. Family Ardeidae, Herons

1. Cattle egret (Bubulcus ibis)

This egret was imported to aid "in the battle to control house flies, horn flies, and other flies that damage hides and cause lower weight gains in cattle" (Breese, 1959). Most of the funds were provided by ranchers to have the birds released on their land. Cattle egrets were released on Oahu in 1959 and 1961. Thistle (1962) reported that the population of egrets on Oahu exceeded 150 birds by July 1962. Some 700 birds were counted during July 1983 by personnel of the Division of Forestry and Wildlife; 477 birds were reported on the annual Hawaii Audubon Society Christmas Count on December 16, 1984. The Cattle egret is an abundant species in the Pearl Harbor region, and I saw several birds in the watercress beds and a dozen flying over the area.

B. Order Columbiformes

b. Family Columbidae, Pigeons and Doves

2. Spotted or Lace-necked dove (Streptopelia c. chinensis)

This Asian dove was introduced to the Hawaiian Islands at an unknown early date; the birds were said to have been common on Oahu by 1879 (Caum, 1933). Now common to abundant on all of the islands, this dove is classified as a gamebird in Hawaii. Although it occurs where the rainfall exceeds 100 inches per year, the highest densities are found in drier areas where the alien kiawe and haole koa are dominant plants. For example, Schwartz and Schwartz (1949) found densities as great as 200 birds per square mile in dry areas on Molokai. The diet was found by the Schwartzes to consist of 77 percent weed seeds and about 23 percent fruits; animal matter was "almost negligible." However, tapeworm parasitism was heavy, thus indicating that the small amount of animal material eaten was important in contracting the worm parasites. The Spotted dove is common throughout the project region.

3. Zebra or Barred Dove (Geopelia striata)

This dove is said to have been introduced to the islands from Australia sometime after 1922 (Bryan, 1958). It is now abundant on all of the islands. This dove also prefers drier areas where weed seeds are abundant. Schwartz and Schwartz (1949) reported densities as high as 400 to 800 birds per square mile on Oahu (e.g., at Barber's Point) in 1947, less than 25 years after the doves had been introduced to the islands. The diet consists of about 97 percent seeds

and other plant materials; the 3 percent animal matter includes several species of beetles, weevils, and wireworm larvae. The Zebra dove is common throughout the project area.

C. Order Passeriformes

a. Family Pycnonotidae, Bulbuls

4. Red-vented Bulbul (Pycnonotus cafer)

Although all members of this Old-world family are "prohibited entry" into Hawaii by the quarantine division of the State Department of Agriculture, two species are now well-established on Oahu. The history of the spread of the Red-vented bulbul since the mid-1960's has been discussed by Berger (1975,1981). This bulbul is common in the Pearl Harbor region and in the vegetation surrounding the project site.

b. Family Turdidae, Thrushes and Bluebirds

5. Shama (Copsychus malabaricus)

Shama is the Indian name for this thrush, which is native to India, Nepal, Burma, Malaysia, and throughout Indonesia. The Hui Manu imported Shamas in 1940 and released them in Nuuanu Valley "and at some homes in the 2400 block on Makiki Heights road" (Harpham, 1953). The Shama now is common both on the windward and leeward sides of Oahu. The birds prefer lush vegetation, and this thrush was common in the thickets surrounding the project site.

c. Family Zosteropidae, White-eyes and Silver-eyes

6. Japanese White-eye or Mejiro (Zosterops japonicus)

Long a favorite cage-bird in the Orient, this white-eye was first imported from Japan for release in the islands by the Territorial Board of Agriculture and Forestry in 1929 (Cau, 1933). Later importations were made by the Hui Manu. Mejiro Clubs held singing competitions with these birds. The Japanese White-eye rivals the House Sparrow and the European Starling in North America as a successful alien species, and it now is undoubtedly the most common songbird species in the Hawaiian Islands. It occurs from sea level to about 10,000 feet elevation on Hawaii and Maui, and it occurs in near desert areas and in those with an annual rainfall of more than 300 inches. It is a common species in the project area.

d. Family Sturnidae, Mynas and Starlings

7. Common Indian Myna (Acridotheres tristis)

This myna is native to Sri Lanka, India, Nepal, and adjacent regions. It "was introduced from India in

1865 by Dr. William Hillebrand to combat the plague of army worms that was ravaging the pasture lands of the islands...reported to be abundant in Honolulu by 1879, it now is extremely common throughout the Territory" (Caum, 1933). The myna is a common bird throughout the project area and surrounding areas.

e. Family Ploceidae, Weaverbirds and their Allies

8. Red-eared or Common Waxbill (Estrilda troglodytes)

This is an African species whose range includes semi-arid habitats from Senegal to Ethiopia and southward to Zaire (Congo). This common cagebird was first reported on Oahu in the Diamond Head region in 1965. This waxbill also has been reported in sugarcane fields in the West Beach region and at Kahuku. I saw four birds in the thickets along Waiawa Road that forms part of the upper boundary of the project site.

9. Spotted Munia or Ricebird (Lonchura punctulata)

This seed-eater has a wide distribution in Sri Lanka, India, Nepal, Burma, and southward into Malaysia and the Indo-Chinese subregion, and in the Philippines. The species was introduced to Hawaii about 1865 by Dr. William Hillebrand. Caum wrote that the Ricebird "feeds on the seeds of weeds and grasses and does considerable damage to green rice." Rice no longer is grown in Hawaii, but the birds continue to be destructful of crops (see House Finch). Ricebirds are highly gregarious, and flocks of 100 or more birds are not uncommon at some times of the year. The spotted munia is a common species in the project region.

10. House Sparrow (Passer domesticus)

Incorrectly called the English Sparrow (it has a wide distribution in Europe and Asia), this sparrow was first imported to Oahu in 1871, when nine birds were brought in from New Zealand (where it had previously been introduced). Caum (1933) wrote that "the species was reported to be numerous in Honolulu in 1879." Unlike the introduced sparrows in North America, the House sparrow did not become a destructive pest in Hawaii. This species is omnivorous in eating habits, eating weed seeds as well as insects and their larvae. The House sparrow typically is found in the vicinity of man and his buildings and is found throughout the project area.

f. Family Fringillidae, Cardinals, Buntings, Sparrows

11. Red-crested Cardinal (Paroaria coronata)

This species has been called the Brazilian cardinal in

Hawaii, but the native range of this South American species includes Uruguay, Paraguay, Brazil, and parts of Bolivia and Argentina. The species was released several times between 1928 and 1931 (Caum, 1933). This cardinal is a common species on Oahu and is found in urban, residential, and rural areas. It is generally distributed in the project area.

12. Cardinal (Cardinalis cardinalis)

This North American bird also is called the Kentucky cardinal and Virginia cardinal. Its native range is the eastern part of North America east of the plains and northward into Ontario. This cardinal was released several times on Oahu between 1929 and 1931 (Caum, 1933). It is now a common species in residential and rural areas. Males were singing throughout my field studies and I heard several fledglings giving their distinctive callnotes.

13. House Finch (Carpodacus mexicanus frontalis)

The house finch was introduced to Hawaii from California "prior to 1870, probably from San Francisco" (Caum, 1933). This seed-eater is now an abundant species on all of the main islands in the chain, and probably is the second most abundant song bird in the islands. Although house finches sometimes eat over-ripe papaya and other soft fruits (thus the vernacular name of Papayabird), the species is predominantly a seed-eater. House finches and spotted munias caused great damage to experimental sorghum crops on Hawaii and Kauai during 1971. A report by the State Senate Committee on Ecology, Environment, and Recreation said that "ricebirds and linnets [House finch] caused a 30 to 50 percent loss in the sorghum fields at Kilauea on Kauai last year...seed-eating birds at Kohala ate 50 tons of sorghum grains in a 30-acre experimental field that was supposed to produce 60 tons" (Honolulu Advertiser, March 14, 1972, p.B-2). The house finch is a very common bird in the Pearl Harbor region, including the project site.

Mammals of the Watercress Farms Area

I. Endemic Mammals

The only endemic land mammal in the Hawaiian Islands is the Hawaiian bat (Lasiurus cinereus semotus), a subspecies of the North American hoary bat. The Hawaiian bat is found primarily on the islands of Hawaii and Kauai (Kramer, 1971; Tomich, 1969). I know of no evidence that there is a resident population of the Hawaiian bat on the island of Oahu.

II. Introduced Mammals

All of the introduced mammals which have proven highly detrimental to man, his buildings, products, agricultural crops, and/or to the native forests and endemic wildlife. None is an endangered species and none is of any concern as far as detrimental effects from the proposed landfill project.

With the possible exception of the house mouse (Mus musculus), all of the smaller introduced or alien mammals prey on birds, their eggs, and young. These small mammals include the roof rat (Rattus rattus), Polynesian rat (R. exulans), Norway rat (R. norvegicus), small Indian mongoose (Herpestes auropunctatus), feral cat (Felis catus), and feral dog (Canis familiaris). It is reasonable to assume that all of the rodents occur in the Pearl Harbor area (Tomich, 1969; Kramer, 1971). The diurnal mongoose does occur throughout the project area. Wallows and trails of the feral pig (Sus scrofa) also occur in the area.

Discussion

The 13 species of introduced birds and all of the introduced mammals in the general project area at Waiawa are irrelevant to an environmental assessment both because the proposed project will have no important impacts on the populations of these animals and because many of these exotics are pestiferous animals, causing considerable damage to agricultural crops (e.g., rats to sugarcane, bulbuls, white-eyes, and house finches to fruit crops).

The only concern about birds in the Pearl Harbor region deals with the four endangered waterbirds mentioned on page 2 of this report: that is, the gallinule, coot, stilt, and Hawaiian duck. However, there is now no suitable habitat for any of these birds in the project site. By suitable habitat is meant habitat for feeding, resting, and nesting. Therefore, filling in the lower portion of the site to an elevation that is suitable for watercress farming and for reducing the danger from flooding will have absolutely no effect on any of the endangered Hawaiian waterbirds.

The project site is not included in "waterbird habitat" as defined by the Hawaiian Waterbirds Recovery Plan (Walker, et al., 1978). According to Shallenberger (1977:298) "Coots find far less suitable habitat in the Pearl Harbor wetlands than do stilt. No more than three coots have been reported on individual counts at Honouliuli refuge unitGreatest numbers in the Pearl Harbor area have generally been found in small fish ponds in the Waikele area." One can conclude that the general Pearl Harbor region does not provide optimal habitat for the feeding and nesting of the Hawaiian coot.

Nor does the region provide good habitat for the Hawaiian gallinule. Shallenberger (1977) wrote: "Hawaiian Gallinule are

even less common in Pearl Harbor areas than are coots. No more than two birds have been reported in the Honouliuli refuge unit in recent years." Moreover, the gallinule prefers fresh or brackish water so that it is doubtful that the Pearl Harbor region will ever provide habitat for any large number of birds.

It also seems certain that the Pearl Harbor area can never be a good habitat for the Hawaiian duck. Apparently this duck became extinct on Oahu during the 1950's. A Koloa restoration project was initiated by the State Division of Fish and Game in 1972. As of April 1979, 347 Koloa have been released on Oahu in an attempt to reestablish the species on this island: 199 birds were released in Kawainui Marsh; 103 at Waimea Falls Park; and 45 at Nuupia Pond on the Kaneohe Marine Corps Air Station. "Although release of cage-reared Koloa began on the windward side of Oahu in 1969, we can find no reports of the species in the Pearl Harbor area until 7/18/76, when two birds were counted on the ponds at Waipio peninsula. Since that time, they have also been observed at the Honouliuli refuge unit. Because of the distance involved, it is questionable whether or not birds from the windward side will successfully disperse in greater numbers to this area." (Shallenberger, 1977:299). Moreover, much more is involved than a "greater dispersment." It seems doubtful that the Pearl Harbor area offers the necessary food and safe nesting sites required by the Hawaiian duck. I know of no documented records of this duck nesting in the vicinity of salt water.

The island of Oahu supports nearly one-half of the Hawaiian stilts in the state (Landgraf, et al., 1984). The limiting factor for most, if not all, of the endangered Hawaiian waterbirds is a lack of safe breeding habitat, especially safe from predators, such as mongooses and feral cats and dogs. Stilt prefer nesting habitat that is close to fresh or brackish water ponds or mudflats, where the downy young also are subject to predation by bullfrogs and herons.

"Numerous fishponds and a 31 acre salt evaporation pond were found on the west shore of West Loch (Honouliuli) early in this century. At the suggestion of Federal and State biologists, the salt pond was set aside as a wildlife sanctuary by the U.S. Navy in 1971. More recently, this site was selected as one of two areas to be developed as waterbird refuges to compensate for 186 acres of silted coral mudflats that were lost in the construction of the reef runway at Keehi Lagoon" (Shallenberger, 1977:292). The second of these refuges was established as the Waiawa unit. This Pearl City pond "was modified by diking, nest island construction, development of a fresh water source and fencing. The 24.5 acre site became the Waiawa or Pearl City Unit of the Pearl Harbor National Wildlife Refuge in 1976. At the time of our survey [in 1977], USF&WS personnel were having difficulty pumping sufficient water to maintain desired levels in the pond... It is apparent that some selective vegetation control and possibly judicious planting of other marsh vegetation may be desirable in the future." (Shallenberger, 1977:296).

On March 18, 1985, the Waiawa Unit of the National Wildlife Refuge still required a great deal of management. I did not find a single Hawaiian stilt (nor gallinule, coot, or Koloa) in the refuge. Eric Guinther (of AECOS, Inc.) told me that he understood that the pond had been drained about one month ago. The water level was not high enough to isolate all of the "nesting islands," and the islands were nearly devoid of any vegetation. Hence, the habitat is not now suitable for feeding or nesting by the stilt.

I have discussed the details above in order to demonstrate that the proposed raising of the marshland elevation at the project site can have no adverse effects on any of the endangered Hawaiian waterbirds.

Conclusions

1. The 13 species of introduced birds and the introduced mammals that occur in the general project site area are irrelevant to an environmental impact statement because all are alien animals and because many are destructive to man, his buildings and property, and/or to his agricultural crops.

2. The proposal to raise the ground level in the lower portion of the project site can have no adverse effects on any of the endangered Hawaiian waterbirds, as detailed above. After a thorough examination of all information on a nearby project, Dale T. Coggeshall, Pacific Islands Administrator of the U.S. Fish & Wildlife Service, wrote (letter dated April 15, 1981, to Colonel A.J. Thiede of the U.S Army Engineer District, Honolulu) as follows: "Therefore, upon consideration of the data available, it is our opinion that the Waterfront Manor Condominium Project at Middle Loch, Pearl Harbor, will not jeopardize the continued existence of either the Hawaiian stilt or the Hawaiian gallinule." At the Waterfront Manor site there also was an open water pond. There is none in the watercress site.

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ARCHAEOLOGICAL RECONNAISSANCE
OF A 37-ACRE WETLAND PARCEL
WAIAWA, EWA, O'AHU

by
Hallett H. Hammatt, Ph.D.
Douglas Borthwick, B. A.

Prepared by
Cultural Surveys Hawaii
for
AECOS, Inc.

April, 1985

RECONNAISSANCE RESULTS

On March 18, the authors conducted an archaeological reconnaissance of a wetland parcel designated TMK 9-6-03, 25-28. This parcel of approximately 37 acres is located between Leeward Community College and the northern point of Middle Loch of Pearl Harbor and lies west of the main branch of Waiawa Stream (Fig. 1-4). The project area is in the Ahupua'a of Waiawa which means milk fish water or pond.

The property consists predominately of marsh land with some filled areas. The south boundary consists of an unpaved road which fronts Middle Loch. The north side is a steep slope with Waiawa Road and a number of private residences overlooking the marsh. The north and west portions of the marsh are currently being used for cultivation of watercress (Fig. 5). Major filling has taken place in the center in an area now used for pig farming and in other areas fronting the road in the southeast portion of the property. Large piles of junk, mostly abandoned vehicles, line both sides of the southern boundary road and are piled in other areas of the property.

The purpose of the reconnaissance was to locate and evaluate archaeological sites which would be impacted by proposed land-fill operations.

The reconnaissance consisted of a walk through the property except for inaccessible areas of the marsh and the wet watercress fields. However, all of these areas were visible from accessible filled-in portions of the marsh.

The on-site inspection located no prehistoric or significant historic features.

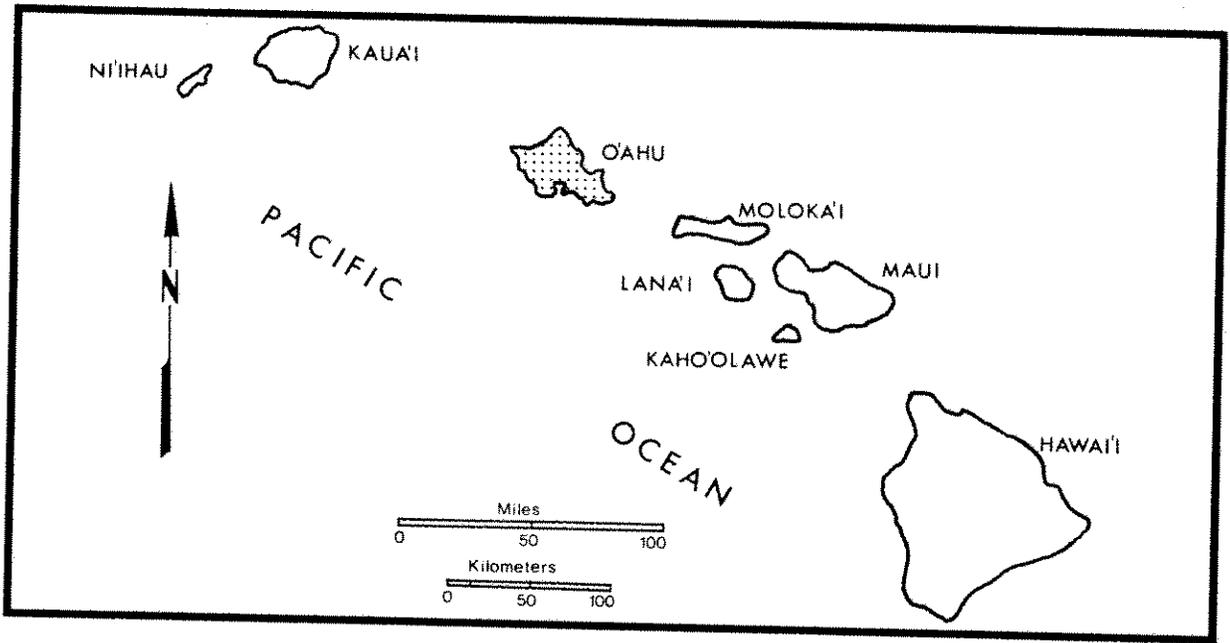


FIGURE 1
State of Hawai'i

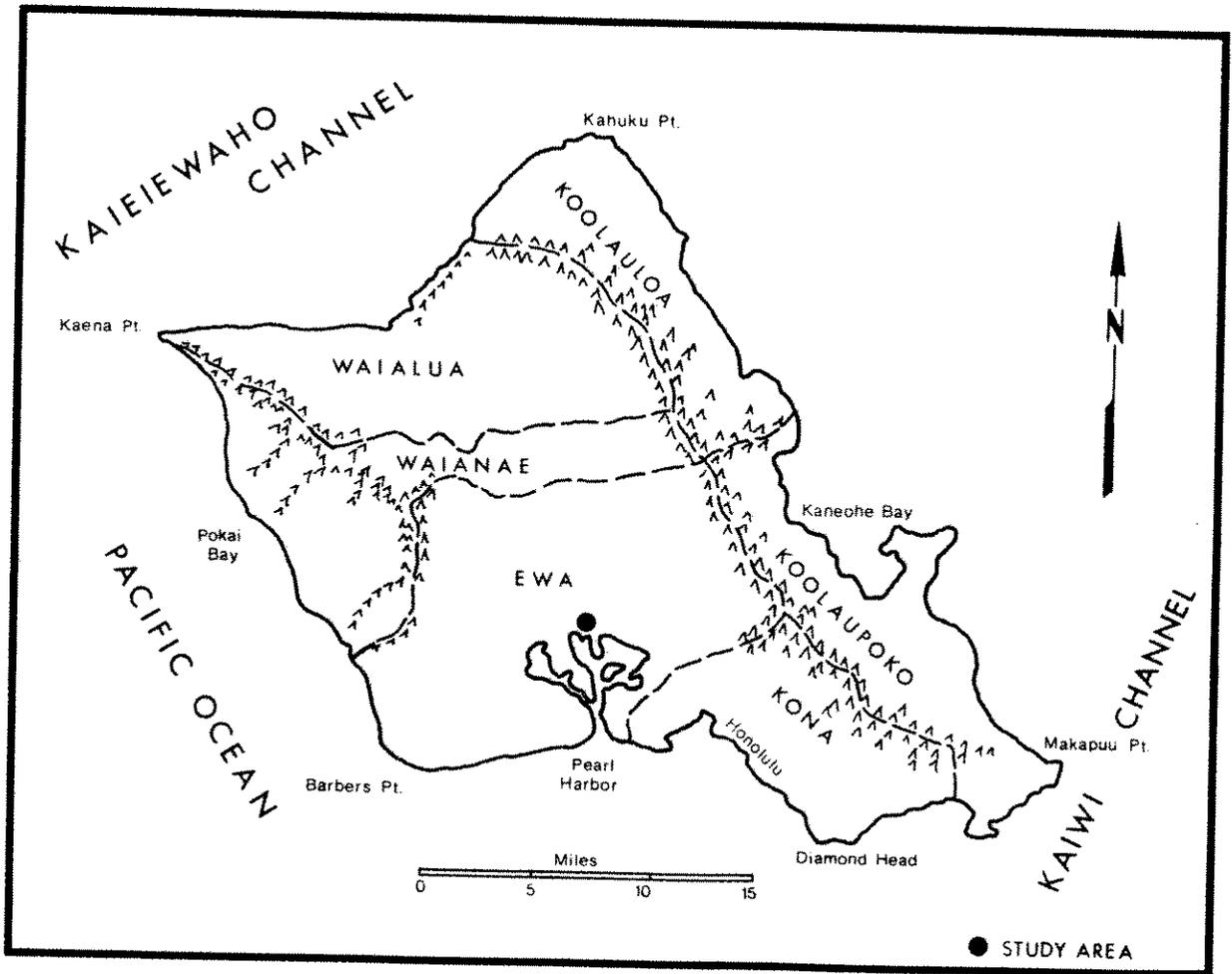


FIGURE 2
General Location Map, O'ahu Island

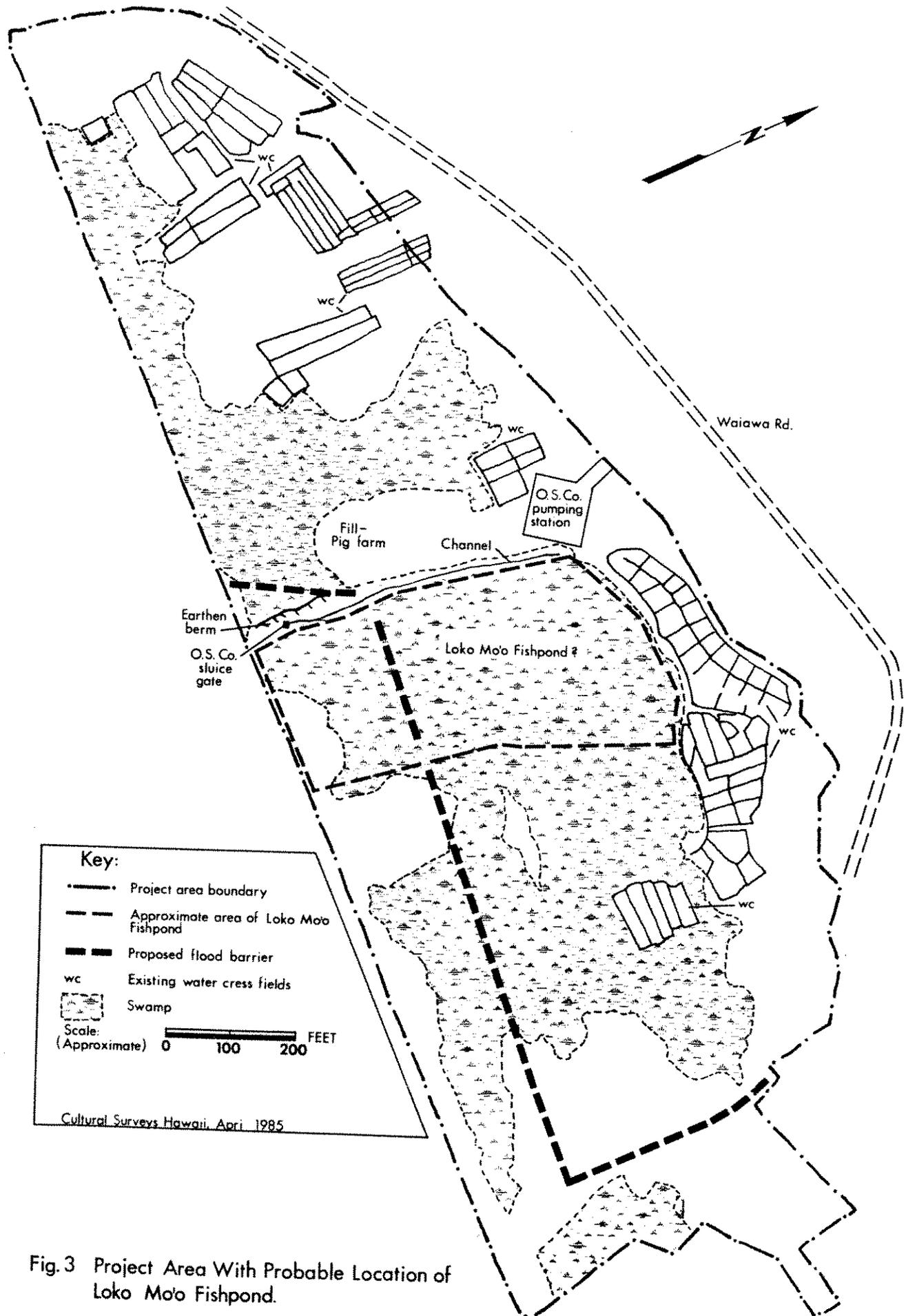


Fig. 3 Project Area With Probable Location of Loko Mo'o Fishpond.

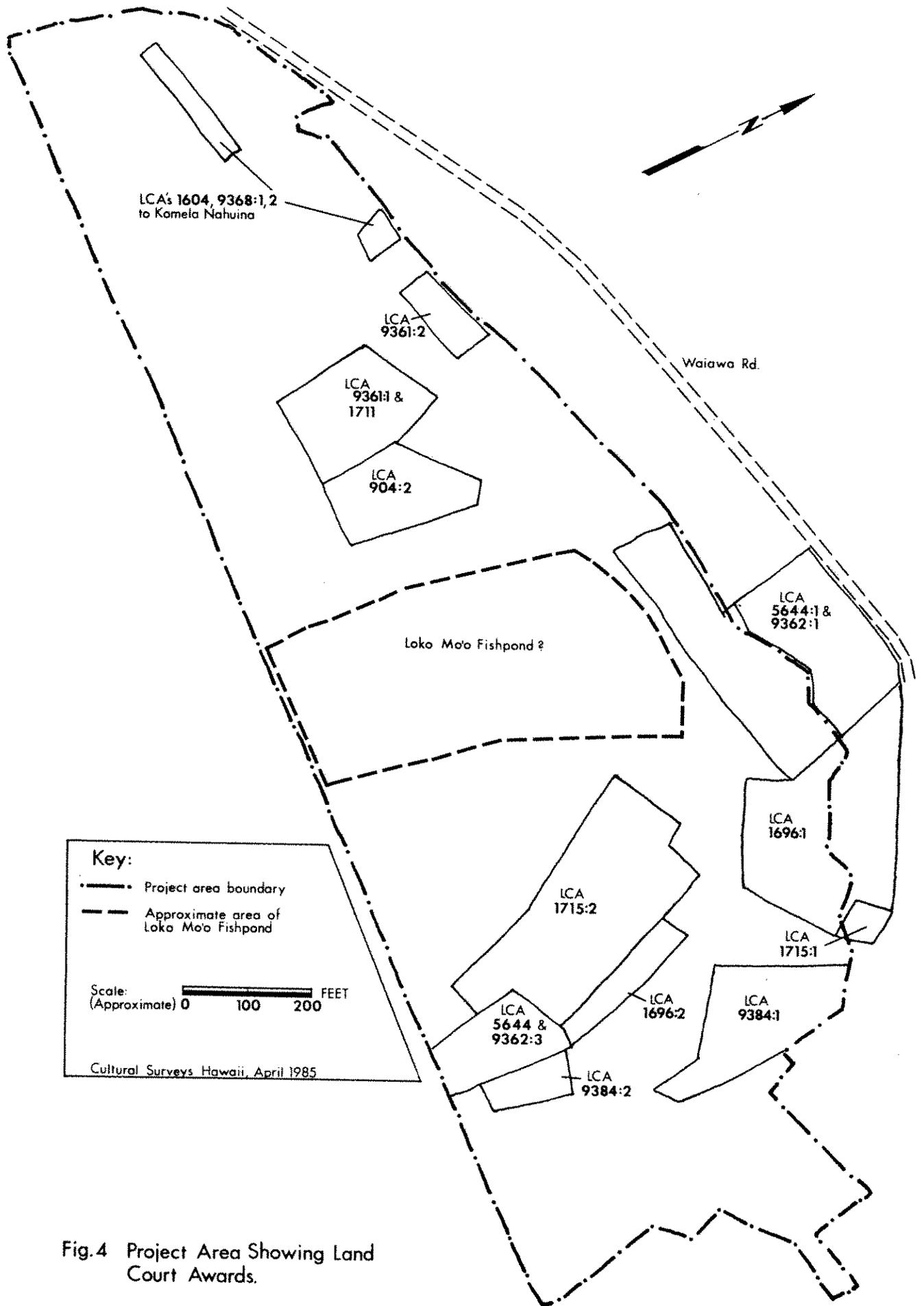


Fig.4 Project Area Showing Land Court Awards.



Figure 5. View of study area from North showing watercress patches.



Figure 6. View of former location of Loko Mo'o fishpond.

HISTORICAL SEARCH

Through background research, two Hawaiian fishponds were found to have been located either within the project boundaries or on adjacent lands. The two fishponds are Loko Mo'o and Loko-kahailoko, sites 120 and 119, respectively, as listed by McAllister (1930). Loko is a Hawaiian term referring to a pool, pond, lake, or other enclosed body of water. (Apple, Kikuchi, 1975) These two ponds were possibly of the type termed loko wai which is "an inland freshwater fishpond which is usually either a natural lake or swamp which can contain ditches connected to a river, stream or the sea and which can contain sluice grates." (Apple, Kikuchi, 1975:7) These types of fishponds would be ali'i fishponds and would be owned by paramount chiefs. Loko Kuhialoko, "was called after Kuhia, one of the butlers or purveyors to Ka'ahupahau, the shark queen of Ewa." (Sterling & Summers, 1978:17) And as "Polea and Kuhia were konohikis in Ewa, there are places on the shore named after Polea and Kuhia." (Sterling & Summers, 1978: 18) The term konohiki refers to a resident land manager of an ahupua'a, who would be appointed by the particular landlord chief.

These two fishponds recorded in the 1930's were not in evidence by the 1950's. The area was described by Sterling in 1957 as follows:

"Loko Mo'o fishpond (filled in) just north of the railroad track in Waiawa. It formerly covered 13 acres, but is now a very small pond. (Saw taro, watercress and lotus patches, may be former fishpond.)" (Sterling & Summers, 1978: 48).

Loko Kuhialoko fishpond is described as being at Waiawa on the southwest side of the Pearl City Peninsula and on the sea side of the O'ahu Railroad. (Sterling & Summers, 1978: 48). This would place it south of the present project area. The area marked pond on Figure 3 is therefore the probable location of the former Loko Mo'o fishpond mentioned above (Figure 6).

Also through the assistance of Ed Matsumura at R. M. Twill Corporation, aerial photos from 1955 were studied. These showed no discernible fishpond or other pre-historic type structures with property boundaries. Traces of the fishpond must have disappeared many years before this. What was observed was historic modification to the property such as watercress farming and roadways. The 1955 photo showed essentially the same activities and land configuration as is found there presently.

In addition to the 1955 photo and Sterling's 1957 inspection, communication with one of the watercress farmers, who has been a resident since before World War II, indicated no recollection of any fishponds or other Hawaiian structures in the immediate area.

The Oahu Sugar Company has a pumping station and dam with a sluice gate located approximately in the middle of the property (Figure 3) which utilized the pond area as a reservoir from which water was pumped to nearby cane lands (Figure 6). The earthen berm and concrete sluice gate were inspected in this reconnaissance and found to be still in functioning order, but apparently not in use. It is probable that the use of the marsh as a reservoir marked the end of the earlier fishpond.

Because of the existence of the fishpond at the time that the marsh was a functioning fishpond--probably up to the early part of this century--there were surely other associated traditional wetland uses such as taro growing which were very typical around fishponds. Sterling observed taro fields in the early 1950's (Sterling and Summers, 1978:48). There are a number of land court awards recorded for the parcel (Figure 4). These were probably taro loi which took advantage of the surrounding springs and the ditch network of the adjacent fishpond.

SUMMARY AND RECOMMENDATIONS

The archaeological reconnaissance of the subject property shows severe modern modification and no trace of archaeological sites or features of historical significance. Historical documents (McAllister, 1930) show two Hawaiian fishponds in the area, one of which would have been directly in the subject parcel (Loko Mo'o fishpond). However, the natural silting processes of wetlands, its use as a sugar company reservoir, and modern land use have erased all traces of this former site (Figure 6).

In short, the proposed filling and other improvements of the subject property will not impact archaeological resources, and there appears to be no need for further archaeological investigation.

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APPENDIX C.

Comments and Actions Relative to the
Environmental Assessment

Following are letters received from agencies requested by DLU to review the Environmental Assessment (AECOS, 1985) for the Waiawa watercross project. No comments were received in response to the EIS Preparation Notice for this project.

LIST OF COMMENTS RECEIVED

FEDERAL AGENCIES

Operations Branch, Army Corps of Engineers
Engineering Division, Army Corps of Engineers
Department of the Navy
Fish and Wildlife Service, US Dept. of Interior
National Marine Fisheries Service, NOAA, Dept. of Commerce

STATE AGENCIES

Agriculture Coordinating Committee, Office of the Governor
Representative Clarice Hashimoto, State Rep., 42nd District
Department of Agriculture
Department of Land and Natural Resources
Department of Health
Environmental Center, University of Hawai'i at Manoa

CITY AND COUNTY AGENCIES

Board of Water Supply
Department of Land Utilization



GEORGE H. ARYOSH
GOVERNOR

TADASHI TOJO
CLERK

HOUSE OF REPRESENTATIVES
THE THIRTEENTH LEGISLATURE

STATE OF HAWAII
STATE CAPITOL
HONOLULU, HAWAII 96813



STATE OF HAWAII
OFFICE OF THE GOVERNOR
AGRICULTURE COORDINATING COMMITTEE

ROOM 208
150 HALEKALANUIA STREET
HONOLULU, HAWAII 96813
TELEPHONE 548-2828

June 18, 1985

ABCOX INC.
970 North Kalanooe Avenue, Suite A-300
Kailua, Hawaii 96734

Gentlemen:

I am writing to you in support of the developmental plan for the expansion of watercress plantings in the Waiawa wetland area, submitted by Watercress of Hawaii, Inc. I have known Mr. Sumida, President, for many years, and have recently come to know Mr. Nakatani, the Vice President, of the Company who is serving as the project coordinator. Both of these gentlemen are persons of high integrity. Their knowledge of watercress farming in Hawaii, and particularly in the area concerned, is tops in this state. Added to this capacity, is their keen sense of responsibility for the environment as attested to by the leading role they both played in successfully finding a way to combat the diamondhead moth which devastated watercress fields in 1982.

I feel confident that if their plan is approved, they will manage the area with judiciousness and care, at the same time contributing to the economy of Hawaii.

Sincerely,

Tadashi Tojo

June 27, 1985

8766jl

Colonel Michael Jenks
District Engineer
U.S. Army Corps of Engineers
Fort Shafter, Hawaii 96858-5440

RE: Watercress of Hawaii, Inc.
Waiawa, Oahu Development Project

Dear Colonel Jenks:

I have recently had the opportunity to review the detailed proposal of Watercress of Hawaii, Inc.'s wetland farming proposal at Waiawa, Oahu. I wish to express my unqualified support for this endeavor as well as request your favorable consideration in granting the necessary permits and approvals for this project.

The Hawaii State Legislature has recognized for several years the importance of developing diversified agriculture in our State and has supported both policy and functional developments which bring this goal closer to reality. One of the fundamental precepts of developing Hawaii's diversified agriculture industry is to capitalize upon the unique agricultural assets and advantages that Hawaii has to offer. Wetland farming is a case in point. The unique soil and water conditions requisite to this manner of farming are extremely limited. Where viable opportunity for pursuing this agricultural activity exists, therefore, it is in the best interest of the State to encourage and support such use. Employment of the Waiawa wetlands for a watercress farm is in conformance with this precept and will advance the agricultural goals and objectives of the State.

The specifics of Watercress of Hawaii, Inc.'s development plan are based on a sound combination of land use and economic planning. The physical and ecological impacts of the backfill and alternative use of the Waiawa wetlands have been minimized by a planful and sensitive development strategy. In addition, these impacts pale further when the resultant economic, employment, and agricultural benefits of the proposed project are taken under consideration. Thus, despite the alteration of the wetland

Colonel Michael Jenks
June 27, 1985
Page 2

GEORGE R. ARIYOSHI
GOVERNOR



JACK K. SUWA
CHAIRPERSON, BOARD OF AGRICULTURE
SUZANNE D. PETERSON
DEPUTY TO THE CHAIRPERSON

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

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822

environment and the raising of the elevation of the subject property to accommodate the needs of wetland farming practices, the net result--a productive and profitable watercress farm--is clearly a positive gain for the people and State of Hawaii.

July 9, 1985

I urge you to favorably consider the proposal of Watercress of Hawaii, Inc. and, in-turn, advance the goals of diversified agriculture and the aspirations of Hawaii's watercress farmers.

Sincerely,

CLARICE HASHIMOTO
State Representative
42nd District

In re.: Draft Environmental Assessment for a
Proposed Watercress Development Project
at Waiawa, Oahu (June 1985)
TMK: 1-9-6-03: 26-38, excluding 30
37 acres

cc: John P. Whalen
AECOS, Inc.

AECOS, Inc.
970 North Kalaheo Avenue
Suite A300
Kailua, Hawaii 96734
Gentlemen:

As requested, we have reviewed the subject draft assessment, which has been prepared to support the issuance of City and County of Honolulu Special Management Area (SMA) and Department of the Army Corps of Engineers permits, and have the following comments to offer.

Watercress of Hawaii, Inc. and Landsend, Inc., propose an innovative and mutually beneficial project to alter and improve approximately 37 acres of wetland for the expansion of watercress production. The site, leased for 25 years from the B. P. Bishop Estate (effective June 1, 1985), will be used as a landfill for demolition and land clearance debris, in order to elevate the land and alleviate stagnant water and potential flooding conditions. Dredge spoil from the site would be set aside and reused over the fill material in order to retain the productivity of the existing soil (classified as "Unique" in the Agricultural Lands of Importance to the State of Hawaii (ALISH) system).

Permits are required inasmuch as the landfill operation would be a commercial venture technically inconsistent with the present land use zoning (AG-1), because the site is in a shoreline location, and because it is classified as a wetland. In this regard, we question whether the statement

AECOS, Inc.
July 9, 1985
Page -2-

on page 13 of the assessment, which refers to a Conditional Use Permit (CUP) of the State Department of Land and Natural Resources, should not instead refer to a Special Use Permit (SUP) issued by the City Department of Land Utilization and approved by the State Land Use Commission.

Page 15 of the assessment indicates that watercress production for the last three years has averaged a little over one million pounds annually, while local demand is believed to be close to three million pounds. In this regard, it should be noted that watercress production declined sharply during 1981 and 1982 due to infestation from the diamond back moth, which has since been alleviated. In 1984, watercress production returned to its 1980 level of approximately 1.4 million pounds, and imports from out-of-state dropped back to 6,000 pounds from their 1981-82 levels of 177,000 and 130,000 pounds, respectively. Unpublished data indicate that some dryland watercress produced on the Neighbor Islands has recently begun to enter the Oahu market in competition with local wetland production. Statewide, watercress acreage has increased to 35 acres in 1984; however, the new acreage was not in full production the entire year. The proposed project will increase this acreage substantially, by 20 additional acres.

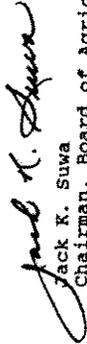
Page 42 of the assessment indicates that the site is ideal for watercress production due to the proximity of several large freshwater artesian springs which provide a ready supply of clear, fresh water. We understand that the Department of Land and Natural Resources has no present plans to tap or modify these springs, which might reduce the supply of fresh water upon which the success of the watercress project is predicated. However, any substantial future increase in groundwater pumpage in the vicinity, by the Board of Water Supply or other entities, could possibly adversely affect the long-term viability of the project, if the applicants do not have secure rights to use of a specified quantity of the spring water.

The principals of Watercress of Hawaii, Inc., are demonstrated leaders in the local watercress industry, and their Waiawa project will measurably contribute to the State's goal of increased agricultural self-sufficiency. The project is therefore deserving of full support from all permitting agencies.

AECOS, Inc.
July 9, 1985
Page -3-

The Department of Agriculture appreciates this opportunity to comment.

Sincerely,


Jack K. Suwa
Chairman, Board of Agriculture

cc: Watercress of Hawaii, Inc.
Landsend, Inc.



970 N. Kaliaheo Avenue, Suite A300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

July 22, 1985

The Honorable Jack Suwa
Chairman
State of Hawaii, Board of Agriculture
1428 So. King Street
Honolulu, Hawaii 96814

Dear Mr. Suwa,

We appreciate the fact that you have taken the time to review the Draft Environmental Assessment for a Proposed Water-Cross Development Project at Waiawa, Oahu and provided a review of this project. By way of responding to your comments, we offer the following:

Apparently the copy of the Draft EA provided your department was an early draft. Reference to a Conditional Use Permit (CUP) was corrected in the copies provided to the Army Corps and the Department of Land Utilization to reflect the possible requirement for a Special Use Permit (SUP) as pointed out in your letter. The need to obtain a SUP is subject to interpretation. For example, the landfill might be considered an "unusual and reasonable" use of the land, in as much as fill would be required to realize the agricultural potential of the land. Also, this intermediate use of the site would not be contrary to the objectives of the Agricultural District, and public agencies would not be unduly burdened by the interim operation.

Your other comments provide additional insight and your letter will be incorporated in future copies of the Environmental Assessment. Again, thank you for your review.

Sincerely,

Eric B. Guinther



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

June 28, 1985

Operations Branch

Mr. Steven Anderson
Landseid, Incorporated
1553 Colburn Street, Room #202
Honolulu, Hawaii 96817

Dear Mr. Anderson:

This is in response to your application for a Department of the Army permit for fill in Waiawa Wetland, Middle Loch, Pearl Harbor, Hawaii. The application is incomplete.

Recommend you revise your permit application to exclude objectionable waste building material fill such as waste wood, asphalt roofing material, etc. and provide the following additional information:

- a. Provide a drawing showing in plan and section the silt control basins proposed.
- b. Show a plan and typical sections of the flood barrier. A drawing of the existing wetland and proposed development plans should also be included as part of the permit drawings. Review attached EP 1145-2-1 (Enclosure 1) on permit application drawing requirements.

Please contact my Operations Branch at 438-9258 if any additional clarification is needed.

Sincerely,

Charlotte A. Flinders
Chief, Construction-Operations
Division

Enclosure

Copy Furnished: without enclosure

Mr. Masaru Sumida
Watercross of Hawaii, Inc.
P.O. Box 146
Aiea, Hawaii 96701

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU

680 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 521-4432



FRANK E. EASI
MAYOR

JOHN P. WHALEN
DIRECTOR

(EM)

July 24, 1985

(See attached Mailing List)

Environmental Assessment for a Watercress Farming
Operation at Waiawa, Oahu
Tax Map Key 9-6-03: 4, 5, 26-38, Excluding 30, 35

The enclosed environmental assessment was received in conjunction with a Special Management Area (SMA) permit application for a proposed expansion of a watercress farming operation at Waiawa, Oahu. The project involves extensive dredging, landfilling and other earthwork associated with developing a 36.9-acre wetland over a period of 10 years.

We are presently reviewing the assessment to make a determination of Negative Declaration or require the applicant to prepare an environmental impact statement (EIS), pursuant to Ordinance No. 84-4, therefore, based on your agency's experience and expertise regarding various aspects of the proposed development, we are seeking your input as to the adequacy of the subject environmental assessment. To accommodate timing requirements for processing the SMA permit, we request that comments be submitted no later than August 9, 1985.

Your assistance in this matter is greatly appreciated. If there are any questions, please contact Mr. Earl Matsukawa of our staff at 527-5038.

Very truly yours,

John P. Whalen

JOHN P. WHALEN
Director of Land Utilization

JPS:s1
2293A

LIST

Board of Water Supply
630 South Beretania Street
Honolulu, Hawaii 96843

Department of Health
State of Hawaii
P.O. Box 3378
Honolulu, Hawaii 96801

Department of Agriculture
State of Hawaii
1428 South King Street
Honolulu, Hawaii 96814

Department of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

University of Hawaii - Environmental Center
2550 Campus Road
Crawford 317
Honolulu, Hawaii 96822

U.S. Department of the Interior
Fish & Wildlife Service
300 Ala Moana Boulevard
Room 5302
Honolulu, Hawaii 96813

U. S. Army Corps of Engineers
Honolulu District
Building 230
Fort Shafter, Hawaii 96858

Commander
Naval Base
Box 110
Pearl Harbor, Hawaii 96860



DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5340

August 2, 1985

Mr. John Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Thank you for the opportunity to review and comment on the Environmental Assessment for Watercross Farming Operation at Waiawa, Oahu. The following comments are offered:

- a. An application for a Department of the Army permit has been received. We recommend that objectionable waste building materials such as waste wood and asphalt roofing material be excluded as part of the land-fill. We have requested copies of drawings that show plan and section of silt control basins and flood barriers be submitted to Operations Branch in a letter dated June 28, 1985.
- b. Page 12, Section III.A. The U.S. Army Corps of Engineers conducted a detailed study of Waiawa Stream and adjacent unnamed stream areas in June 1982 that updates the current Flood Insurance Study for Oahu by the Federal Insurance Administration. According to the Corps' flood study, the watercross farming operation project will occur within the 100-year flood plain of Zone A4 designation where the water surface elevation ranges from 4 to 12 feet mean sea level. The 100-year flood has a one percent chance of occurring in any given year. Enclosure 1 includes the flood hazard map for the Waiawa area and the flood profile for the unnamed stream.

Sincerely,


Kisuk Cheung
Chief, Engineering Division

Enclosure

LC 8/85



970 N. Kalanooa Avenue, Suite A 100 • Kalaheo, Hawaii 96741
Telephone: (808) 251-5884

August 4, 1985

Everette A. Flanders
Chief, Construction - Operations Div.
Department of the Army
U.S. Army Engineer District, Honolulu
Ft. Shafter, Hawaii 96858-5440

Dear Mr. Flanders,

Enclosed are additional drawings showing the proposed flood corridor and barrier, proposed siltation basins, and relationship of the project to existing wetland areas as requested in your letter to Mr. Steven Anderson dated June 28, 1985.

Note that the "flood barrier" is merely a facing for the proposed landfill where the latter borders the low portion of the property (the "flood corridor" -- to be left open to allow flood waters across the property with minimal damage to watercross plots). This facing will be composed of coarse debris (boulders and concrete) derived from the fill material.

The silt control basins will be constructed as needed in relation to the land-fill phases. Before a landfill phase is begun (Phases I, II, and III), the flood corridor along the south side of the fill area will be constructed. This process will involve some dredging (particularly where old fill land exists in the proposed flood corridor). The dredged area will serve as a "silt basin" for the on-going land-fill. In effect, the silt basin will move westward within the flood corridor maintaining a constant positional relationship to the ongoing landfill operation. That is, each landfill area will have a siltation basin of 40 by 40 feet minimum dimensions at the downslope end of the fill area. Accumulated silt will be placed back into the on-going landfill area, as required to maintain the flood corridor as open wetland above the reach of the tide.

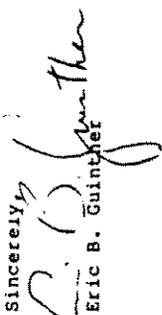
Note that during the Phase I fill operation, the existing drainage from the springs and watercross fields will remain to the west of the fill area. When Phase II is begun, a portion of the spring water will be diverted to the new fields created within the Phase I area. Runoff from these fields will be into the flood corridor. When Phase III is started, the silt basin (as shown on the accompanying drawings) will be moved to the area adjacent to the stream outlet. Construction of a holding pond for runoff water (from the Phase I and II fields) will also be

undertaken which will divert much of the water back into the present stream channel. Once Phase III is completed, the silt basin would be moved across the outlet channel to serve the Phase IV and V fill operations.

No practical means exists to separate the waste building material from the debris accepted for the land-fill. If loads containing any such material were not accepted, it is unlikely the fill operation would attract users. The fill could not be managed economically if each load had to be separated into "objectionable" and "non-objectionable" material. Particularly because "objectionable" material would then have to be hauled to a landfill somewhere else on the island at the farmers' expense. Successful conversion of the marshland to watercress fields must be accomplished at no expense to the watercress growers, or the economic prospects of the expansion will not be justified.

Please contact either Mr. Steven Anderson of Landsend, Inc. or myself if additional questions arise.

Sincerely,


Eric B. Guinther

cc: Mr. Steve Anderson
Landsend, Inc.



DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5407

August 13, 1985

REPLY TO
ATTENTION OF

Operations Branch

Mr. Steven Anderson
Landsend, Incorporated
1553 Colburn Street, Room 202
Honolulu, Hawaii 96817

Dear Mr. Anderson:

We have reviewed your permit application for fill to develop watercress farming at Malawa wetland, near Middle Loch, Pearl Harbor, Oahu, Hawaii.

The application is complete and is being processed. File Number PDDCO-0 1891-SD has been assigned to the project. Please refer to this number in future correspondence.

W. J. Paresse
Acting Chief, Construction-
Operations Division

Copies Furnished:
AECOS, 970 N. Kalaheo Avenue, Kailua, Oahu, Hawaii 96734
Mr. Masaru Sumida, Watercress of Hawaii, Inc., P.O. Box 146, Aiea,
Hawaii 96701

AUG -8 PM 3:22
DEPT. OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96843



August 6, 1985

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: KAZU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: YOUR LETTER OF JULY 24, 1985, ON THE ENVIRONMENTAL ASSESSMENT FOR A WATERCRESS FARMING OPERATION AT WAIANA, TMK: 9-6-03:4, 5, 26-38, EXCLUDING 30 & 35

We have no objections to the proposed watercress farming operation. However, extreme care should be taken during any excavation work so that there will be no increase in discharge from springs in the area.

The proposed landfill operation is not anticipated to have an adverse impact to existing potable groundwater resources in the area.

For your information, the area is within the Pearl Harbor Groundwater Control Area administered by the State Department of Land and Natural Resources (DLNR); therefore, we suggest that the developer also coordinate the project with DLNR.

If you have any questions, please contact Lawrence Whang at 527-6138.

Kazu Hayashida
KAZU HAYASHIDA
Manager and Chief Engineer

1985 AUG -8 PM 3:22
DEPT. OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU

LCU 8/85-3404

FRANK F. FABI, Mayor
ERNEST A. WATARI, Chairman
WILTON J. AGADER, Vice Chairman
RYOKOCHI HIGASHIMOTO
PALLA R. RATH
RUSSELL L. SMITH, JR.
WAYNE J. YAMASAKI
KAZU HAYASHIDA
Manager and Chief Engineer



AECOS
970 N. Kalia Avenue, Suite A 400 • Kalia, Hawaii 96734
Telephone: (808) 254-5000

December 4, 1985

Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawaii 96843

Dear Mr. Hayashida,

Thank you for your comments on the "Environmental Assessment for a Watercress Farming Operation at Waiana" distributed by DLU. Because several agencies reviewing the original project proposal raised concerns about potential leachate generation from demolition debris in a wetland site, this aspect of the project has been modified and a Draft Environmental Impact Statement for the project will be circulated soon for review.

Note that dredging would be limited to removal of old landfill areas and the upper 1 to 2 feet of a portion of the marsh (generally the more mauka areas away from the springs). However, U.S. Fish and Wildlife has requested that a portion of one parcel of wetland (TMK: 9-6-03:26) be dredged for wildlife habitat to a depth of 4 to 6 feet. We have informed them of your concerns and may request coordination in this effort with your agency to determine the final depth of dredging and if any areas in this parcel should not be dredged.

Sincerely,
E. B. Guinther
Eric B. Guinther

GEORGE A. ARIYOSHI
GOVERNOR



State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814
August 8, 1985

JACK K. SUWA
CHAIRPERSON, BOARD OF AGRICULTURE
SUZANNE D. PETERSON
DEPUTY TO THE CHAIRPERSON

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822

OFFICE OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU

MEMORANDUM

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

Subject: Environmental Assessment (EA) for a
Watercress Farming Operation at Waiawa, Oahu
Watercress of Hawaii, Inc. and Landsend, Inc.
TMK: 9-6-03: 4, 5, 26-38, excluding 30, 35
Acres: 37

The Department of Agriculture has reviewed the subject document and finds that it addresses the concerns found in our letter to AECOS, Inc., dated July 9, 1985 (EA, Appendix C). We support the approval and establishment of the proposed project.

Thank you for the opportunity to comment.

Jack K. Suwa
JACK K. SUWA
Chairman, Board of Agriculture

LC 8/85 - 334



DEPARTMENT OF THE NAVY
HEADQUARTERS
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860-5000

IN REPLY, REFER TO
9510

Set 002 (09P2)/1462

9 AUG 1985

OFFICE OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU

Mr. John P. Whalen
Director of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

ENVIRONMENTAL ASSESSMENT FOR A WATERCRESS FARMING
OPERATION AT WAIAWA, OAHU
TAX MAP KEY 9-6-03: 4, 5, 26-38, EXCLUDING 30, 35

Thank you for the opportunity to comment on the subject Environmental Assessment forwarded by your letter of 24 July 1985.

There are five basic comments that should be carefully considered:

- a. There must be provisions to insure that should watercress farming become not economically feasible that the area would remain in wetland agriculture or wetland sanctuary and not filled in for development.
- b. Access should be provided to State and Federal agencies for wildlife surveys.
- c. What happens to flood waters? They appear to be directed across the Navy Right-of-Way.
- d. The overall potential of the site for other options has never been adequately addressed.
- e. There is no indication that copies of this EA have been provided to State and Federal Fish and Wildlife agencies.

In addition, specific text comments are as follows:

- a. Page 4, Par. 2, Line 2: "poor quality" is by whose definition?
- b. Page 27, Par. 2, Last Line: There should be no petroleum-type products utilized (re: old asphalt paving, etc.).
- c. Page 30, Par. 2, Line 5: The developer (Watercress of Hawaii, Inc.) should be required to sample and analyze the water for heavy metals, hydrocarbons, bacteria, etc., every 6 months for 5 years and provide results to USFWS, DOFAN, State Health, etc.
- d. Page 31, Par. 3, Line 7: California grass will certainly restrict but not always preclude use by waterbirds.

LC 8/85 - 348



950 N. Kohala Avenue, Suite A-901, Kohala, Hawaii, 96741
Telephone: (808) 241-5884

November 29, 1985

Department of the Navy
Headquarters
Naval Base Pearl Harbor
Box 110
Pearl Harbor, Hawaii 96860-3020

Attn: P. O'Connor, Captain, U.S. Navy

Dear Captain O'Connor

Thank you for your comments regarding the Environmental Assessment entitled "Environmental Assessment for a Watercress Farming Operation at Waiawa, Oahu," produced by AECOS, Inc. for Watercress of Hawaii, Inc. The Dept. of Land Utilization, City and County of Honolulu determined that the project, as originally conceived, should proceed with an Environmental Impact Statement. The primary reason stated was the considerable concern expressed by a number of agencies reviewing the EA about the use of demolition debris in a setting of considerable potential leachate generation posed unknown hazards dependent upon the nature of the material, and the use of demolition debris, no matter how well supervised, could not guarantee that some material posing an environmental risk would not be inadvertently placed in the fill, the use of alternative fill material was strongly urged. Consequently, Watercress of Hawaii, Inc. has agreed to limit fill material to inert materials (soil, land-clearing debris, some concrete). The EA has been rewritten to reflect modifications in the proposal, incorporate suggestions made by yourself and others who reviewed the document, and is being resubmitted as a draft EIS, which no doubt you will be requested to review. As to the points made in your initial review of the EA (dtd. 9 Aug 1985), I offer the following comments.

"a." - The land is presently zoned for agriculture. Although, realistically, zoning cannot guarantee long term future uses of a parcel, it is the mechanism by which the County determines land use. Watercress of Hawaii is not seeking to change this designation. Further, Watercress of Hawaii does not own the land, but has leased it for agriculture purposes.

"b" - Agreed; access should not be difficult.

9510
Ser 002(09P2)/141

- e. Page 37, Par. 2, Line 10: Probably loose domestic pigs, not feral pigs.
- f. Appendix A-1, Par. 4, Line 11: Disagree. There are suitable habitat for endangered waterbirds on site.
- g. Appendix A-7, Par. 5, Line 2: This may be true. However the Recovery Plan does not attempt to identify all waterbird habitat, only those of high value.
- h. Appendix A-7, Par. 5, Line 8: Shallenberg's report is outdated. There are new significant Coot and Gallinule populations at the Honouliuli unit and elsewhere in the Pearl Harbor area.
- i. Appendix A-8, Par. 3, Line 6: Not true. Many nest at Kaneohe Marine Corps Air Station and elsewhere near salt water.

We have no comments on whether or not an Environmental Impact Statement (EIS) is required. However should an EIS be developed, we would appreciate receiving a copy for comment.

Sincerely,

P. O'CONNOR
Captain, U.S. Navy
Chief of Staff

"c" - In a sense, floodwaters would "be directed across the Navy Right-of-Way" -- this is the existing situation and would not be altered by the proposed project. The U.S. Army Corps of Engineers has designated most of the property, including the Navy Right-of-Way, as a floodway (see FIRM maps) for Waiawa Stream. The proposed project would not alter these existing circumstances either by reducing or enhancing the flood potential across the Navy Right-of-Way.

"d" - "Other options" on use of the land are rather limited given the zoning and wetland nature of the site. These other options are discussed in the "alternatives" section of the draft EIS, and include use of the site as wildlife habitat (requiring active management of some kind) and commercial development (predicated on altering the wetland nature of the site more than to the extent proposed by Watercross of Hawaii).

"e" - Both the State Department of Land and Natural Resources and the U.S. Fish and Wildlife Service were provided copies of the EA as indicated in the letter from DLU which accompanied the distribution of the document.

Your specific comments:

"a" - The wetland is described in the text and defined as of "poor quality" by the biologists who conducted the surveys. Obviously, these are subjective assessments, and must be taken as relative to a particular type of wetland life. The area may be excellent habitat for mosquitos and poor for Hawaiian stilt, etc. It is exceptional for California grass (recognized as a noxious pest in Hawaiian wetland habitats) and generally poor as representative of native wetland flora.

"b" - Asphalt would not be used in the landfill.

"c" - Possibly some form of monitoring would be required, although restrictions on the type of material used (i.e., the modified proposal) is for the reason of avoiding generation of hazardous leachate.

"d" - Agreed; the impact is different for each species of waterbird. In this regard, it is suggested only that overall improvements in habitat would result from clearing California grass. By the same token, the watercross fields could be described as restricting but not precluding use by waterbirds.

"e" - Agreed.

"f" - My assessment is that there are some minor areas of suitable habitat within the marsh, the most conspicuous being an open pond about 4-5 meters across. All of the areas not yet covered by California grass appear to be abandoned wetland agriculture fields.

"g" - see response to "f", above. By inference, the "Waterbird Recovery Plan" found this site to be of relatively "poor quality".

"h" - Salinity and water level vary tremendously in the Honolulu-Uli Unit of the Pearl Harbor NWR. At times this wetland may be suitable for endangered waterbirds which prefer fresh water, such as the coot and gallinule -- at other times, this area is clearly not suitable.

"i" - Agreed. I believe Dr. Berger's emphasis in this paragraph was intended to be on "ponds and mud flats". Stilt utilize wetland areas encompassing a wide range of salinities, the ponds at MCAS-KB being a good example of stilt nesting around hyper-haline ponds. However, the height and density of exotic vegetation (in this instance, *Banksia*) is a problem at Mu upia (MCAS-KB) as well.

Your comments are appreciated, and will be incorporated into the EIS. A copy of the draft EIS will be provided for your review.

Sincerely,


Eric B. Guinther

GEORGE R. ARYTON
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P O BOX 621
HONOLULU HAWAII 96808

AUG 12 1985

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Comments on Environmental Assessment for a
Watercress Farming Operation at Waiawa, Oahu

Thank you for the opportunity to review the subject environmental assessment for the proposed expansion of a watercress farming operation at Waiawa, Oahu.

The proposed project to expand watercress production involves filling the low marshland area with approximately 120,000 to 175,000 cu. yds. of construction fill material over 20 acres. Due to this extensive amount of fill material to be placed on marshland near the shore of Pearl Harbor, there is a potential problem of leachate generation entering the waters of Pearl Harbor. It is therefore suggested that a continuing leachate monitoring program be established and appropriate action be implemented should leachate contamination problems occur.

Although the wetlands in Waiawa described in the environmental assessment is mostly overgrown, it still provides some habitat for a few endangered waterbirds such as the Hawaiian Gallinule and/or Hawaiian Coot. Therefore, the statement on page 37, Section IV.c.3, "Impacts on Wildlife" which states in part, "filling in the lower portion of the site to an elevation that is suitable for watercress farming...will have absolutely no effect on any of the endangered Hawaiian waterbirds," may not be entirely accurate, especially since detailed description of the project is not presented in the assessment.

The environmental assessment discusses the possibility of developing part of the marshland as feeding habitat for waterbirds, and we agree that such a purpose will be beneficial to waterbirds in the area if properly designed and maintained.

We, therefore, recommend that the U.S. Fish and Wildlife Service and this office be consulted during the planning stage for technical assistance in designing portions of the marshland to benefit waterbirds in the area.

Very truly yours,

SUSUMU ONO
Chairperson of the Board



970 N. Kalanani'olu Avenue, Suite A.300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

December 4, 1985

Susumu Ono
Chairperson of the Board
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

RE: Watercress Farming Operation at Waiawa, Oahu

Dear Mr. Ono

We appreciate your comments on the Environmental Assessment for this proposed project to expand watercress production at Waiawa. Due to concerns that demolition debris, if used for landfill in this wetland site, could result in leachate containing pesticides and petroleum residues, Watercress of Hawaii has agreed to limit both the amount of fill (i.e., fill depth would be reduced to 1 to 2 feet) and the kinds of material used. These changes are incorporated in the Draft Environmental Impact Statement that will be forwarded to your agency for review.

The question of habitat modification, including plans for creating additional wildlife habitat under the direction of U.S. Fish and Wildlife, is also addressed in the EIS document to be submitted to DLU next week. We look forward to your continued input to this proposal. Mr. Rayashida of the Board of Water Supply, pointed out that the project is within the Pearl Harbor Groundwater Control Area administered by DLNR. Although we believe the project will not impact on groundwater resources in the area, we would appreciate your particular attention to whether this aspect needs additional consideration in the EIS.

Sincerely,

Eric B. Guinther

1003 AUG 14 1985

LU 8/15 - 3571

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HANASU
DEPUTY TO THE CHAIRMAN
DIVISIONS:
AGRICULTURE DEVELOPMENT
PROGRAM
PUBLIC RESOURCES
CONSERVATION
RESOURCES ENHANCEMENT
COMMUNITIES
ENERGY AND WILDLIFE
LAND AND WATER
STATE PARKS
WATER AND LAND DEVELOPMENT

1305 AUG 15 PM 2:11 LU 8/85 - 3532

DEPT. OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU



STATE OF HAWAII
DEPARTMENT OF HEALTH

P. O. BOX 2070
HONOLULU, HAWAII 96820

LESLIE S. MATSUMURA
DIRECTOR OF HEALTH

IN REPLY, PLEASE REFER TO:
EPHSD

August 12, 1985

Mr. John P. Whalen
Director of Land Utilization
City & County of Honolulu
650 S. King St.
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Subject: Request for Comments on Environmental Assessment for a Watercross Farming Operation at Waiawa, Oahu, Tax Map Key 9-6-03: 4, 5, 26-38, Excluding 30, 35

Thank you for allowing us to review and comment on the subject environmental assessment. We submit the following comments for your considerations:

Water Quality

Our engineering staff has reviewed the subject environmental assessment and have the following comments concerning potential impacts on water quality.

1. Recycling of Watercross Patch Water - Accumulation of pesticides in the adjacent source patch water could occur if recycling is performed. This could pose a potential problem to public health if this issue is not further addressed.
2. Contamination of Watercross Patches by Leachate - Contamination of down gradient terraced patches and the source water reservoir (located down gradient) by leachate may occur if the proposed fill material of demolition and land clearing/excavation debris composed of 25% concrete and rock, 30% soil, and 45% wood and other building materials is used. Pesticide leachate from treated wood and fumigant treated soils may percolate into and thus contaminate down gradient patches and source water, causing potential danger to public health if watercross is consumed. Parasiticide, adsorption by plant, and plant uptake, of the potential pesticides present should be addressed, if significant.
3. Contamination of Middle Loch, Pearl Harbor, by Leachate - Contamination of Middle Loch by the fill material leachate may occur if the proposed fill material is used. Leachate from the proposed fill material will naturally flow down gradient until its emergence in Middle Loch, which could pose serious environmental problems. PCB has been detected in East Loch in the vicinity of an old abandoned landfill.
4. Alternative Fill Material - it is highly recommended that an alternative fill material be used because of the potential environmental problems listed above.

Mr. John P. Whalen
August 12, 1985
Page 2

Sanitation

Discharges of domestic wastewater into ground generated by operators and employees of the farms.

This site is located between Board of Water Supply "no pees" and "pees" zones. We were informed by the Board of Water Supply that the requirements for this type of zone depends on submission of soil boring data by the developer for Board of Water Supply evaluation for determining whether the Board of Water Supply ground water sources will be affected.

Noise

1. Construction, dredging and landfilling activities must comply with the provisions of Title II, Administrative Rules Chapter 43, Community Noise Control for Oahu
 - a. The contractor must obtain a noise permit if the noise levels from the activities are expected to exceed the allowable levels of the regulations.
 - b. Construction, dredging and landfilling equipment, including on-site vehicles or devices requiring an exhaust of gas or air, must be equipped with mufflers.
 - c. The contractor must comply with the conditional use of the permit as specified in the regulations and conditions issued with the permit.
2. Traffic noise from heavy vehicles travelling to and from the construction site must be minimized near existing residential areas, and must comply with the provisions of Title II, Administrative Rules Chapter 42, Vehicular Noise Control for Oahu.
3. For backyard and stockpile areas located adjacent to residences, mitigative measures such as earthen berms and noise barriers must be developed.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

Sincerely,

WILLIAM K. KOFRON
Deputy Director for
Environmental Health



970 N. Kalanooa Avenue, Suite A300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

December 5, 1985

Melvin K. Koizumi
Deputy Director for Environmental Health
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Attn: EPHSD

Re: EA for a Watercess Farming Operation at Waiawa, Oahu.
Reply to comments submitted to DLU, Aug. 12, 1985

Dear Mr. Koizumi,

Your comments regarding the "Environmental Assessment for a Watercess Farming Operation at Waiawa, Oahu," produced by AECOS, Inc. for Watercess of Hawaii, Inc. are appreciated. The Dept. of Land Utilization, City and County of Honolulu determined that the project, as originally conceived, should proceed with an Environmental Impact Statement. The primary reason stated was the concern expressed by Department of Health and other agencies reviewing the EA about the use of demolition debris in the proposed land fill. Because the use of such material in a setting of potential leachate generation posed unknown hazards dependent upon the nature of the material, and the use of demolition debris, no matter how well supervised, could not guarantee that some material posing an environmental risk would not be inadvertently placed in the fill. The use of alternative fill material was strongly urged. Consequently, Watercess of Hawaii, Inc. has agreed to limit fill material to inert materials (soil, land-clearing debris, some concrete). The EA has been rewritten to reflect modifications in the proposal and incorporate suggestions made by yourself and others who reviewed the document, and is being resubmitted as a draft EIS, which no doubt you will be requested to review. As to the points made in your initial review of the EA (dtd. 12 Aug 1985), I offer the following:

Water Quality

1. - Water would not be continuously recycled. A portion of the runoff from the eastern watercess plots will be used to supplement well water sources in the western part of the property. Runoff from the latter area will go to offsite drainage (i.e., will not be recycled).

2. - Limitations on the types of material to be used should eliminate potential leachate problems (detailed in EIS).

3. - See #2 above.

4. - Alternative fill material will be used as detailed in the Draft EIS.

Sanitation

No sanitation facilities are to be added for the project. The farmers are resident on their parcels.

Noise

No comment required.

Thank you for your response to the DLU's request for comments on this project. Distribution of the Draft EIS will be made next week.

Sincerely,

Eric B. Guinther



United States Department of the Interior

FISH AND WILDLIFE SERVICE

100 ALA MOANA BOULEVARD
HONOLULU HAWAII 96810

ES
Rm 6307

AUG 10 1985

DEPT. OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU

085 AUG 14 PM 1:29

Mr. John P. Whalen
Director of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

We have reviewed the Environmental Assessment for a Watercress Farming Operation at Waiawa, Oahu, and provide the following comments for your consideration. We have focused on the relationship of this proposed project to the four endangered Hawaiian waterbirds.

Although we agree with the basic conclusions of the environmental assessment, certain aspects of this document regarding habitat use by waterbirds are somewhat confusing or misleading. On page 39, 2nd paragraph, it suggests the value of the marshland to waterbirds is low due to the poor condition (i.e., overgrown with introduced plants) of the habitat. This is in fact basically the case. However, some waterbirds do use the area and under better conditions it could provide some good habitat. Thus we cannot agree with some of the statements on pages 35 and 36. (e.g., 4th paragraph, page 35) that suggests there is "...no suitable habitat for any of these endangered waterbirds...."

This area is not one noted in the recovery plan for the endangered waterbirds, largely for reasons stated above and in the EA. However, wetland habitat is in such short supply that any opportunities to maintain/restore wetlands should be taken to help the recovery program. In view of the above facts, the Fish and Wildlife Service would have no objection to the proposed project given the provisions stated in paragraph 2, page 17 and paragraph 2, page 39 (improvements to waterbird habitat potential as a secondary benefit to the project) are followed through. This area and the proposed project indeed have potential to provide habitat more suitable for endangered waterbirds than that which presently exists on this land. Habitat improvement there would also be beneficial to the neighboring Waiala Unit of the Pearl Harbor National Wildlife Refuge.

In the EA there is only short mention of the types of habitat improvements (e.g., increase in shallow open water) that would accompany the project. Areas intended to provide benefits to waterbirds in conjunction with other project objectives will need to be developed and managed with some assistance from wildlife management experts. We recommend that development and management of the catchment basin (and possibly other facets of the projects) be coordinated with input from this office and the Hawaii Division of Forestry and Wildlife.

This project offers a good opportunity to incorporate some benefits to endangered species within the context of the primary purposes of the project. We hope to be able to assist at a future date. Thank you for the opportunity to comment.

Sincerely,

Allan Marmelstein
Pacific Islands Administrator

cc: DOFAW
RO, Portland, OR (AHR)





970 N. Kalanianaʻolu Highway, Suite A300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

December 5, 1985

Alan Marmelstein
Pacific Islands Administrator
U.S. Fish and Wildlife
300 Ala Moana Blvd.
Honolulu, Hawaii 96850

RE: Watercross of Hawaii, Inc., Waiawa Watercross Expansion
Environmental Assessment

Dear Mr. Marmelstein,

Thank you for your review comments concerning the "Environmental Assessment for a Watercross Farming Operation at Waiawa, Oahu". The DLU has requested that this project proceed with the preparation of a Draft EIS, which should be distributed next week. The project has been altered -- a smaller volume of fill is proposed, the final elevation of the watercross plots will be lower, and fill material will be limited to soil, rock, and concrete (i.e., demolition debris will not be used). These changes were necessitated by concerns over potential leachate generation at this wetland site.

We have been in contact with Mr. Andrew Yuen of your office, and have worked out plans to improve, for wildlife use, a portion of Parcel 26, which is included in Watercross of Hawaii, Inc.'s lease from Bishop Estate, but most of which is not included in the proposed project's watercross expansion. This area, and probably most of the proposed flood corridor, as well as the proposed water reservoir, would be available for habitat improvement of value to Hawaii's endangered waterbirds.

Our assessment that suitable habitat for endangered waterbirds is not present on the site, may be somewhat of a simplification. Clearly, very little "suitable" habitat is present, although, as you state, the site has potential requiring only management for this purpose. On balance, the proposed alterations should increase the area of suitable habitat, a benefit to waterbirds that is enhanced by the close proximity of the Waiawa Unit of the Pearl Harbor NWR.

Sincerely,
Eric B. Guinther
Eric B. Guinther



University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2350 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Environmental Assessment
Watercross Farming Operation
Waiawa, Oahu

In response to your request of July 24, 1985 we have briefly reviewed the above cited environmental assessment. The following points are provided for your information with regard to EIS requirements for this proposed development.

Landfill Material

The primary environmental concern involves the use of demolition debris for landfill and in particular the use of wood debris impregnated with termiticides. The potential for environmentally hazardous leachate from this treated wood to enter Pearl Harbor, Waiawa stream, or adjacent ecosystems including the watercross farm is of significant concern. We suggest that an EIS or expanded EA be developed to address this issue.

Relationship of Watercross Farm to Wildlife Refuges

The EA discusses (Appendix A) the various birds and mammals in the project area and describes nearby areas set aside as wildlife sanctuaries by the U.S. Navy in 1971 (page 38). It also mentions two areas to be developed as waterbird refuges to compensate for the 186 acres of mudflats lost in the construction of the reef runway at Keehi Lagoon. One of these marshlands, the Waiawa unit of the National Wildlife Refuge is located very close to the proposed project, Figure 9, (not Figure 8 as indicated in the text, page 39). The relationship of the proposed wetland filling to the wildlife refuges in the vicinity is not clearly apparent. The EA should clarify the relative location and water sources for the refuges and the watercross farm. If toxic leachate is likely to be present in the watercross effluent then any recycling of this water to the refuges could create a serious environmental problem. A discussion of the relationships should be provided in the EA.

LC 8/85-3725

1985 AUG 27 AM 10:35
DEPT. OF LAND USE CONTROL
CITY & COUNTY OF HONOLULU

August 21, 1985

RN:0131

Mr. John P. Whalen

-2-

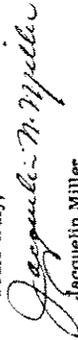
August 21, 1985

Archaeology

According to Figure 4, and the text, the marsh land will first be dredged to a uniform depth and then the surface raised using certain types of land fill waste materials. The archaeological study consisted of a reconnaissance walk-through survey and concluded that no prehistoric or significant historic features are present. Our University archaeological reviewers are presently out of the state hence we were unable, at this time, to acquire specific information on the archaeological significance of this site. However, the historic record of two fishponds on the site and its location adjacent to Pearl Harbor, a biologically rich coastal embayment, indicates that the area would have been a prime site for prehistoric human activities. We would expect to find numerous archaeological sites in this area. We strongly urge that the State Historic Preservation office be contacted for their input prior to decisionmaking on this project. If the project is approved, we urge that a qualified archaeologist be on duty when the dredging and land leveling is undertaken.

We appreciate the opportunity to comment on this EA and hope you will find our comments useful in your evaluation of the potential environmental impacts associated with this project.

Yours truly,



Jacquelin Miller
Acting Associate Director

cc: Patrick Takahashi, Act. Dir., Env. Ctr.



970 N. Kalanianaʻolahi Avenue, Suite A300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

December 5, 1985

Jacquelin Miller
Environmental Center
University of Hawaii at Manoa
Crawford 217
2550 Campus Road
Honolulu, Hawaii 96822

Dear Ms. Miller,

Your comments regarding the "Environmental Assessment for a Watercress Farming Operation at Waiawa, Oahu," produced by AECOS, Inc. for Watercress of Hawaii, Inc. are appreciated. The Dept. of Land Utilization, City and County of Honolulu determined that the project, as originally conceived, should proceed with an Environmental Impact Statement. The primary reason stated was the concern expressed by Department of Health, yourself, and others that the use of demolition debris in the proposed land fill could potentially result in hazardous leachate. The use of alternative fill material has been considered and Watercress of Hawaii, Inc. has agreed to limit fill material to inert materials (soil, land-clearing debris, some concrete). The EA has been rewritten to reflect modifications in the proposal and incorporate suggestions made by yourself and others who reviewed the document, and is being resubmitted as a Draft EIS. No doubt you will be requested to review this revised document. As to the points made in your initial review of the EA (dtd. 12 Aug 1985), I offer the following:

Landfill Material

At the suggestion of the Department of Health and the U.S. Army Corps of Engineers, landfill material will be restricted to land-clearing debris (soil, rock, concrete). Building demolition debris will not be utilized.

Relationship to Wildlife Refuges

At the present time, some portion of the water for the refuge is obtained from the estuary which serves as drainage for some of the existing watercress plots, and would be the principal drainage for the proposed expansion areas. U.S. Fish and Wildlife has expressed verbally an interest in obtaining water for this refuge from closer to the watercress and springs to reduce

the salinity of the make-up source. The modified fill proposal should eliminate the potential for any toxic leachates.

Archaeology

The historic record suggests one fishpond may have been located at this site. The other fishpond mentioned was probably located closer to Pearl Harbor across the Navy Access Road (indeed, the Waiala Unit of the NWR may have been this fishpond). For the most part, substantial dredging on the site will be done in areas of historically recent landfills. Dredging in marshlands will be primarily for the purposes of clearing and leveling, lowering slightly the flood corridor, and increasing the depth in specified areas under the direction of USFWS for waterbird habitat. With the exception of the latter purpose, it is unlikely that the shallow dredging in most areas will produce much of archaeological interest. However, this decision should be made by the State Archaeologist.

Thank you again for your comments. They have proved useful in producing the EIS.

Sincerely,

E. B. Guinther
Eric B. Guinther

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU

680 SOUTH KING STREET
HONOLULU, HAWAII 96801-313-4432



FRANK P. WHALEN
DIRECTOR

FRANK P. WHALEN
DIRECTOR

(EM)

September 17, 1985

Mr. Eric Guinther, AECOS
970 North Kalanui Avenue, Suite A300
Kailua, Hawaii 96734

Dear Mr. Guinther:

Ordinance No. 84-4, Special Management Area Use Permit (SMP)

Applicant : Watercross of Hawaii, Inc.
Recorded Owner : Bishop Estate
Tax Map Key : 9-6-03; 4, 5, 26-29, 32-34, 36-38
Request : Establish a landfill to create new agricultural land devoted to wetland crops within the Special Management Area

We have reviewed your request for an SMP and have determined that an Environmental Impact Statement (EIS) is required for the proposed project. Attached is a copy of our EIS Preparation Notice, which identifies the areas of concern.

An SMP may not be processed until an EIS has been completed and accepted.

If you have any questions, please contact Mr. Earl Matsukawa of our staff at 527-5038.

Very truly yours,

John P. Whalen

JOHN P. WHALEN
Director of Land Utilization

JPH:s1
attach.



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

October 24, 1985

REPLY TO
ATTENTION OF

Operations Branch

Mr. Eric B. Guinther
AECOS
970 H. Kalaheo Avenue, Suite A-300
Kailua, Hawaii 96734

Dear Mr. Guinther:

Enclosed is a letter from the National Marine Fisheries Service (NMFS) regarding the proposed fill project for watercress farming at the Waiawa Wetland, Oahu, Hawaii, File No. PODOCO-O 1891-#D.

The NMFS expresses several concerns about the project which should be addressed in the revised application which you are preparing. Thank you for your attention to this matter.

Sincerely,

Everette A. Flanders
Everette A. Flanders
Chief, Construction-Operations
Division

Enclosure

Copy Furnished:

Mr. Steven Anderson with enclosure
Landsend, Inc.
1553 Colburn Street, Room 202
Honolulu, Hawaii 96817

National Marine Fisheries Service, Honolulu, Hawaii
without enclosure

Rec 11048

18 OCT 1985



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
Western Pacific Program Office
P. O. Box 3830
Honolulu, Hawaii 96812

October 16, 1985

PK
WU
F/SWR1 PUN Con-ops

Colonel Michael M. Jenks
District Engineer
U.S. Army Corps of Engineers
Fort Shafter, HI 96858

Dear Colonel Jenks:

Subject: PODOCO-O 1891-SD. Fill to Develop Watercress Farming at Waiawa Wetland, Oahu.
Application by Watercress of Hawaii, Inc.

The National Marine Fisheries Service (NMFS) has reviewed the subject permit application to expand the existing watercress farming acreage at Waiawa, Oahu. The acreage would be expanded from 5-acres to approximately 20-acres with placement of fill so that elevation of the land will be raised to allow necessary water flow across the watercress fields and resolve flooding problems from Waiawa Stream. We offer the following comments for your consideration.

On September 25, 1985 NMFS participated in a site inspection with personnel from the Corps of Engineers, the U.S. Fish and Wildlife Service, and the agent for the applicant. The wetland was found to be choked with vegetation and has been used as a dumping ground for old automobiles and other solid waste. However, the area still acts as a natural flood water storage reservoir for waters eventually entering Middle Loch, Pearl Harbor.

The major concern of NMFS is the impact from the project on Middle Loch, an important nehu baiting area for the commercial skipjack tuna fleet. We are particularly concerned with the potential for pesticides (from the additional watercress acreage) and pest control chemicals (from fill material containing construction demolition debris) entering Middle Loch and other adjacent areas of Pearl Harbor.

A second concern is the proposed construction of a flood channel which would transport flood waters directly into Middle Loch. This would greatly reduce the settling out of suspended sediment and unnecessarily increase the sediment load to Pearl Harbor, creating shoaling and water quality problems.

RECEIVED OCT 25 1985

Recently it was learned that the applicant proposes to make several substantial changes to the project, which will be reflected in a revised permit application. The above areas of concern to this agency should be brought to the attention of the applicant prior to submission of the revised application.

NMFS feels the proposed project should be modified to minimize potential impacts on marine and estuarine fishery resources, including the important nehu stocks, in the waters of Pearl Harbor.

Sincerely yours,

Doyle E. Gates
Doyle E. Gates
Administrator

cc: F/SWR, Terminal Is., CA
F/M4, Washington, D.C.
EPA, Region IX (P-5)
FWS, Honolulu
Hawaii State Div. of Aquatic Resources
Tuna Boatowners' Co-op., Inc.



970 N. Kalia Avenue, Suite A-300 • Kalia, Hawaii 96734
Telephone: (808) 254-5864

Dec. 6, 1985

Doyle E. Gates
Administrator
National Marine Fisheries Service
Southwest Region
Western Pacific Program Office
P.O. Box 3830
Honolulu, Hawaii

RE: PODCO-0 1891. Waiawa Watercress Expansion, Watercress
of Hawaii, Inc.

Dear Mr. Gates,

Thank you for your response to the U.S. Army Corps of Engineers request for comments on the subject project. At the request of the U.S. Army Corps, Hawaii State Department of Health, and the Department of Land Utilization, City and County of Honolulu reconsideration has been given to the type of fill materials for the proposed landfill. Material will be limited to land-clearing debris: soil, rock, and some concrete. Demolition debris will not be used. This change necessitates reducing the overall volume of fill, as it is anticipated that the restrictions will greatly limit availability of materials. Rather than extend the term of the landfill, watercress plots would be developed at a lower elevation (that is, less fill would be utilized). As a consequence, the growers will accept a greater risk of flood damage when Waiawa Stream overflows its banks. In response to the concerns expressed in your letter dated October 16, 1985 the modifications proposed should lessen impacts on Pearl Harbor waters due to the fact that the natural functions of the existing marshland as regards sediment retention during stream flooding will not be substantially altered. Also, the use of inert materials should eliminate concerns over potentially hazardous leachates coming from the landfill. Recent advances in non-toxic methods of pest control for watercress have substantially reduced the growers' use of pesticides, and watercress ponds now support an abundance of aquatic life.

Although this marsh no doubt does remove some sediment from Waiawa Stream flood waters, there are reasons to believe that its

actual contribution in terms of the overall hydrology of a flood is small. First, the primary outlet for Waialua Stream lies elsewhere. Second, the mangrove belt between this marsh and Middle Loch would seem primarily responsible for slowing floodwaters and allowing fine sediment to settle before reaching Pearl Harbor. This belt would not be altered, and the modified plans for the project would not prevent flood waters from spreading out over the lowlands. Consequently, the project will not alter the mechanism by which the marsh "protects" Pearl Harbor. The proposed flood corridor, and a pond to be dredged along the eastern part of the project area for wildlife use, will serve to extend the life of the marsh as a sediment trap, in as much as accumulated sediment will be removed. The flood corridor would not be a lined channel designed to direct flood waters as quickly as possible into Pearl Harbor. It would be a vegetated marshland serving as a bypass for all but the most severe flood conditions (the latter would flood the watercross areas).

The revised project is described in a Draft EIS now in preparation and your review of this document will be much appreciated. We anticipate distribution in about one week.

Sincerely,



Eric B. Guininger

cc: U.S. Army Corps, Permits Branch

U.S. FISH AND WILDLIFE SERVICE

Room 6307
OCT 17 1985

Colonel Michael M. Jenks
U.S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858-5440

Re: FODCO-O 1891-SP, Proposed Wetland Fill to Expand Watercross
Farming at Waialua, Oahu

Dear Colonel Jenks:

We have reviewed the referenced public notice and offer the following comments for your consideration.

This report has been prepared under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and other authorities mandating Department of the Interior concern for environmental values. It is also consistent with the intent of the National Environmental Policy Act.

Based on an October 7, 1985 meeting with your Operations Branch and the project's agent and consultant, we understand that the proposed project has been modified as follows:

- a. The amount of fill placed in the wetland has been reduced.
 - b. Only soil, rock, concrete, and vegetation will be used as fill. Treated lumber will not be allowed because of the potential problems with termiticides leaching into the groundwater.
- We understand that revised permit drawings will be provided as they become available.
- At the referenced meeting, we discussed potential mitigation and compensation measures for the conversion of an existing natural wetland into a watercross farm. It appears that the project offers limited opportunities to provide improved endangered waterbird habitat in the affected area.

RECEIVED NOV 20 1985
RECEIVED NOV 20 1985

10 9/85-4282

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN
DIVISIONS:
AGRICULTURE DEVELOPMENT
PROGRAM
ADAPTIVE RESOURCES
CONSERVATION
CONSERVATION ENHANCEMENT
CONSERVATION
FORESTRY AND WILDLIFE
STATE PARKS
WATER AND LAND DEVELOPMENT



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 821
HONOLULU, HAWAII 96809

SEP 24 1985

1985 SEP 25 AM 11:14
DEPT. OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU

Honorable John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 So. King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

This is to add to the comments made in our letter of August 12, 1985, concerning the environmental assessment for a watercess farm project at Maiana, Oahu.

a. In the event the watercess operation proves unecological, the area will remain a wetland. The springs that feed the wetland will remain and will not be capped, tapped, or diverted for other purposes that would affect the maintenance of the area as a wetland. The area will be allowed to return to a natural wetland.

b. Water quality standards will be maintained in accordance with Federal and State water quality regulations. This may require monitoring of runoff waters and leachate.

Our office remains available for technical assistance.

Sincerely yours,

Original signed by
Ernest Koseka
Project Leader
Office of Environmental Services

cc: DON
DLU
EPA, San Francisco
NMFS
OROC

ARY:um:pf:10/17/85
MAIANA.AY (180)

Sincerely,

SUSUMU ONO
Chairperson

RECORDED OCT 02 1985

APPENDIX D.

Comments and Actions Relative to the
Draft Environmental Impact Statement

Following are letters received from agencies requested by
DLU to review the Draft Environmental Impact Statement for the
Waiawa watercross project.

LIST OF COMMENTS RECEIVED

FEDERAL AGENCIES

Federal Aviation Administration, US Department of Transportation
Water Resources Division, Geological Survey, US Dept. of Interior
Department of the Navy, Department of Defense
Fish and Wildlife Service, US Dept. of Interior

STATE AGENCIES

Department of Land and Natural Resources
Department of Accounting and General Services
Department of Education
Department of Agriculture
Department of Health
Department of Transportation
Department of Planning and Economic Development
Department of Hawaiian Home Lands
Water Resources Research Center, University of Hawai'i at Manoa
Environmental Center, University of Hawai'i at Manoa

CITY AND COUNTY AGENCIES

Board of Water Supply
Department of General Planning
Department of Parks and Recreation
Department of Transportation Services
Building Department
Department of Public Works

GEORGE R. ANIYOSHI
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96808

OCT 10 1985

Honorable John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 So. King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

This is to add to our August 12, 1985 and September 24, 1985 comments on the environmental assessment for a watercress farm at Waiawa.

We have reviewed the archaeological reconnaissance report attached with the subject assessment ("Archaeological Reconnaissance of a 37-acre wetland parcel, Waiawa, Ewa, O'ahu," Hammatt and Borthwick, 1985) and concur with the consulting archaeologist that the parcels are characterized by "severe modern modification and no trace of archaeological sites or features of historical significance" (Hammatt and Borthwick, 1985:8). Thus, the proposed project will not impact any known archaeological resources.

However, if any previously unidentified sites or remains (such as artifacts, shell, bone, or charcoal) deposits, human burials, rock or coral alignments, pavings, or walls) are encountered during construction, we ask that the applicant be required to stop work and contact our historic preservation office at 548-7460, immediately. Work in the immediate area should be stopped until the office is able to assess the impact and make further recommendations for mitigative activity.

Sincerely,

SUSUMU ONO
Chairperson

Lv 10/85-4579

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN
DIVISIONS:
ARCHAEOLOGICAL DEVELOPMENT
PROGRAMS
AGRICULTURAL RESOURCES
CONSERVATION AND IMPROVEMENT
CONSERVATION
FORESTRY AND WILDLIFE
PLANNING AND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

1985 OCT 11 PM 1:51
DEPT. OF LAND UTILIZATION
& COUNTY OF HONOLULU



970 N. Kalaheo Avenue, Suite A300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

January 29, 1986

Mr. Susumu Ono
Chairperson
Dept. of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

RE: Watercress Expansion Project, Waiawa, Oahu (draft EIS)

Thank you for your comments on the Environmental Assessment and draft EIS for the Waiawa Watercress Project proposed by the Watercress of Hawaii. Your department's concurrence with the archeologists' report is appreciated. Although dredging on the site will be limited to a few specified areas, the applicant will adhere to your request to contact the State historic preservation office if significant or unusual strata are encountered.

Sincerely,

Eric B. Guinther

Dept. of Acct. + General Services

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU



COPY

December 31, 1985

(P)1897.5

DEC 27 1985

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Subject: Proposed Watercress Development
Project at Waiawa, Oahu

We have reviewed the subject document and have no
comments to offer.

Very truly yours,

Teuane Tomina
TEUANE TOMINAGA
State Public Works Engineer

/jnt
cc: ✓Mr. Eric Guinther

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: KASU HAYASHIDA, MANAGER AND CHIEF ENGINEER
BOARD OF WATER SUPPLY

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR A PROPOSED
WATERCRESS DEVELOPMENT PROJECT AT WAIAWA

We have the following comments on the environmental document
for the proposed watercress project:

1. The document should discuss the total water requirements for the project. According to the document, 15 million gallons per day will come from the three springs located within the project. However, the amount of water to be contributed from the existing wells (Figure 5, p. 12; p. 15) is not mentioned.
2. Since the project is within the Pearl Harbor Ground Water Control Area, the document should indicate whether the wells and springs would be free flowing or pumped. If the wells and springs are to be pumped, then pumpages must comply with Chapter 166 of Title 13 of the Department of Land and Natural Resources.
3. Data on salinity, rate of flow, and artesian head for each source to be used should be included in the document. The document is unclear as to the impacts the landfiling will have on reducing flows from the proposed water sources.

If you have any questions, please contact Lawrence Whang at 527-6138.

Very truly yours,

Kasu Hayashida

KASU HAYASHIDA
Manager and Chief Engineer

cc: Mr. Eric Guinther (AMCOS, Inc.)



970 N. Kalanianaʻolahi Avenue, Suite A 800 • Kalaheo, Hawaii 96734
Telephone: (808) 254-5884

January 29, 1986

Mr. Kazu Hayashida
Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu

Dear Mr. Hayashida,

Thank you for your comments on the draft EIS for the Proposed Watercess Development Project at Waiawa. We offer the following responses to your comments.

1 and 2. Total water requirements for the project will be discussed in the final EIS document. Although the draft EIS refers to "wells" presently utilized by the farmers in the westernmost part of the project area, we believe these "wells" may actually be small artesian springs (i.e., free flowing wells). Apparently, no water is pumped from the ground for watercess cropping at this site. Measurements of water flow from these small springs may never have been made (although presumably could be estimated). The cropping units in this area are small and have developed in ground. That is, the size of these plots has likely been limited by the quantity and quality (poor in terms of salinity compared with the larger springs) of the spring water in the immediate area.

3. The U.S. Geological Survey has made discontinuous measurements of flow from the largest of the springs in this area. To the extent possible, additional data on the springs will be incorporated in the final EIS. Wherever landfill impinges on an artesian spring (all of the larger springs are above the project site), a box will be constructed to prevent the landfill from impacting on water flow.

Sincerely,

Eric B. Guitcher

GEORGE F. ARTSON
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2380
HONOLULU, HAWAII 96813

OFFICE OF THE SUPERINTENDENT

January 2, 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Subject: Proposed Watercess Development Project at Waiawa, Oahu
The Department of Education has no comment to offer on the project at this time.

Thank you for the opportunity to review the materials.

Sincerely,



FRANCIS M. HATANAKA
Superintendent of Education
FMH:th

cc Mr. Vernon Honda
Leeward District

20106-143
FRANCIS M. HATANAKA
SUPERINTENDENT

OFFICE OF THE SUPERINTENDENT
CITY & COUNTY OF HONOLULU

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813



FRANK FASI
SAUCE

DONALD A. CLEGG
CHIEF PLANNING OFFICER
GENE CONNELL
DEPUTY CHIEF PLANNING OFFICER

WL/DGP 12/85-7124



U.S. Department
of Transportation
Federal Aviation
Administration

Western-Pacific Region
P. O. Box 50109
Honolulu, HI 96850

January 7, 1986

January 6, 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, HI 96813

MEMORANDUM

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: DONALD A. CLEGG, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

SUBJECT: PROPOSED WATERCRESS DEVELOPMENT
PROJECT AT WAIANA, OAHU

We have reviewed the Environmental Impact Statement and find that the proposed use conforms to the General Plan and Central Oahu Development Plan.

cc: Mr. Eric Guinther

Donald A. Clegg
DONALD A. CLEGG
Chief Planning Officer

Dear Sir:

We have no comment regarding the Environmental Impact Statement (EIS) for the proposed Watercress Development Project at Waiana, Oahu.

We appreciate the referral of such matters for our review.
Sincerely,

Original signed by

Ralph W. Miller
Real Estate and Utilities Branch, AHNL-56

Enclosure

cc: Mr. Eric Guinther
AECOS Inc.
970 North Kaliaheo Ave., Suite A300
Kaliua, HI 96734

8 1986

RECEIVED

RECEIVED JAN 8 1986

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
850 SOUTH KING STREET
HONOLULU, HAWAII 96813



FRANK F. FASI
MAYOR

TOM I. NEKOTA
DIRECTOR

FRANK F. FASI
MAYOR

January 8, 1986

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: TOM I. NEKOTA, DIRECTOR

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED WATERCRESS
DEVELOPMENT PROJECT AT WAIAMA, OAHU

Implementation of the proposed project should not adversely affect existing or
planned recreation facilities.

Thank you for the opportunity to review the EIS.

Tom I. Nekota
TOM I. NEKOTA, Director

TTN:ei

cc: Mr. Eric Guinther, AECOS, Inc.

RECEIVED JAN 10 1986

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
HONOLULU MUNICIPAL BUILDING
850 SOUTH KING STREET
HONOLULU, HAWAII 96813



JOHN E. HIRTEN
DIRECTOR

JOSEPH M. MAGALD
DEPUTY DIRECTOR

TR-6230
PL 1.0185

January 8, 1986

MEMORANDUM

TO: JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: JOHN E. HIRTEN, DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR A PROPOSED
WATERCRESS DEVELOPMENT PROJECT AT WAIAMA
TMK: 9-6-03: 4, 5, 26-38 (excluding 30 & 35)

This is in response to your request for comments on the above
draft EIS.

We have reviewed the draft EIS and find that the traffic related
issues connected with the project have been addressed.

John E. Hirten

(for) JOHN E. HIRTEN

✓ cc: Mr. Eric Guinther

RECEIVED JAN 10 1986

DRAGON RESPONSE

40 1/86-160

BUILDING DEPARTMENT
CITY AND COUNTY OF HONOLULU
 HONOLULU MUNICIPAL BUILDING
 450 SOUTH KING STREET
 HONOLULU, HAWAII 96813



FRANK F. FASI
 MAYOR

HERBERT K. MURAKA
 DIRECTOR AND BUILDING SUPERINTENDENT

PB 86-20

January 9, 1986

MEMO TO: MR. JOHN P. WHALEN, DIRECTOR
 DEPARTMENT OF LAND UTILIZATION

FROM: HERBERT K. MURAKA
 DIRECTOR AND BUILDING SUPERINTENDENT

SUBJECT: PROPOSED WATERCRESS DEVELOPMENT PROJECT
 WAIANA, OAHU

We have reviewed the draft Environmental Impact Statement (EIS) for the proposed Watercress Development project in Waiana and have no comments.

Thank you for the opportunity to review the draft EIS.

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

cc: J. Harada
 AECOS, Inc. (E. Guinther)

1986 JAN 10 AM 10:45
 DEPT. OF LAND UTILIZATION
 CITY & COUNTY OF HONOLULU



GEORGE R. ABIYOSHI
 GOVERNOR

JACK K. SUWA
 CHAIRMAN, BOARD OF AGRICULTURE

RUZANNE D. PETERSON
 DEPUTY TO THE CHAIRMAN

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

January 10, 1986

Mailing Address:
 P. O. Box 22159
 Honolulu, Hawaii 96822

MEMORANDUM

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

Subject: Draft Environmental Impact Statement for a
 Proposed Watercress Development Project
 at Waiana, Oahu
 Watercress of Hawaii, Inc.
 TMK: 9-6-03: 04, 05, 26-38 (excluding 30 & 35)
 Acres: 36.9

The Department of Agriculture has reviewed the subject document and finds that it addresses our concerns. We support the approval and establishment of the proposed project.

Thank you for the opportunity to comment.

Jack K. Suwa
 JACK K. SUWA
 Chairman, Board of Agriculture

cc: Eric Guinther, AECOS, Inc.

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



FRANK F. FAUJ
MAYOR

RUSSELL L. SMITH, JR.
DIRECTOR AND CHIEF ENGINEER

PRO 86-5

January 13, 1986

MEMORANDUM

TO: MR. JOHN P. WHALEN, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM: RUSSELL L. SMITH, JR., DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR A PROPOSED
WATERCRESS DEVELOPMENT PROJECT AT WAIANA, OAHU

We have reviewed the subject draft environmental impact statement and have the following comments.

1. A drainage report is required for any grading and landfill work.
2. The Ewa Branch Trunk Sewer passes through the proposed development. The sewer should be located on the map and precautionary measures should be taken to prevent burial of manholes.

for RUSSELL L. SMITH, JR.
Director and Chief Engineer

cc: Mr. Eric Guinther, AECOS Inc.

RECEIVED JAN 15 1986



970 N. Kalanooa Avenue, Suite A300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

January 29, 1986

Russell L. Smith
Director and Chief Engineer
Dept. Public Works
City & County of Honolulu
650 S. King St.
Honolulu, Hawaii 96813

Dear Mr. Smith,

In response to your thoughtful comments on the draft EIS prepared for the Proposed Watercress Development Project at Waiana, Oahu we offer the following:

1. We presume that a drainage report will accompany application for grubbing and grading permit as required.
2. Although we learned from the watercress growers in the area that a sewer line had been placed across portions of the property, our initial inquiries to the Department of Public Works produced a denial that the City and County had ever had such a project in the area. Shortly after the draft EIS was completed we returned for another try and learned that the Ewa Branch Trunk Sewer was the project name we were seeking. Apparently this project was not included on the master map referred to during our initial inquiry. We will incorporate pertinent routing and depth information on project maps in the Final EIS.

Eric B. Guinther

GEORGE R. ANIYOSHI
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 921
HONOLULU, HAWAII 96808

JAN 14 1986

Mr. Eric B. Guinther
AECOS
970 N. Kalaheo Avenue
Suite A300
Kailua, Hawaii 96734

Dear Mr. Guinther:

Watercress Farming Operation at Waiawa, Oahu

Thank you for acknowledging our comments on the Environmental Assessment for the subject project. We have followed up on your suggestion that we review the Environmental Impact Statement to determine whether the project will impact on the PHGWCA.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

RECEIVED JAN 15 1986



SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMAIBU
DEPUTY TO THE COMMISSIONER
DIVISIONS:
AGRICULTURE DEVELOPMENT
AQUATIC RESOURCES
CONSERVATION AND
RECREATION
RESOURCE ENFORCEMENT
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

United States Department of the Interior
GEOLOGICAL SURVEY

Water Resources Division
P.O. Box 50166
Honolulu, Hawaii 96850

January 15, 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City & County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Subject: Proposed watercress development project at Waiawa, Oahu

The subject draft environmental impact statement was reviewed by our staff. We have no comments to make at this time.

We appreciate the opportunity to review the subject report and are returning it for your future use.

Sincerely,

Stanley P. Kapustka
District Chief

Enclosure

cc: Mr. Eric Guinther, AECOS, Inc., Kailua, Hawaii 96734

RECEIVED JAN 17 1986

GEORGE R. ARYOSH
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF HEALTH

P.O. BOX 3378
HONOLULU, HAWAII 96801

LESLIE MATSUMURA
DIRECTOR OF HEALTH

Mr. John P. Whalen

January 16, 1986

- 2 -

January 16, 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Thank you for the opportunity to comment on the draft of the environmental impact statement for the proposed watercross development project at Waiawa. The following areas of concern need to be addressed:

- a) Potential for transmission of leptospirosis (Leptospira interrogans) to humans.
The presence of a large rodent population, areas of open water, and feral swine provides an ideal setting for the propagation of this disease. Utilization of water draining from the adjacent hog operation (page 22) would further increase this possibility.
- b) Potential for establishment and transmission of liver flukes (Fasciola gigantica).
Although the use of artesian water minimizes possibility of this occurrence, routine monitoring of the snail population should be instituted.

Watercross of Hawaii, Inc. is to be commended for implementing a progressive integrated pest management strategy for diamondback moth control.

We would like to encourage the use of Bacillus thuringiensis against the diamondback moth in this system because resistance to other classes of insecticide has already been noted. Inasmuch as pyrethroid insecticides are toxic to fish, extreme caution should be exercised in their usage.

If we may be of any assistance in the future, please feel free to contact our office.

Sincerely,

ELIZABETH L. LYONS, D.V.M., M.S.
State Public Health Veterinarian

cc: Mr. Eric Ginther



970 N. Kalanoo Avenue, Suite A300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

discussed with the watercress growers. It is my understanding that the overhead sprinklers used to control the diamondback moth are quite effective.

Sincerely,


Eric B. Guinther

January 29, 1986

Elizabeth L. Lyons
State Public Health Veterinarian
State of Hawaii
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Ms. Lyons,

Thank you for your comments on the draft EIS for the Proposed Watercress Development Project at Waiawa. Given the nature of watercress farming and product use, close cooperation between the Department of Health and the growers would certainly be in the growers' interests. In this regard, any input DOH can provide to prevent or mitigate leptospirosis (potentially a hazard to the growers working in the wet fields) will be appreciated. Obviously, nothing can be done about the "open water" -- necessary for the growth of this type of watercress. On the positive side, site development will begin with removal of potential rodent breeding areas in the numerous abandoned sheds, vehicles, and former swine pens which litter portions of the property. Squatters have been removed from the area, and much of the litter along the Federal Access Road has been removed at the request of the Fire Department and with the cooperation of the U.S. Navy.

Water draining from adjacent hog farming operations is not, nor will it be, used in the watercress cropping areas. At present, two hog farming operations occur in the drainage basin. It is anticipated that these pens will not be present if and when watercress cropping expands into areas adjacent to these "piggeries". A ditch with flowing water presently separates drainage from the hog pens and the proposed cropping expansion areas. This ditch will be maintained until such time as the potential conflict between watercress cropping and hog rearing can be resolved. Feral swine (probably not numerous in the area) can be expected to seek sanctuary elsewhere once the land is developed as proposed.

Your suggestions regarding monitoring of the snail population for liver fluke and use of *Bacillus thuringiensis* will be



DEPARTMENT OF THE NAVY
HEADQUARTERS
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96806-0020

IN REPLY REFER TO:

9510
Set 002B/64
16 JAN 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
630 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

ENVIRONMENTAL IMPACT STATEMENT
PROPOSED WATERCRESS DEVELOPMENT PROJECT AT WAIAWA, OAHU

The Environmental Impact Statement for the Proposed Watercress Development Project at Waiawa, Oahu has been reviewed and we have no comments to offer.

Thank you for the opportunity to review the EIS.

Sincerely,

HENRY J. RINNERT
Captain, CEC, U.S. Navy
Facilities Engineer
By direction of the Commander

Copy to:
Mr. Eric Guinther
AECOS Inc.
970 North Kalaheo Avenue, Suite A300
Kailua, Hawaii 96734

RECEIVED JAN 17 1986



United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P. O. BOX 50187
HONOLULU, HAWAII 96850

ES
Room 6307
JAN 16 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City & County of Honolulu
630 South King Street
Honolulu, Hawaii 96813

Re: Draft Environmental Impact Statement, Proposed Watercress Development Project, Waiawa, Oahu

Dear Mr. Whalen:

The U.S. Fish and Wildlife Service has reviewed the referenced Draft Environmental Impact Statement and offers the following comments for your consideration.

It is the Service's understanding that land fill material will be limited to soil, rock, and concrete. No treated lumber, garbage, industrial waste, hazardous wastes, building rubble, demolition debris, or asphaltic material will be used as land fill. We support these restrictions.

We continue to recommend that the flood channel and a portion of Parcel 26 be used to create open water/edge habitat for endangered Hawaiian waterbirds.

In view of the project modifications and endangered waterbird mitigation, the Service has no objection to the proposed project.

Sincerely yours,

Eric Guinther
Ernest Kosaka
Project Leader
Office of Environmental Services

cc: CE, Operations Br.
✓ Eric Guinther, AECOS Inc.

RECEIVED JAN 17 1986





University of Hawaii at Manoa

Water Resources Research Center
Holmes Hall 283 • 2540 Dole Street
Honolulu, Hawaii 96822

17 January 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
850 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

SUBJECT: Draft Environmental Impact Statement
for a Proposed Watercress Development
Project at Waiawa, Oahu, December 1985

We have reviewed the subject DEIS and offer the following comments. The EIS has considered the impact of the proposed watercress development on the environment. In this instance, what also needs to be considered is the impact of the environment on the project, namely the effect of existing pig farm immediately adjacent to subject sites. The insect vectors such as flies, and the manure and wash water associated with piggeries are substantial hazards to watercress culture inasmuch as much of the vegetable is consumed raw. Department of Health Administrative Rules 11-11-8(C) addresses this issue.

In sampling the water at various stations, the statement is made that the nutrient loading of the west-central marshland may be considerably greater than that measured to the east (samples B, C, and W) if the mangrove estuary sample (A1) is the result of land drainage. Included in this west-central marsh area is a pig farm which would generate large quantities of manure. These animal wastes could drain into the estuary and contaminate surrounding watercress fields. It would appear that animal raising, such as pigs or cattle, is highly incompatible with watercress culture. The water testing needs to screen for coliform bacteria and other animal related disease organisms as well as heavy metals which could be absorbed by plants.

Thank you for the opportunity to comment. This material was reviewed by WRRRC personnel.

Sincerely,

Edwin T. Murabayashi
Edwin T. Murabayashi
EIS Coordinator
ETM:jm
cc: E. Guinther, AECOS

RECEIVED JAN 22 1986



970 N. Kalanokou Avenue, Suite A 300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

January 29, 1986

Edwin T. Murabayashi
EIS Coordinator
University of Hawaii
Water Resources Research Center
Holmes Hall 283
2540 Dole Street
Honolulu, Hawaii 96822

Dear Mr. Murabayashi,

Thank you for your thoughtful comments on the draft EIS for the Proposed Watercress Development Project at Waiawa. The growers are aware of the potential conflicts inherent in having watercress cropping adjacent to hog rearing pens. The following comments were provided to the State DOH which also noted the mention of pig-farms on maps in the draft EIS representing present land uses:

Water draining from adjacent hog farming operations is not, nor will it be, used in the watercress cropping areas. At present, two hog farming operations occur in the drainage basin. It is anticipated that these pens will not be present if and when watercress cropping expands into areas adjacent to these "piggeries". A ditch with flowing water presently separates drainage from the hog pens and the proposed cropping expansion areas. This ditch will be maintained until such time as the potential conflict between watercress cropping and hog rearing can be resolved.

Note that anything "draining into the estuary" would not contaminate watercress fields in as much as the estuary is well down slope of the fields. The water in the estuary would not be suitable for the growth of watercress. Were it to reach the fields (say during an unusual high tide), the crop would probably be killed or rendered unmarketable.

Water testing, or testing of the marketable product, for coliforms or heavy metals is a matter between the grower and the Department of Health and not really germane to an EIS of the proposed project. Watercress is not a new crop or new market

item, (and not that unique in this respect from a variety of other fruit and vegetable products eaten raw), but has been grown on this site and others around the state for many years. Considering the source of the water used for watercess at this site, a heavy metals contamination problem seems very unlikely.

Thank you again for your comments.

Sincerely,

Eric B. Guinther

DORIS ARIYOSHI
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
165 KAUAI AVENUE, SUITE 100
HONOLULU, HAWAII 96813

January 17, 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

DEIS - Proposed Watercess Development Project
Waiaua, Pearl City, Oahu

A review of the draft environmental impact statement revealed that the proposed development will occur in the same general area as the easement for the energy corridor alignment (see enclosed map). However, we were unable to determine the exact relationship between the two from the information provided. It is therefore recommended that the developer coordinate this matter closely with the Harbors Division to avoid any conflicts. Otherwise, we have no other concerns.

Thank you for this opportunity to provide comments.

Very truly yours,

Wayne J. Yamagaki
Director of Transportation

Enclosure

LU/186- 410

WAYNE J. YAMAGAKI
DIRECTOR

DEPUTY DIRECTORS
JONATHAN K. SHIMADA, P.L.D.
WALTER T. MA'HO
CHERYL D. SOON
ADAM D. VINCENT

IN REPLY REFER TO:

STP 8.1135

1986 JAN 21 PM 1:46
DEPT. OF LAND UTILIZATION
CITY & COUNTY OF HONOLULU



970 N. Kalanooe Avenue, Suite A300 • Kailua, Hawaii 96734
 Telephone: (808) 254-5884

January 30, 1986

Wayne J. Yamaaki
 Director of Transportation
 State of Hawaii
 Department of Transportation
 869 Punchbowl Street
 Honolulu, Hawaii 96813

Dear Mr. Yamaaki,

Thank you for responding to the request for comments on the draft EIS for a Proposed Watercross Development Project, Waiala, Oahu. At your urging we have looked closely at the energy corridor easement located in the general vicinity of the proposed project. We found that with the possible exception of a small area on the west, this corridor alignment is outside of the project site, passing along Waiala Road north of the marshland and existing watercross plots. The energy corridor may skirt the western edge of the project where little or no modification (fill) is planned. None of the proposed land development changes will impact on land use options inherent to the easement. We will incorporate this information into the final EIS for the project.

Sincerely,

 Eric B. Guinther

GEORGE R. ANTONIO
DIRECTOR OF HEALTH



STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 327
HONOLULU, HAWAII 96811

January 21, 1986

LELIE S. MATSUURARA
DIRECTOR OF HEALTH

In reply, please refer to
EPWSD

Mr. John P. Whalen
January 21, 1986
Page 2

Mr. John P. Whalen, Director
Department of Land Utilization
City & County of Honolulu
650 S. King St.
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Subject: Proposed Watercess Development Project at Walawa, Pearl City, Oahu

Thank you for allowing us to comment on the subject Draft Environmental Impact Statement. We provide the following comments for your consideration:

Solid Waste

The developer has changed his original concept of landfilling the area with solid wastes to filling with grading materials which is acceptable and in compliance with the City's grading ordinances. A solid waste management permit from the State Department of Health is not required.

Sanitation

1. There is a concern over the presence of existing farms in the adjacent areas. Files breeding in hog farm manure will rest and defecate on the watercess plant.
2. Will the amount of artesian water be adequate to supply water for this development? In the event of a water shortage, will water be drawn from Walawa Stream to supplement the artesian supply? We do not recommend the use of Walawa Stream water to supplement the existing supply for watercess cultivation.
3. With the increase in watercess farming acreage, there will be a corresponding increase in the number of field workers. What sanitary facilities will be made available for them?

Noise

1. The applicant has not indicated any mitigative measures toward possible noise impacts resulting from baseyard and stockpile areas adjacent to residential areas. (Reference comments to Environmental Assessment, August 12, 1985.)

2. On page 46, the regulation governing vehicular noise should be corrected to read Administrative Rules, Title II, Chapter 42.
3. There are additional comments to Section H.3.1 addressing construction activities.
 - a. Construction equipment and on-site vehicles or devices requiring an exhaust of gas or air must have a muffler.
 - b. The conditional use of the permit must be compiled with as specified in the regulations and the conditions issued with the permit.

Sincerely,


JAMES K. IKEDA
Deputy Director for
Environmental Health

cc: Mr. Eric Guinther



970 N. Kalaheo Avenue, Suite A300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

January 29, 1986

Mr. James K. Ikeda
Deputy Director for Environmental Health
State of Hawaii
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Mr. Ikeda,

Thank you for providing comments on the draft EIS for the Proposed Watercess Development Project at Waiawa and noting therein that changes made in the project design as initially expressed in an Environmental Assessment for this project have satisfactorily met previously raised DOH concerns and objections. With respect to the new comments offered, we provide the following:

Sanitation

1. The problem of hog rearing in the project area has been addressed in letters from and to Elizabeth L. Lyons (State Public Health Veterinarian), who also noted the potential conflict. The growers are aware of the problem, and intend to rectify the situation.
2. The size of the project is essentially determined by the availability of the artesian water. No other sources of water would be sought. In the event of a water shortage impacting on the springs within the property boundaries, the growers would have no choice but to reduce the area under cultivation.
3. Mostly, these are small farms attempting to expand through a cooperative effort. The number of additional workers required would not be large, and would not place any strain on existing sanitary waste facilities.

Noise

1. Considering the size of the project and the relatively unambitious time schedule proposed in the draft EIS, the terms "base-

yard" and "stockpile areas" are conceptually difficult to apply here. For the most part the "adjacent residences" are those of the growers. Earthen berms and/or noise barriers would seem to be overkill for a project of this size located in an essentially isolated and rural area. More importantly, we believe the significance of these kinds of impacts was reduced substantially by the modifications made in the project design and scope between the EA and the draft EIS.

2. Noted and corrected.

3. a. Noted.

b. Noted.

Sincerely,

Eric B. Guinther

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

P. O. BOX 50004
HONOLULU, HAWAII
96850

January 21, 1986

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, HI 96813

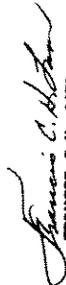
Dear Mr. Whalen:

Subject: EIS - Proposed Watercress Development Project, Waiawa, Oahu

We reviewed the subject document and have no comments to make.

Thank you for the opportunity to review the document.

Sincerely,


FRANCIS C.H. LUM
State Conservationist

cc:
Mr. Eric Guinther ✓
ABCOS Inc.
970 North Kalanooe Ave., Suite A300
Kailua, HI 96734



University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

January 22, 1986

RE:0431

Mr. John P. Whalen, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Whalen:

Draft Environmental Impact Statement
Watercress Development
Waiawa, Oahu

This document addresses the potential environmental impact related to the Watercress of Hawaii, Inc. proposal to alter 27 acres of wetland for the purpose of expanding watercress production for Waiawa watercress growers.

The Environmental Center review was prepared with the assistance of Bion Griffin, Anthropology; Paul Ekern, Water Resources Research Center; James Parrish, Hawaii Cooperative Fishery Research Unit; and Martha Diaz and Wallington Yee, Environmental Center.

Wetland Agricultural Development

A feasibility study for watercress production should be included in the EIS before irreversible and irretrievable resources are committed. As described in the Hawaii Coastal Zone Management Program's (HCZMP) goals and objectives, activities within the Shoreline Management Area (SMA) must achieve compliance with overall CZMP, especially in the case where "filling and dredging" of wetland environments are proposed and resources committed prior to justifying their need. The following issues need to be addressed in detail in order to adequately analyze the impacts of the proposed project.

The needs of watercress culture are not adequately discussed in the EIS. For example: What is the salt tolerance of watercress? Is low salinity water essential for watercress production? If so, then recycled water may not serve as a viable alternative. Will sprinkle irrigation with salty water (even 1500 ppm, cl) result in foliar burn, as it does with taro? Is flowing water essential to maintain cool temperatures? If so, recycling warm water would not be feasible and may cause root rot in watercress, as is the case with taro. Perhaps the Final EIS could incorporate a discussion of potentially applicable techniques for watercress culture production (see attachments A and B).

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970 N. Kaliaheo Avenue, Suite A300 • Kailua, Hawaii 96734
Telephone: (808) 254-5884

February 5, 1986

University of Hawaii, Environmental Center
Crawford 317
2550 Campus Rd.
Honolulu, Hawaii 96822

Dear Jacqueline Miller,

Thank you for responding to the DIU request for comments on the draft EIS, Watercress Development, Waialua, Oahu. We will incorporate the concerns raised by your review in the final EIS for this project. I respond here to certain specific comments presented by your staff.

Wetland Agriculture Development

Be assured that Watercress of Hawaii, Inc. -- established by the leading watercress growers in the State of Hawaii -- is not proposing a project without thorough consideration of the economic feasibility of expanding watercress production on Oahu. The fact that the project area is surrounded by a significant proportion of the presently existing wetland watercress cropping on this island is suggestive of the potential for an expansion of the sort proposed. Further, Watercress of Hawaii would not lease land, subject its shareholders to the costs of obtaining the necessary permits, and then proceed with the additional costs of site development, were there any considerable doubt as to the feasibility of the project. Although feasibility studies (primarily of an economic nature) have been prepared for proprietary distribution, I fail to see any environmental purpose achieved by incorporating these in the EIS.

Although the requirements for watercress are not addressed in a section labeled "requirements for watercress culture", these requirements are alluded to at various places in the text where they would seem pertinent (ref paragraphs A.1.2, B.1.2, B.2.2, B.3.2).

Watercress does require low salinity water. As indicated in the EIS, recycling of a portion of the spring water from the major (eastern) springs is required to reduce the salinity of the source water obtained from some of the minor (western) springs. I would suspect that anything that added salt to the water would reduce the economic viability of the project whether foliar burn occurred or not. The relationship between your request to in-

January 22, 1986

-2-

Mr. John P. Whalen

Environmental Setting

The references cited in the geology section need to be included in the bibliography. A pertinent paper by Ruhe et. al, 1965 deals with the specific geomorphic surface of the Pearl Harbor clays and estimates them to be less than 640 years of age. This should be cited in the Final EIS. Lum and Stearns paper on the eustatic history of Waimanalo is related to the project setting and should also be added. In particular Figure 2 of this report is valuable.

Since watercress is most often consumed as a raw product, the potential pollution problems discussed in the WRRRC review of the preparation notice, including the proximity to the pig farms, need to be addressed.

Archaeology

The proposed project area is known to contain potentially significant subsurface archaeological data. Due to the nature of the project these remains may be significantly impacted by the filling in and dredging of the wetland. It is our understanding that the area contains significant inland fish ponds which should be mapped and salvaged, as appropriate, following a sub-surface survey.

Impact on Wildlife

In general, it would appear that the project may supplement the wildlife refuges established for wetland birds in the Pearl Harbor area. In particular, the night crown heron and cattle egret may benefit the most. The EIS sites an inventory of bird life in the Pearl Harbor area conducted in 1977. Are there more recent inventories for this area available.

We appreciate the opportunity to comment on this Draft EIS.

Yours truly,

Jacquelin N. Miller
Acting Associate Director

Attachments

- cc: OEQC
- ↳ Eric Guinther
- Patrick Takahashi,
- Acting Director, Environmental Center
- Bion Griffin
- Paul Ekern
- James Parrish
- Martha Diaz
- Walongton Yee

honorable

2001/86-525
GEORGE S. ARYONS
CITY ENGINEER
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DEPUTY DIRECTOR
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DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

HONOLULU BUILDING, 250 SOUTH KING ST. HONOLULU, HAWAII, 96820-4000
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Ref. No. P-3385

January 23, 1986

DIRECTIONS
BUSINESS AND INDUSTRY DEVELOPMENT DIVISION
ENERGY DIVISION
FOREIGN-INVESTMENT DIVISION
LAND-USE DIVISION
LAND-PLANNING DIVISION
RESEARCH AND ECONOMIC ANALYSIS DIVISION
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1986 JAN 1
DEPT. OF LAND UTILIZATION
& COUNTY OF HONOLULU

Environmental Setting

We will look at the references suggested. The watercress growers are aware of the potential for conflict where watercress plots occur in proximity to pig farms. This subject will be discussed and resolved in the EIS.

Archaeology

The project site is not known "to contain potentially significant subsurface archaeological data." The consulting archaeologists' report (in the draft EIS) comes to this conclusion as does the State archaeologist (DLNR ltr dtd 10/10/85). We would not concur with the statement that the area contains a "significant" inland fish pond. Maps depicting a limited dredging in this area (included in the archaeological report), bearing in mind unknown sites would be undertaken with caution. We are uncertain that hitherto unknown features might be uncovered. We are uncertain how one would "salvage" a fishpond and maintain project viability. Does salvaging entail renovating and maintaining part of the site as a fishpond?

Impact on Wildlife

We do not understand the statement that "night crown heron (sic) and cattle egret may benefit most." The black-crowned night heron (a fish eater) and the cattle egret (an insectivore which feeds mostly in areas where insects are plentiful such as cow pastures and sanitary landfills) would not be attracted to this area for any reasons peculiar to the proposed land alterations.

Inventories of birds are conducted frequently in the Pearl Harbor area (at least annually by the Audubon Society). The project is anticipated to have a positive impact on wetland species and therefore area wide counts would be on only incidental interest.

Thank you for your comments.

Sincerely,
Eric B. Guinther
Eric B. Guinther

The Honorable John P. Whalen
Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96815

Dear Mr. Whalen:

Subject: Draft EIS for Proposed Watercress Development Project at Waiawa, Oahu

We have reviewed the draft EIS and have no comments at this time.

Thank you for the opportunity to review the document.

Very truly yours,
Montgomery F. Taniwail
Agent M. Keith

cc: Mr. Eric Guinther
AECOS, Inc.