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LLOYD P.C.W. LEE, P.E.
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DAVID WISSMAR, P.E.
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BRIAN HASHIRO, P.E.
Highways Division

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
AND WASTE MANAGEMENT
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

January 21, 1997

Mr. Gary Gill, Director
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
220 South King Street, Suite 400
Honolulu, Hawaii 96813

Dear Mr. Gill:

SUBJECT: OHIAPILO WETLAND ENHANCEMENT
KALAMAULA, MOLOKAI
TMK 5-2-11:POR.1 AND POR.33

In accordance with the requirements of Chapter 343, Hawaii Revised Statutes, and Chapter 200 of Title 11, Administrative Rules of the State Department of Health, a Final Environmental Assessment has been prepared for the proposed project.

The County of Maui, Department of Public Works and Waste Management has reviewed the comments received during the 30-day public comment period and believes that there will be no significant impact as a result of the project. Accordingly, we are issuing a negative declaration.

Enclosed are one (1) copy of the OEQC Bulletin Publication Form and four (4) copies of the Final Environmental Assessment. We respectfully request that notice of the Final Environmental Assessment be published in the next edition of The Environmental Notice.

Sincerely,

Charles Jencks
Director of Public Works &
Waste Management

CJ:to
Enclosures
b&c\ohia\garyltr.oeq

1997-02-08-MO-FEA-Ohiapilo Wetland Enhancement

Final Environmental Assessment

Ohiapilo Wetland Enhancement

Prepared for

County of Maui,
Department of Public Works
and Waste Management

January 1997

MUNEKIYO & ARAKAWA, INC.

Final
Environmental Assessment

Ohiapilo Wetland Enhancement

Prepared for

County of Maui,
Department of Public Works
and Waste Management

January 1997

MUNEKIYO & ARAKAWA, INC.

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Preface

The County of Maui, Department of Public Works and Waste Management, proposes to enhance approximately 25.4 acres of the Ohiapilo Pond, located approximately two (2) miles west of Kaunakakai Town. The enhancement of Ohiapilo Pond is part of a mitigation plan for the encroachment of approximately 6.55 acres of wetlands at the Kalamaula Landfill site. The Kalamaula Landfill stopped receiving wastes on October 7, 1993. The engineering closure of the facility was completed on August 14, 1994.

Pursuant to Chapter 343, Hawaii Revised Statutes, and Chapter 200, of Title 11, Administrative Rules, Environmental Impact Statement Rules, this Final Environmental Assessment documents the project's technical characteristics and environmental impacts, and advances findings and conclusions relative to the significance of the project.

Chapter I

Introduction

I. INTRODUCTION

A. PROPERTY LOCATION, EXISTING USE, AND LAND OWNERSHIP

The applicant, the County of Maui, Department of Public Works and Waste Management, is proposing to enhance approximately 25.4 acres of Ohiapilo Pond on the Island of Molokai. Identified as TMK 5-2-11: portion 1 and portion 33, the enhancement site is located approximately two (2) miles west of Kaunakakai. See Figure 1. The enhancement of Ohiapilo Pond addresses the unauthorized encroachment of approximately 6.55 acres of wetland at the County's Kalamaula Landfill. (The Kalamaula Landfill stopped receiving refuse on October 7, 1993. The engineering closure of the facility was completed on August 14, 1994.) This mitigation action is proposed pursuant to an Administrative Order on Consent which was executed by the County of Maui and the U.S. Environmental Protection Agency on June 17, 1994.

The enhancement site is part of the larger 60-acre Ohiapilo Wetland site. Through the mitigation action, approximately 25.4 acres of the southern portion of Ohiapilo Pond and its surrounding areas will be enhanced such that the endangered wildlife and plant life of the area will benefit. The site will be excavated and unwanted vegetation removed to create a deeper wetland habitat. This will lengthen the inundation duration and increase the area in which open-water conditions exist. A Draft Wetlands Enhancement Plan, prepared by the County of Maui (Brown and Caldwell, 1996), discloses the technical details of the enhancement program. See Appendix A.

To the south, southeast and west, in the vicinity of the project site, lands consist of swampy marshlands. These marshlands are comprised of mangrove and other related wetland vegetation. Located to the north and

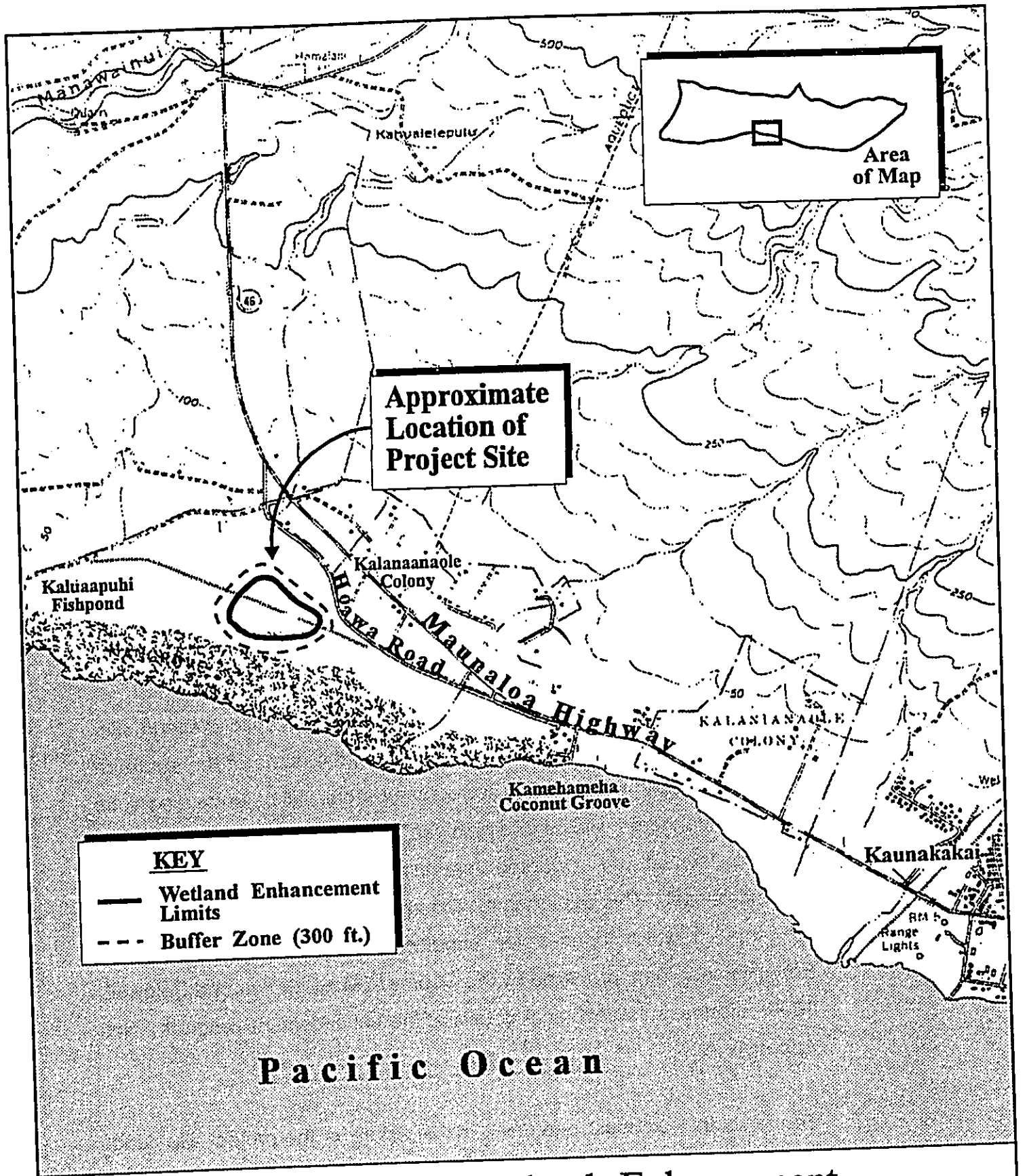


Figure 1 Ohiapilo Wetland Enhancement
Regional Location Map

Prepared for: County of Maui, Dept. of Public Works and Waste Management

east of the project site, lands are vacant and undeveloped. The rural residential Kalanianaole Colony is located further east of the project site, across Maunaloa Highway.

The subject property is owned by the State of Hawaii, Department of Hawaiian Home Lands (DHHL). The DHHL has granted a license to the County of Maui for use of the subject parcel for wetland enhancement purposes.

B. ***PROPOSED ACTION***

The proposed enhancement of approximately 25.4 acres of Ohiapilo Pond will serve as mitigation for the County's unauthorized encroachment of approximately 6.55 acres of wetland areas surrounding the Kalamaula Landfill site. Primary to the restoration of the Ohiapilo wetland area is the removal of unwanted vegetation. Invasive species, such as pickleweed, Red Mangrove, and Indian Fleabane, have reduced the available open-water areas, which serve as a habitat for native waterbirds. Second, excavation to the groundwater table will be implemented at selected areas to provide additional open mudflat areas which will establish varying depths of water conditions. See Appendix B (Proposed Mitigation Design).

To ensure the protection of the wetland plants and wildlife, a moat and predator-proof fence will be constructed along the perimeter of the site. The proposed fenced area will be set off of the main pond by an approximate 50-foot buffer, thus allowing for nesting along the periphery of the open-water area. The 25.4-acre wetland will be protected by a 300-foot wide buffer zone.

In addition to the foregoing, accessory improvements will be provided, including a temporary access road to facilitate debris removal and excavation work, and maintenance pathways and observation areas to facilitate the long-term management of the enhanced wetland.

C. ***CONSTRUCTION COSTS AND IMPLEMENTATION TIMELINE***

Based on approval of all applicable permits, construction is anticipated during July 1997 to November 1997, during the drier portions of the year.

Chapter II

Description of the Existing Environment

II. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. PHYSICAL ENVIRONMENT

1. Surrounding Land Uses

With a land area of approximately 261 square miles, the Island of Molokai is one (1) of three (3) islands which comprise the County of Maui. The proposed enhancement site is located on the south-central portion of the Island, approximately two (2) miles west of Kaunakakai.

Located south of Maunaloa Highway, the subject property falls within the rural Kalamaula region of the Island. The areas to the north of the site are primarily agricultural lands, used for grazing and other agricultural operations. The areas to the south, southeast, and west are predominantly wetland areas which comprise the 60-acre Ohiapilo Wetland. Undeveloped, vacant lands encompass the area across Hoawa Road, to the east along with the Kalamaula Landfill site. Northeast of the pond site, across Maunaloa Highway, lies the rural residential area of Kalanianaole Colony.

2. Climate

Hawaii's tropical location accounts for generally uniform weather conditions throughout the year. Northeasterly trade winds provide for high rainfall on the Island's windward and mauka (mountain) areas. Average temperatures for the Island range from the low 70's with highs in the low 90's (DBEDT, Data Book, June 1994).

Although the enhancement site is located on the drier leeward coast of Molokai, the project site and surrounding lowlands encounter flooding conditions during the winter months of

December through April. Average annual rainfall is approximately twelve (12) inches (Brown & Caldwell, January 1995). During the dry period, August to October, the project site dries through evapotranspiration and subsiding groundwater.

3. ***Topography and Soil Characteristics***

Located at elevations ranging from 0.2 to 2.8 feet above mean sea level, the project site is presently characterized as a degraded wetland area.

Underlying the project site and surrounding areas are soils of the Jaucas-Mala-Pulehu association. See Figure 2. Soils of the Jaucas-Mala-Pulehu association are deep, nearly level and gently sloping, excessively drained and well-drained soils with coarse-textured to fine-textured underlying materials, found on the coastal plains of Molokai and Lanai Islands. Soil types specific to the project site are Kealia silt loam (KMW) and Marsh (MZ). See Figure 3.

Kealia silt loam (KMW) is a poorly drained soil containing high levels of salt. Ponding often occurs, with salt crystals accumulating on the soil surface upon drying. The soil has a brackish water table which fluctuates with the tides. Permeability is moderately rapid. Runoff is slow to very slow. The hazard of water erosion is no more than slight, but the hazard of wind erosion is severe when the soil is dry and the surface layer becomes loose and fluffy. Marsh (MZ) lands consist of wet, periodically flooded areas covered dominantly with grasses and bulrushes or other herbaceous plants. It occurs on small, lowlying areas along coastal plains, seasonally or dominantly covered in water.

LEGEND

① Jaucas-Mala-Pulehu association

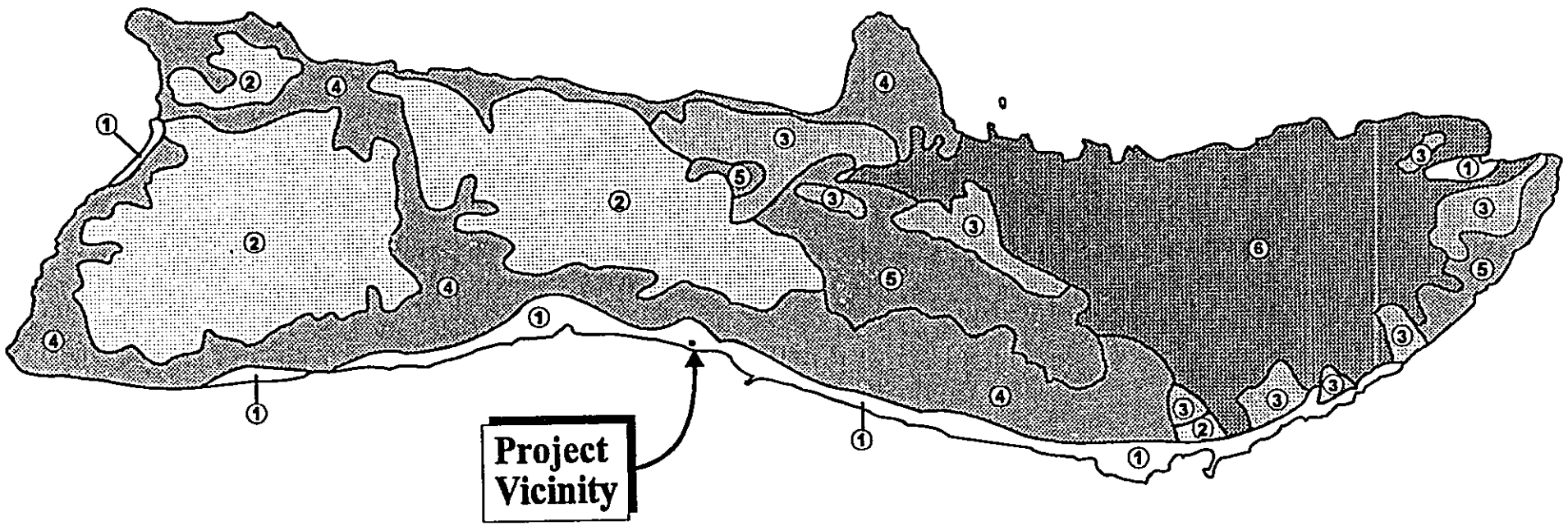
② Molokai-Lahaina association

③ Kahanui-Kalae-Kanepuu association

④ Very Stony Land-Rock Land association

⑤ Rough Broken Land-Oli association

⑥ Rough Mountainous Land-Amalu-Olokui association



Map Source: USDA Soil Conservation Service

Figure 2

Ohiapilo Wetland Enhancement
Soil Association Map

MUNEKIYO & ARAKAWA, INC.

Prepared for: County of Maui, Dept. of Public Works and Waste Management

NOT TO SCALE

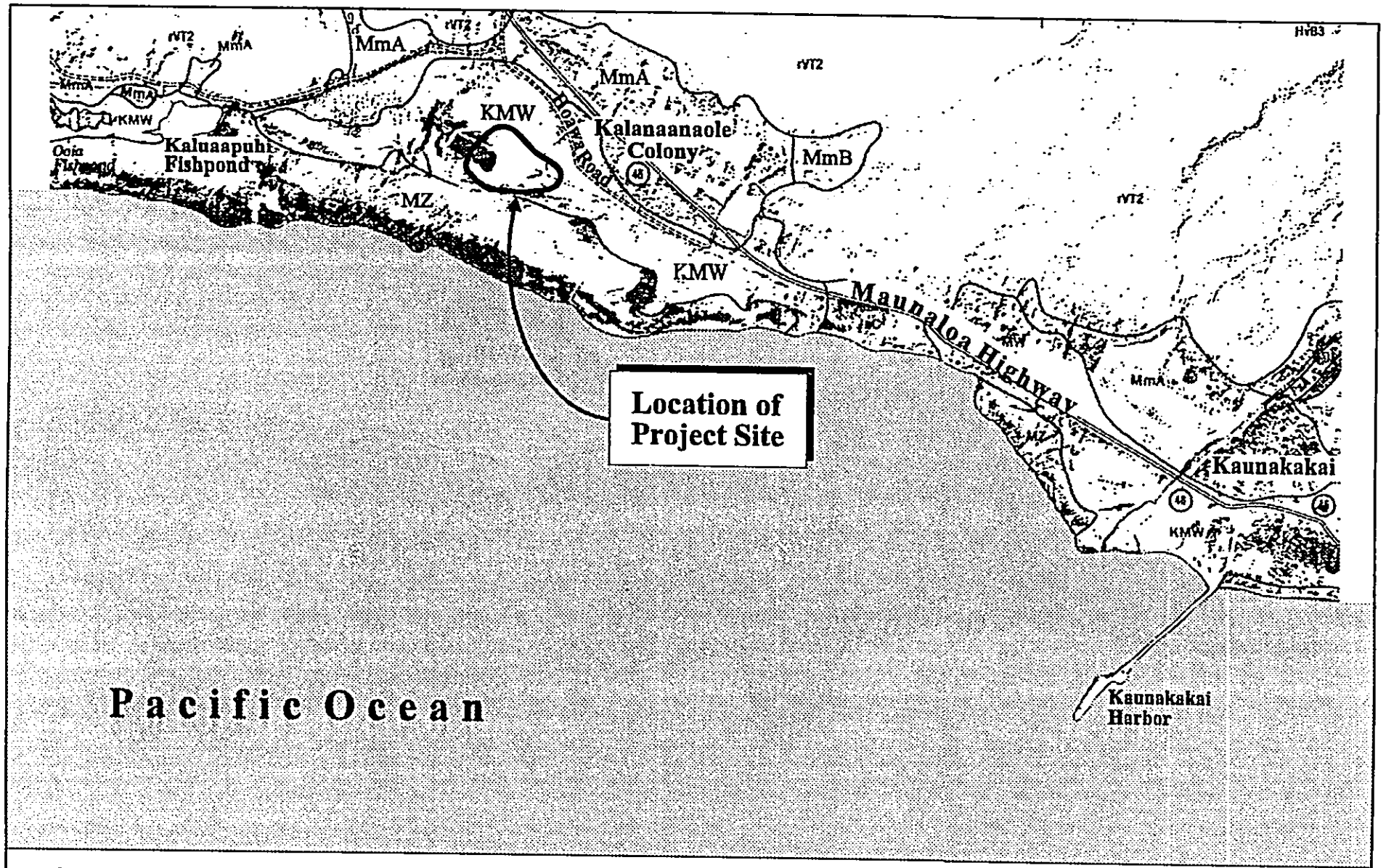


Figure 3

Ohiapilo Wetland Enhancement
Soil Classifications Map

Prepared for: County of Maui, Dept. of Public Works and Waste Management

1000 0 2000 4000 Feet

MUNEKIYO & ARAKAWA, INC.

4. ***Agricultural Resources***

As designated by the University of Hawaii, Land Study Bureau's Detailed Land Classification map, the area of the Ohiapilo Wetland is classified as "E28". An over-all rating of the productivity of the region establishes a value system on a scale from "A" to "E", "A" representing the highest productivity rating and "E" the lowest. A land type is representative of a group of lands possessing characteristics such as soil properties, topography, and climate. Land type "28" is typically used for grazing purposes or is unused.

The State of Hawaii, Department of Agriculture, designates Agricultural Lands of Importance in the State of Hawaii (ALISH) as "Prime", "Unique" and "Other Important" lands. According to the ALISH map, the project site in not classified. See Figure 4. The project site and surrounding area have not been cultivated or utilized for agricultural purposes.

5. ***Flood and Tsunami Hazards***

The Ohiapilo Wetland area is located within Zone C as indicated by the Flood Insurance Rate Map for the County of Maui. See Figure 5. This indicates an area of minimal flooding. However, the Ohiapilo Wetland is known to be a ponding area and serves as a retention site for the Kalamaula Watershed. Typically, the pond site is flooded during the winter months, but dry during the summer.

The goal of the enhancement is to lengthen the time in which open water and moist soil conditions remain. The project has been designed to create a larger, open wetland area making it more

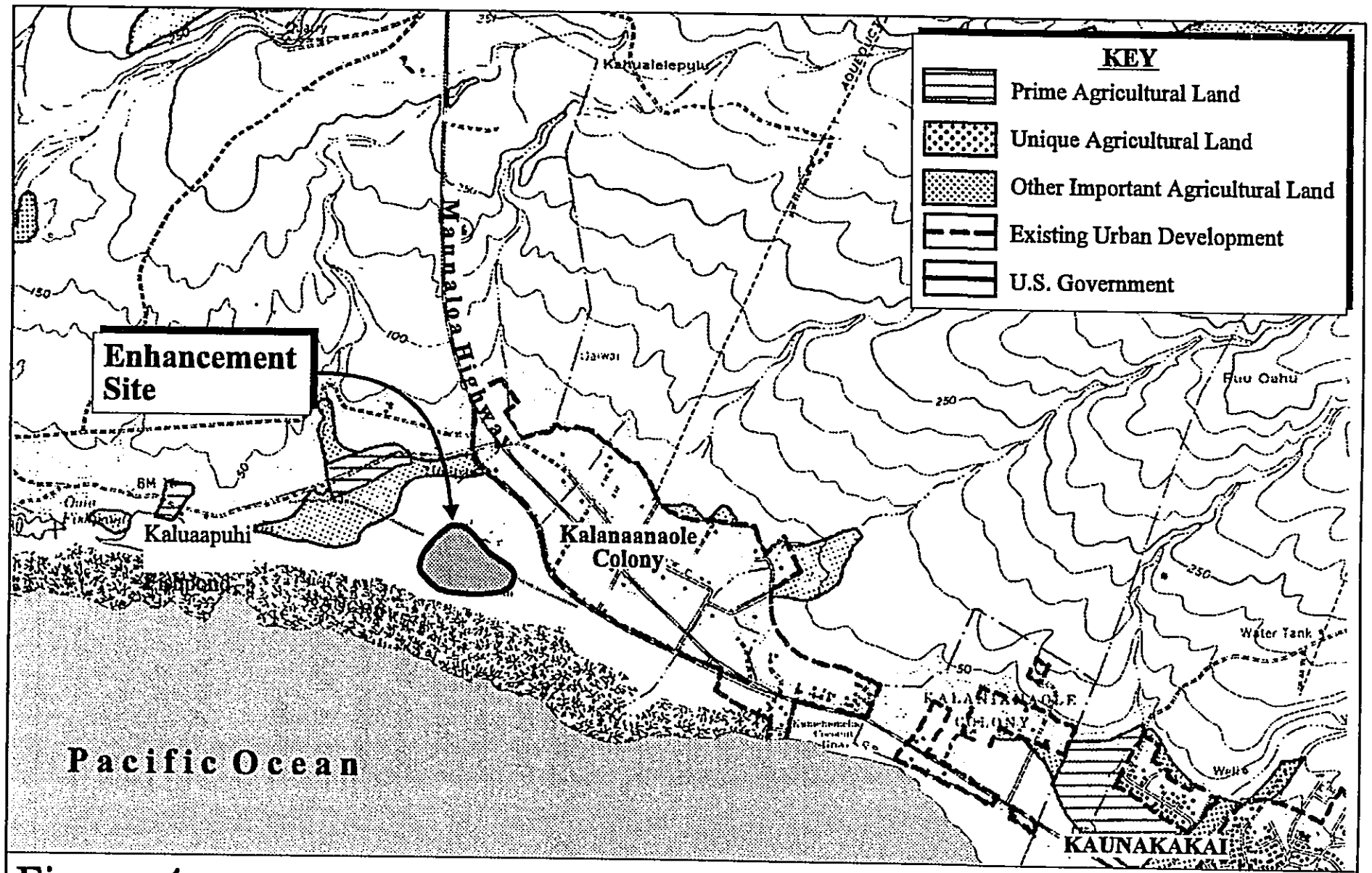


Figure 4

Ohiapilo Wetland Enhancement

Agricultural Land of Importance to the State of Hawaii

Prepared for: County of Maui, Dept. of Public Works and Waste Management

MUNEKIYO & ARAKAWA, INC.

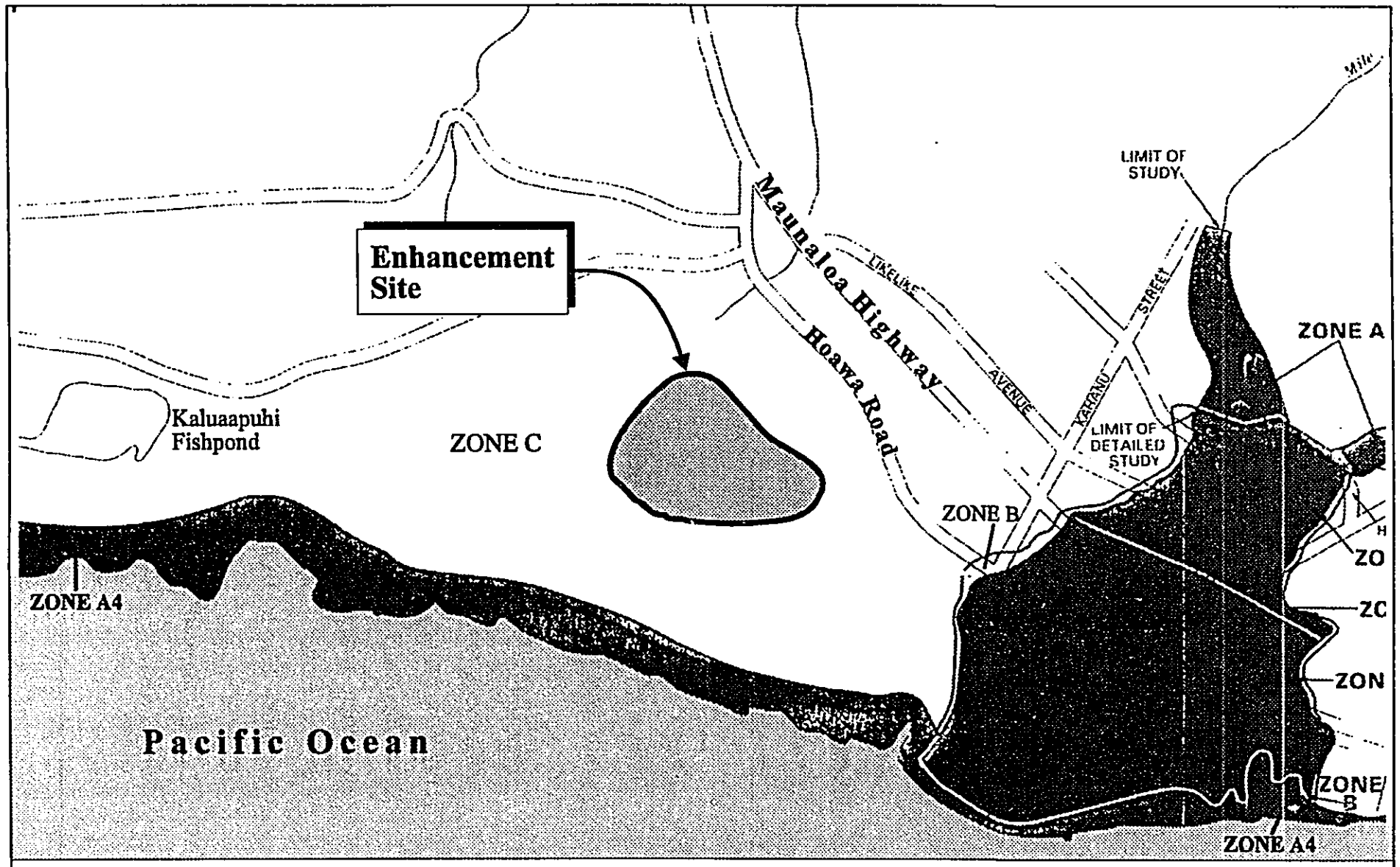


Figure 5

Ohiapilo Wetland Enhancement

Flood Insurance Rate Map

0 500 1000 2000 Feet

MUNEKIYO & ARAKAWA, INC.

Prepared for: County of Maui, Dept. of Public Works and Waste Management

attractive for waterbird use.

6. ***Flora***

The project site can be classified as a low marsh habitat. Typical of coastal marshlands, the project site is characterized by herbaceous vegetation, dominated by species of sedges, grasses, and succulents.

Vegetation communities at the site include kiawe-batis, mangrove, pluchea-batis, and *Batis* flats. While the majority of the enhancement site is a broad mudflat covered by *Batis*, a number of other species have been identified at the site, including sedge, English spike rush, makai, akiaki, duckweed, widgeon grass, pickleweed, Indian fleabane, red mangrove, and water hysop (Brown and Caldwell, 1995).

7. ***Fauna***

Typical of lowlying coastal wetlands, the project site is a habitat for many types of waterbirds. The resident waterbirds in the area include the Cattle Egret (*Bubulcus ibis*) and the Black-crowned Night-Heron (*Nycticorax nycticorax*). The night-heron is a common indigenous resident, while the Cattle egret is a common introduced resident. There are also many migratory and wintering shorebirds and waterfowl utilizing the pond site. The four (4) most common wintering avifauna of Hawaii can be found at Ohiapilo: the Pacific Golden Plover (*Pluvialis fulva*), Wandering Tattler (*Heteroscelus incanus*), Ruddy Turnstone (*Arenaria interpres*), and Sanderling (*Calidris alba*). Waterfowl documented at the site by FWS and Ducks Unlimited, Inc. include the Northern shoveler, American widgeon and northern pintail (*Anas americana*).

The endangered Hawaiian Stilt has been observed at the site. The Stilt frequent the shallow basins of the project site and it is expected that the proposed project will provide this species with a suitable nesting and breeding habitat. Another endangered and native waterbird known to frequent the lowlands of Molokai is the Hawaiian Coot. Coots have been observed at deeper ponds nearby, such as the Ooia and Kaluaapuhi Ponds. It is thought that the enhancement of the Ohiapilo Wetland area would also provide a habitat suitable for reintroduction of the endangered Hawaiian Moorhen.

Common alien avifauna typical of Molokai's lowland habitats were also identified on the site. These include species such as the Common Myna, White-eye, Northern and Red-crested Cardinals, House Finch, and House Sparrow.

Mammals which prey on the waterbirds, eggs and young include mongoose and rodents. Feral cats and dogs may also exist on the site. Preventative measures will be taken to ensure that the waterbirds utilizing the project site are protected from these predators.

8. ***Archaeological Resources***

According to core samples taken and analyzed by BioSystems Analysis, Inc. in January 1993, the project site did not yield any significant cultural materials. However, at the time of the survey, the pond was covered in water ranging from 0.5 to 3 feet deep. Therefore, only limited subsurface coring was conducted.

Subsequently, in May 1996, Garcia and Associates (GANDA) conducted data recovery procedures at the site involving core samples. Currently, the core samples are undergoing analysis and radiocarbon assay. In addition, data recovery fieldwork (trench through the makai sand dike) have been conducted to determine the origin of the fishpond wall located within the subject property. See Appendix C.

9. *Air Quality*

Located on the undeveloped portion of Molokai's southern coast, the project site is relatively isolated. Intermittent disturbances to the ambient air quality may be attributed to vehicular emissions. Heavy machinery used on the agricultural lands located to the north may create temporary dust emissions. The particulates generated are quickly dispersed by prevailing wind conditions.

10. *Noise*

The project site is primarily surrounded by coastal marsh lands. Accordingly, noise levels in the area, due to non-wildlife activities, are minimal. Similar to air quality disturbances, intermittent noise disturbances may occur due to heavy machinery or automobiles on roads near the site.

11. *Scenic and Open Space Resources*

Like much of Molokai's southwestern coast, the project site is located in a coastal open space area. While the project site is not considered to be within a scenic view corridor, the open coastal lowlands of Molokai's south shore is a distinguishing characteristic of the region.

B. SOCIO-ECONOMIC ENVIRONMENT

1. Population

The island of Molokai has exhibited minimal population growth over the past decade. The population of Molokai was estimated at 6,645 in 1987, a 12.6 percent increase over the 1980 estimate of 5,900. Population projections for the years 2000 and 2010 are 7,068 and 7,264, respectively (Community Resources, Inc., January 1994).

2. Economy

Molokai's economic character encompasses both diversified agriculture and the visitor industry. The island is a significant producer of watermelons, sweet potatoes, sweet peppers, and snap beans. In addition, coffee production is firmly established at Coffees of Hawaii's Hoolehua plantation. Agricultural activities also include cattle ranching and subsistence and commercial fishing.

The visitor industry is served by approximately 548 visitor units on the island (Munekiyo & Arakawa, Inc., November 1995). Recent visitor counts reflect annual visitor totals of approximately 100,000.

C. PUBLIC SERVICES

1. Recreational Facilities

The island of Molokai offers a wide range of recreational opportunities. Outdoor activities include bicycling, boating, camping, diving, fishing, golfing, hiking, horseback riding, hunting, surfing, swimming, tennis and windsurfing.

In light of existing use and vegetative conditions, the project site and immediate surrounding environs are not considered to have

significant recreational value.

2. ***Police and Fire Protection***

The island of Molokai is served by the Maui County Police Department. The Molokai station, located in the Mitchell Pauole Center in Kaunakakai, is staffed by 26 administrative, professional and support personnel (telephone conversation with Maui Police Department employee, Mae Kitaoka, April 1996).

Fire prevention, protection, and suppression services are provided by the Maui County Fire Department. The Fire Department maintains stations in Hoolehua, Kaunakakai and Pukoo. Both Hoolehua and Kaunakakai Stations are staffed by twelve (12) firemen and three (3) officers. The Pukoo Station is staffed with six (6) employees (telephone conversation with Maui Fire Department employee, Cindy Kagoshima, April 1996).

3. ***Solid Waste***

Solid waste for the entire island is collected and disposed of at the County Integrated Solid Waste Facility in Naiwa. The Naiwa site was opened following the closing of the Kalamaula site in 1993. The new landfill has been designed to cover an approximate area of twelve (12) acres and have a maximum depth of 70 feet. It has a projected life of 30 years and a capacity of 592,000 cubic yards.

4. ***Medical Services***

Molokai General Hospital, which is owned by Queen's Health Systems on Oahu, is the only major medical facility on the island. Located in Kaunakakai, the 30-bed facility provides long-term, acute and obstetrics care services. The hospital is staffed by two

(2) resident physicians, twelve (12) to fifteen (15) registered nurses (depending on staffing requirements), and two (2) licensed practical nurses. Twelve (12) specialty physicians from Oahu visit Molokai on a monthly basis (telephone conversation with Agatha Fontes, Molokai General Hospital, May 1995).

Other medical facilities include the Molokai Family Health Center in Kaunakakai, a clinic operated by four (4) general practice physicians. In addition, the Women's Health Center, located at the Hospital, provides mid-wife and maternity services for local residents.

5. *Schools*

There are five (5) public schools on Molokai. With the exception of Molokai High and Intermediate School, the remaining public schools provide elementary education for children from Kindergarten through Grade 6. Of all the schools, Molokai High and Intermediate School, servicing Grades 7-12, has the largest student enrollment (868) and total faculty (74) (telephone conversation with Department of Education employee, Joyce Ogawa, April 1996).

D. *INFRASTRUCTURE*

1. *Roadways*

The nearest primary roadway to the project site is the Maunaloa Highway. Maunaloa Highway is a two-lane State highway with a posted speed limit of 45 miles per hour.

While the enhancement site does not directly abut any improved roadway, it can be accessed via Hoawa Road, a two-way, two-lane

paved road which is located approximately 100 feet to the east. Construction access will be provided via a temporary access road off of Hoawa Road.

2. ***Water and Wastewater Systems***

The project site is not served by domestic water and wastewater systems.

3. ***Drainage***

The proposed enhancement site is part of the 311-acre Kalamaula Watershed. Peak discharge calculations indicate a low flow rate, even at peak flows (Brown and Caldwell, 1995). The area retains the run-off from the Kalamaula Watershed in shallow basins, thus causing open-water conditions. Typically, this occurs during the winter months, the period of heavier rains.

There are no improved drainage works in the vicinity of the enhancement site.

4. ***Electrical and Telephone Systems***

Electrical service for the island of Molokai is provided by the Molokai Electric Company, a subsidiary of Maui Electric Company, from their power generation plant at Palaau. Telephone service is supplied by GTE Hawaiian Telephone. There is no electrical or telephone service to the site.

Chapter III

Potential Impacts and Mitigation Measures

III. POTENTIAL IMPACTS AND MITIGATION MEASURES

A. IMPACTS TO THE PHYSICAL ENVIRONMENT

1. Surrounding Land Use

The enhancement site is located in the midst of a coastal wetland environment. Beyond the coastal wetland limits to the north of the site (across Hoawa Road and beyond) are agricultural lands, while the Kalamaula Landfill site is situated to the east. The proposed enhancement is compatible with the surrounding environs and is considered to be a beneficial improvement to the area's natural environment.

2. Topography and Landform

The proposed enhancement at Ohiapilo Pond will involve the removal of vegetation and subsequent lowering of ground-level within certain areas of the project site. The objective of this project is to lengthen the duration of inundation and moist-soil conditions of the Ohiapilo Pond site, in order to create a favorable waterbird habitat. Although the ground-level is to be physically lowered to provide additional open areas, the overall character of the coastal marshland environs will not change.

3. Agricultural Resources

The project site is isolated from areas currently utilized for agricultural purposes. The site itself is not feasible for agricultural development. The proposed project will not impact the agricultural value of the surrounding lands, nor affect their productivity.

4. Flood and Tsunami Hazards

The project site is located within Zone C, an area of minimal flooding. However, the site is known to be an area which retains

stormwater flows from the Kalamaula Watershed. This runoff is stored in shallow basins, creating open-water conditions vital to the survival of certain waterbirds. The project site will establish opportunities to better manage inundation durations and conditions.

5. ***Flora and Fauna***

Over the years, the Ohiapilo Wetland area has lost the characteristics which attract migratory, wintering, and native and endangered waterbirds. The proposed project is intended to optimize the use of the Ohiapilo Wetland area, creating a habitat suitable for the reintroduction and survival of native and endangered waterbirds. It is expected that migratory and wintering species of waterbirds will also utilize the Ohiapilo Pond site once the enhancement has been completed.

In an effort to protect the waterbirds and their young, predatory wildlife will have to be removed and monitored during and after the enhancement action. The project is not expected to impact the common avifauna of the area.

The invasive vegetation of the area will be cleared during the excavation of the site, and allowed to grow back in certain areas to provide protective nesting areas for the endangered native birds. The mangrove and *Batis* will be managed after completion of the project to maintain optimal wetland conditions.

The restoration of the Ohiapilo Wetland would create a deeper and larger open-water habitat, beneficial to all types of shorebirds and waterfowl presently found on the site. It is expected that the improved habitat will provide optimal foraging and nesting

conditions for these and other species of waterbird.

6. ***Archaeological Resources***

The project site has been investigated to determine the historical and cultural value of the site. No evidence was found supporting the use of the project site for cultural purposes. However, the potential for submerged and buried cultural materials at the site is acknowledged. In this regard, data recovery procedures, involving 13 cores, have been completed and are currently undergoing analysis. *Refer to Appendix C. The data recovery procedures*, however, will not affect the use or design of the enhancement project.

In addition, data recovery fieldwork, included trench and shovel probes, were conducted at and around the original fishpond wall. Currently, the core samples are undergoing analysis and additional samples have been sent for radiocarbon assay.

Accordingly, correspondence with Department of Land and Natural Resources, State Historic Preservation Division (SHPD) confirmed that data recovery fieldwork has been successfully executed and that an acceptable monitoring plan (scope) to document the pond wall's location must be submitted to SHPD for review and approval prior to the start of the construction phase. Refer to Appendix C.

7. ***Air Quality and Noise***

Air quality impacts attributed to the project will include dust generated by short-term construction-related activities. Site work, such as clearing, grubbing and grading, for example, will generate air-borne particulates. Dust control measures, such as regular

watering and sprinkling, will be implemented to minimize wind-blown emissions.

Ambient noise conditions will also be temporarily impacted by construction activities. Heavy construction equipment, such as bulldozers, front-end loaders, and materials-carrying trucks and trailers, would be the dominant source of noise during the construction period. All construction activities are anticipated to be limited to daylight working hours.

Construction activities will occur from July 1 to November 1 of any given year. This is due to the flooding of the area and nesting attempts by the Hawaiian Stilt. This period may be extended only if a qualified biologist has determined that no Stilt nests are present.

On a long-term basis, the project is not expected to affect air quality and noise conditions. Periodic maintenance of the predator-proof fence and monitoring of the water in the area are the only disturbances anticipated.

8. ***Water Quality***

Water quality impacts anticipated during the vegetation removal and excavation phase are associated with the disturbance of sediment at the bottom of open-water areas within the site. The shallow basins are self-contained, however, and the sediment will re-settle following excavation. The disturbances to the project site area will not affect other bodies of water.

It is noted that the project site is anticipated to be dry or at its

lowest saturation point during the construction phase since construction activities will commence during the dry season.

9. ***Scenic and Open Space Resources***

The appearance of the site before and after the mitigation action will be similar, with the exception of the predator-protection fence and the vegetation removal. In this regard, the proposed enhancement action will not adversely affect the scenic character of the region.

B. *IMPACTS TO THE SOCIO-ECONOMIC ENVIRONMENT AND PUBLIC SERVICES*

1. ***Economy***

On a short-term basis, the project will support the local construction industry. Once completed, the project is not anticipated to have significant effects on Molokai's economy.

2. ***Public Services***

The proposed project is not expected to have any adverse impact on public services, including police and fire protection, education, recreational and medical services.

C. *IMPACTS TO THE INFRASTRUCTURE*

1. ***Roadways***

A temporary access road will be necessary for the excavation and removal of material from the project site. The temporary access road will extend from Hoawa Road, located northeast of the site. Upon completion of the restoration, all temporary haul road materials will be removed.

Once completed, the project site will not be a vehicular trip generator, and therefore will not affect operations on nearby roadways.

2. ***Water and Wastewater Systems***

The project site is not serviced by any domestic water and wastewater systems, and accordingly, will not impact these systems.

3. ***Drainage and Erosion***

The Kalamaula Watershed area, totalling 311 acres, drains into the project site. The proposed excavation of the site will improve retention capacity of the wetland area and provide for enhanced seasonal flooding. This result will provide the desired habitat conditions for area waterbirds. Beyond the limits of the enhancement site, drainage patterns will remain unaltered. Downstream and adjoining properties will, therefore, not be affected by the project.

4. ***Electrical and Telephone Services***

There are no electrical or telephone service requirements associated with the proposed action. These systems will not be affected by the project.

Chapter IV

Relationship to Governmental Plans, Policies and Controls

IV. RELATIONSHIP TO GOVERNMENTAL PLANS, POLICIES AND CONTROLS

A. STATE LAND USE DISTRICTS

Chapter 205, Hawaii Revised Statutes, relating to the Land Use Commission, establishes the four (4) major land use districts in which all lands in the State are placed. These districts are designated "Urban", "Rural", "Agricultural", and "Conservation". The project site falls within the State Agricultural District. The proposed enhancement action is deemed compatible with activities permitted within the Agricultural District. See Figure 6.

B. HAWAII STATE PLAN

The Hawaii State Planning Act (Chapter 226, Hawaii Revised Statutes) sets forth goals, objectives, policies, and priority guidelines to guide the long-range development of the State of Hawaii. The proposed enhancement project is in keeping with the following objectives and policies of the Hawaii State Plan.

Objectives and Policies for the Physical Environment-Land Based, Shoreline, and Marine Resources (Sec. 226-11)

Objective: Plan for effective protection of Hawaii's unique and fragile environmental resources.

Policies:

1. Ensure compatibility between land-based and water-based activities and natural resources and ecological systems;

2. Take into account the physical attributes of areas when planning and designing facilities;

3. Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaii; and

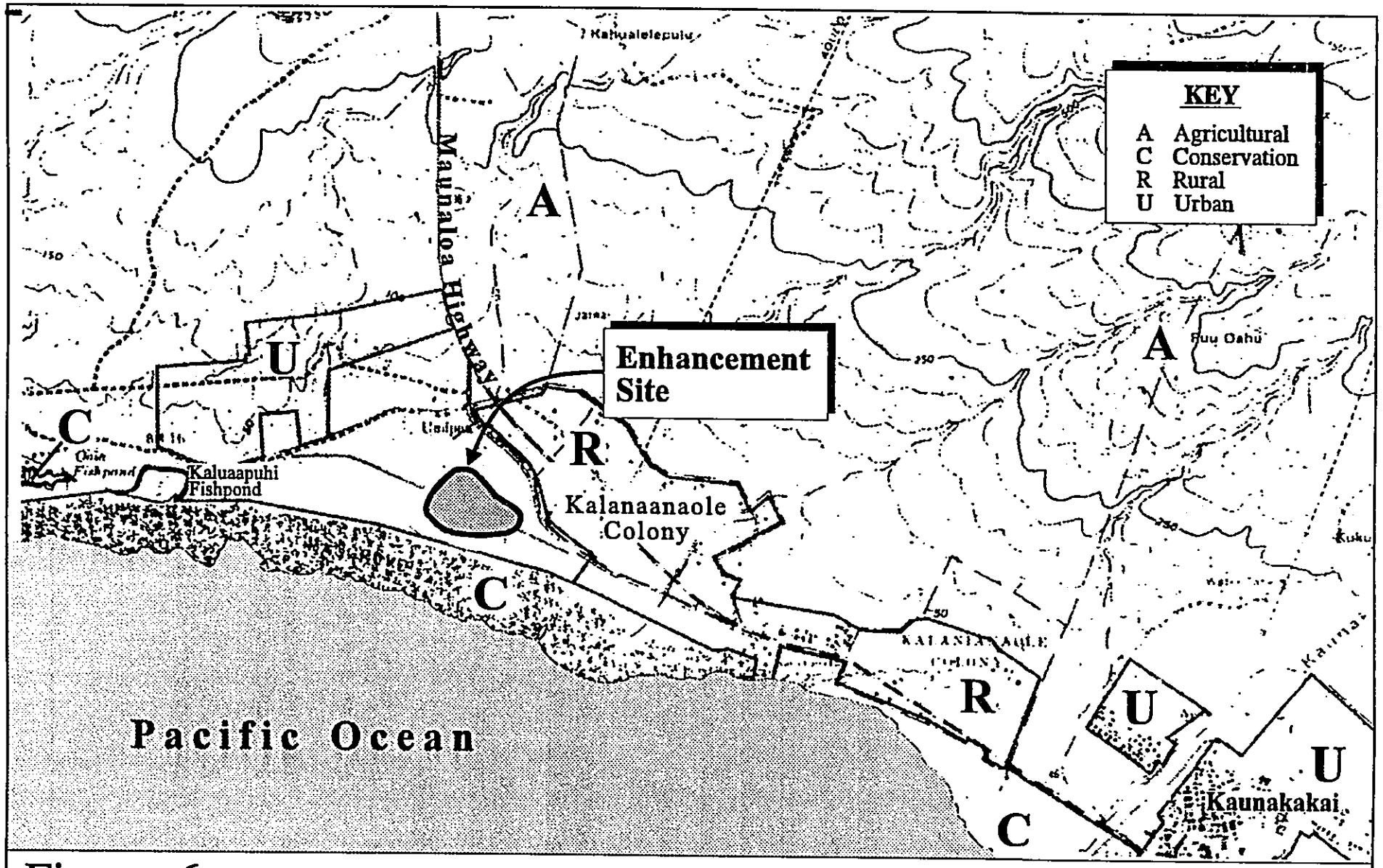


Figure 6

Ohiapilo Wetland Enhancement
State Land Use District Designations

Prepared for: County of Maui, Dept. of Public Works and Waste Management

0 1000 2000 4000 Feet

MUNEKIYO & ARAKAWA, INC.

4. Pursue compatible relationships among activities, facilities, and natural resources.

C. *MAUI COUNTY GENERAL PLAN*

The Maui County General Plan (1990 Update) sets forth broad objectives and policies to help guide the long-range development of the County. As stated in the Maui County Charter:

> "The purpose of the General Plan is to recognize and state the major problems and opportunities concerning the needs and the development of the County and the social, economic, and environmental effects of such development and set forth the desired sequence, patterns and characteristics of future development."

The proposed enhancement action advances the following General Plan objective and policies:

Objective: To preserve and protect the County's unique and fragile environmental resources.

Policies:

1. Support programs to reduce air, land, and water pollution; and

2. Support programs to protect rare and endangered species and programs which will enhance their habitat.

D. *MOLOKAI COMMUNITY PLAN*

The proposed project is located within the Molokai Community Plan region which is one (1) of nine (9) Community Plan regions established in the County of Maui. Planning for each region is guided by the respective Community Plans, which are designed to implement the Maui County General Plan. Each Community Plan contains recommendations and

standards which guide the sequencing, patterns and characteristics of future development in the region.

The project site is located within an area designated for Agricultural Use. See Figure 7. The project is an enhancement of the existing use and is not contrary to the provisions of the Community Plan.

E. ***SPECIAL MANAGEMENT AREA OBJECTIVES AND POLICIES***

Pursuant to Chapter 205A, Hawaii Revised Statutes, and the Rules and Regulations of the Planning Commission of the County of Maui, projects located within the Special Management Area (SMA) are evaluated with respect to SMA objectives, policies and guidelines. This section addresses the project's relationship to applicable coastal zone management considerations, as set forth in Chapter 205A and the Rules and Regulations of the Planning Commission.

1. ***Recreational Resources***

Objective: Provide coastal recreational resources accessible to the public.

Policies:

a. Improve coordination and funding of coastal recreation planning and management; and

b. Provide adequate, accessible and diverse recreational opportunities in the coastal zone management area by:

   i. Protecting coastal resources uniquely suited for recreation activities that cannot be provided in other areas;

   ii. Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites, fishponds, and sandy beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when

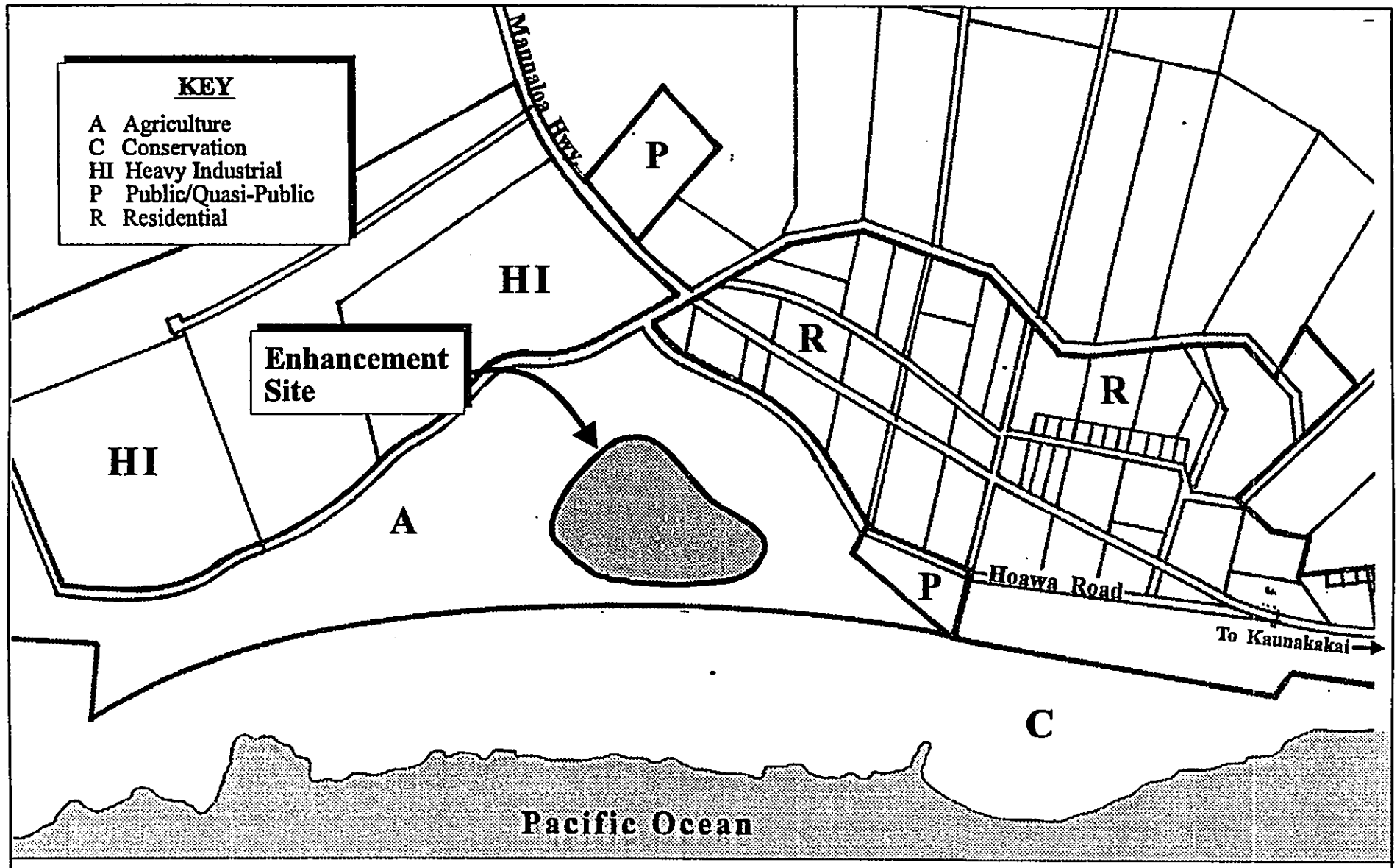


Figure 7

Ohiapilo Wetland Enhancement
Community Plan Land Use Designation

Prepared for: County of Maui, Dept. of Public Works and Waste Management

0 500 1000 2000 Feet

MUNEKIYO & ARAKAWA, INC.

replacement is not feasible or desirable;

iii. Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

iv. Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

v. Ensuring public recreational use of County, State and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

vi. Adopting water quality standards and regulating point and non-point sources of pollution to protect and where feasible, restore the recreational value of coastal waters; and

vii. Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commissions, and crediting such dedication against the requirements of Section 46-6 of the Hawaii Revised Statutes.

Response: The enhancement of Ohiapilo Pond and surrounding areas will not impact recreational facilities or activities. Upon the establishment of the enhanced wetland, recreational activities such as bird watching may increase.

2. ***Historical/Cultural Resources***

Objective: Protect, preserve and where desirable, restore those natural and man-made historic and pre-historic resources in the coastal zone management areas that are significant in Hawaiian and American culture.

Policies:

a. Identify and analyze significant archaeological resources;

b. Maximize information retention through preservation of remains and artifacts or salvage operations; and

c. Support State goals for protection, restoration, interpretation and display of historic resources.

Response: The State Historic Preservation Division (SHPD) has indicated that data recovery fieldwork has been successfully executed at the project site and that an archaeological monitoring plan must be submitted to SHPD for review and approval prior to the start of land altering activities.

3. ***Scenic and Open Space Resources***

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

Policies:

a. Identify valued scenic resources in the coastal zone management area;

b. Insure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural land forms and existing public views to and along the shoreline;

c. Preserve, maintain and, where desirable, improve and restore shoreline open space and scenic resources; and

d. Encourage those developments which are not coastal dependent to locate in inland areas.

Response: The project will not adversely impact the scenic value of the site. The removal of vegetation and the creation of open wetland areas will enhance the open space value of the site.

4. ***Coastal Ecosystems***

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

ecosystems.

Policies:

a. Improve the technical basis for natural resource management;

b. Preserve valuable coastal ecosystems of significant biological or economic importance;

c. Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

d. Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate state water quality standards.

Response: The enhancement of the Ohiapilo Pond site will create a habitat more suitable for native and endangered waterbirds, and wintering and migratory waterfowl. The project is not expected to negatively impact the surrounding areas.

5. Economic Uses

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

Policies:

a. Concentrate coastal dependent development in appropriate areas;

b. Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor facilities and energy-generating facilities are located, designed, and constructed to minimize adverse social, visual and environmental impacts in the coastal zone management area; and

c. Direct the location and expansion of coastal dependent

developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

i. Utilization of presently designated locations is not feasible; and
ii. Adverse environmental effects are minimized.

Response: The proposed action is dependent upon its coastal location. Short-term economic benefits will result from project construction. No adverse impacts to the local economy are anticipated from the project.

6. ***Coastal Hazards***

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

Policies:

a. Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and non-point source pollution hazards;

b. Control development in areas subject to storm wave, tsunami, flood, erosion, subsidence, and point and non-point source pollution hazards;

c. Ensure that developments comply with requirements of the Federal Flood Insurance Program;

d. Prevent coastal flooding from inland projects; and

e. Develop a coastal point and non-point source pollution control program.

Response: The proposed action will increase the retention capacity of the wetland enhancement area. From a watershed and local drainage area standpoint, the proposed action will not

adversely impact downstream or adjoining properties.

7. ***Managing Development***

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

Policies:

a. Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

b. Facilitate timely processing of applications for development permits and resolve overlapping of conflicting permit requirements; and

c. Communicate the potential short and long-term impact of proposed significant coastal developments early in their life-cycle and in terms understandable to the general public to facilitate public participation in the planning and review process.

Response: All aspects of development will be conducted in accordance with applicable Federal, State and County requirements. Opportunities for reviewing the proposed action are available through the early consultation, and public notification, review and comment processes.

8. ***Public Participation***

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

Policies:

a. Maintain a public advisory body to identify coastal management problems and to provide policy advise and assistance to the coastal zone management program;

b. Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal-related issues, developments, and government activities; and

c. Organize workshops, policy dialogues, and site-specific meditations to respond to coastal issues and conflicts.

Response: As previously noted, opportunities for agency and public review of the proposed action are provided through Federal and State notification, review, and comment processes, as well as the County Special Management Area permitting process.

9. Beach Protection

Objective: Protect beaches for public use and recreation.

Policies:

a. Locate new structures inland from the shoreline setback to conserve open space and to minimize loss of improvements due to erosion;

b. Prohibit construction of private erosion protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and water line activities; and

c. Minimize the construction of public erosion-protection structures seaward of the shoreline.

Response: The proposed action is not anticipated to interfere with existing recreational and shoreline activities.

F. U.S. DEPARTMENT OF THE ARMY PERMIT

The Department of Army (DA), Corps of Engineers has determined that a DA permit will be required for the enhancement of the Ohiapilo Wetland.

Accordingly, a DA permit application has been filed with the Corps of Engineers.

G. *SECTION 401 WATER QUALITY CERTIFICATION*

As required by Section 401 of the Clean Water Act, "Any applicant for a federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certification.... that any such discharge will comply with the applicable provisions.... of this Act." Inasmuch as a Corps of Engineers permit is required for the proposed improvements, a Section 401 Water Quality Certification is anticipated to be required. The Director of the State of Hawaii, Department of Health (DOH) is the designated issuing authority for the 401 Water Quality Certification.

H. *HAWAII COASTAL ZONE MANAGEMENT PROGRAM*

The Hawaii Coastal Zone Management Program (HCZMP), as formalized in Chapter 205A, Hawaii Revised Statutes, establishes objectives and policies for the preservation, protection, and restoration of natural resources of Hawaii's coastal zone areas. The objectives of the HCZMP are as follows:

1. Provide coastal recreational opportunities accessible to the public;

2. Protect, preserve, and where desirable, restore those natural and man-made historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture;

3. Protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources;

4. Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems;

5. Provide public or private facilities and improvement important to the state's economy in suitable locations;

6. Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, and subsidence;

7. Improve the development review process, communication, and public participation in the management of coastal resources and hazards;

8. Stimulate public awareness, education, and participation in coastal management; and

9. Protect beaches for public use and recreation.

In accordance with the HCZMP, applicants for DA permits are required to certify that the proposed activity complies with and will be conducted in a manner consistent with the State's approved CZM program. A CZM consistency approval has, therefore, been requested from the Office of Planning.

Chapter V

Summary of Unavoidable, Adverse Environmental Effects; Alternatives to the Proposed Action; and the Irreversible and Irretrievable Commitment of Resources

V. SUMMARY OF UNAVOIDABLE, ADVERSE ENVIRONMENTAL EFFECTS; ALTERNATIVES TO THE PROPOSED ACTION; AND THE IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

A. UNAVOIDABLE, ADVERSE ENVIRONMENTAL EFFECTS

In its present state, Ohiapilo Pond has lost much of its value as a habitat suitable for waterbird nesting and breeding. As a result of this project, several native and endangered waterbirds, as well as migratory and wintering shorebirds, will be able to utilize the project site for nesting, breeding and foraging. The effect of this project will be primarily beneficial, with losses occurring solely in the predator and invasive vegetation population of the area.

B. ALTERNATIVES TO THE PROPOSED ACTION

The proposed project is a result of the unauthorized filling of approximately 6.55 acres of wetland at the Kalamaula Landfill. As part of the mitigation process, representatives from the U.S. Fish and Wildlife Service (FWS) and the Environmental Protection Agency (EPA) were consulted in evaluating alternative sites that could meet the mitigation requirements for the encroachment which had occurred. Refer to Appendix A.

These sites included the Kaluaapuhi Fishpond, the Molokai Sea Farms, Iloli Mudflats, a site near the Kamehameha Coconut Grove and the Ohiapilo Pond. Based on investigative results, the Ohiapilo Pond was the preferred site of the County, FWS, and the EPA.

C. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The proposed action will require capital investment to complete construction of enhancement components. From a land use and

ecological systems standpoint, however, the enhancement action is viewed as a commitment to preserve and advance the natural resource value of the site and immediate surrounding environs.

Chapter VI

Findings and Conclusions

VI. FINDINGS AND CONCLUSIONS

The "Significance Criteria", Section 12 of Hawaii Administrative Rules Title 11, Chapter 200, "Environmental Impact Statement Rules", were reviewed and analyzed to determine whether the proposed project will have significant impacts to the environment. The following analysis is provided:

1. ***The proposed project does not involve an irrevocable commitment to loss or destruction of any natural or cultural resource***

   A portion of the Ohiapilo Pond will be selectively cleared and excavated to create a habitat suitable for endangered and native waterbirds, and migratory and wintering shorebirds. The proposed enhancement is not expected to create any adverse impacts to the lands surrounding the pond, nor change the over-all appearance of the site.

   The State Historic Preservation Division (SHPD) has indicated that data recovery fieldwork has been successfully executed at the project site and that an archaeological monitoring plan must be submitted to SHPD for review and approval prior to land altering activities.

2. ***The proposed action of wetland would not curtail the range of beneficial uses of the environment***

   In its present state, Ohiapilo Pond has lost much of its value as a habitat suitable for waterbird nesting and breeding. As a result of this project, several native and endangered waterbirds, as well as migratory and wintering shorebirds, will be able to utilize the project site for nesting, breeding and foraging. The effect of this project will be primarily beneficial, with losses occurring solely in the predator and invasive vegetation population in the area.

3. ***The proposed action does not conflict with the state's long-term environmental policies or goals as expressed in Chapter 344, Hawaii Revised Statutes***

The State Environmental Policy and Guidelines are set forth in Chapter 344, Hawaii Revised Statutes. The proposed action is in consonance with the following policy guidelines:

Environmental Policy:

Conserve the natural resources, so that land, water, mineral, visual, air and other natural resources are protected by controlling pollution, by preserving or augmenting natural resources, and by safeguarding the State's unique natural environmental characteristics in a manner which will foster and promote the general welfare, create and maintain conditions under which humanity and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of the people of Hawaii.

Guidelines:

1. Land, water, mineral, visual, air, and other natural resources:

    (a) Establish and maintain natural area preserves, wildlife preserves, forest preserves, marine preserves, and unique ecological preserves.

2. Flora and Fauna:

    (a) Protect endangered species of indigenous plants and animals and introduce new plants or animals only upon assurance of negligible ecological hazard.

4. ***The economic or social welfare of the community or State would not be substantially affected***

Once completed, the proposed project will not substantially affect Molokai's economic or social welfare parameters.

5. ***The proposed action does not affect public health***

No impacts to the public's health and welfare are anticipated as a result of the proposed project.

6. ***No substantial secondary impacts, such as population changes or effects on public facilities are anticipated***

The enhancement of Ohiapilo Pond will not affect the Island's population base or place new demands on the Island's public services.

7. ***No substantial degradation of environmental quality is anticipated***

As the proposed project is implemented, appropriate environmental mitigation measures will be used to ensure that adverse environmental effects are minimized. If any, such effects are anticipated to be limited to temporary construction-related effects. Thus, no substantial degradation of environmental quality resulting from the proposed project is anticipated.

8. ***The proposed action does not involve a commitment to larger actions, nor would cumulative impacts result in considerable effects on the environment***

The proposed project is not part of a larger action and is not anticipated to create any significant long-term adverse environmental effects. The restoration of the Ohiapilo Wetland would create a deeper and larger open-water habitat, beneficial to a variety of waterbirds. The improved habitat will provide optimal foraging and nesting conditions for these waterbirds.

9. ***No rare, threatened or endangered species or their habitats would be adversely affected by the proposed action***

The proposed project is intended to optimize the use of the Ohiapilo Pond area, creating a habitat suitable for the reintroduction and survival of native and endangered species of waterbirds. It is expected that migratory and wintering species of waterbirds will also utilize the Ohiapilo Pond site once the enhancement has been completed.

10. ***Air quality, water quality or ambient noise levels would not be detrimentally affected by the proposed project***

Appropriate environmental mitigation measures will be used during construction to ensure that adverse environmental effects on air quality and noise are minimized. The project will be fully landscaped with appropriate wetland plantings to create a site visually integrated with its surroundings.

Water quality impacts anticipated during the vegetation removal and excavation phase are associated with the disturbance of sediment at the bottom of open-water areas within the site. The shallow basins are self-contained, however, and the sediment will re-settle following excavation. The disturbances to the project site area will not affect other bodies of water.

In the long term, the proposed project is not anticipated to have a significant impact on air quality, water quality or noise parameters.

11. ***The proposed project would not affect environmentally sensitive areas, such as flood plains, tsunami zones, erosion-prone areas, geologically hazardous lands, estuaries, fresh waters or coastal waters***

The subject property will not adversely affect environmentally sensitive areas. The proposed action will increase the retention capacity of the wetland enhancement area. Beyond the limits of the enhancement site, drainage patterns will remain unaltered. From a watershed and local drainage area standpoint, the proposed action will not adversely impact downstream or adjoining properties.

It is also noted that applications for a U.S. Department of the Army Permit, a Section 401 Water Quality Certification, and a Coastal Zone Management Consistency Assessment have been filed for the proposed project.

12. ***The proposed project does not substantially affect scenic vistas and viewplanes identified in County or State plans or studies***

The project will not adversely affect scenic vistas and viewplanes. The removal of vegetation and the creation of open wetland areas will enhance the open space value of the site.

13. ***Does the proposed project require substantial energy consumption***

The proposed action involves the enhancement of approximately 25.4 acres of Ohiapilo Pond for the establishment of migratory waterbird habitat and, therefore, does not require substantial energy consumption activities.

Based on the foregoing findings, the enhancement of the Ohiapilo Wetland will not result in any significant adverse impacts on the environment.

Chapter VII

Agencies Consulted

VII. AGENCIES CONSULTED

The selection of the wetland enhancement site and the development of the wetland enhancement plan have been coordinated with the EPA and the FWS. In addition, issues relating to the enhancement program and environmental and regulatory concerns have been coordinated with the U.S. Department of the Army, State Historic Preservation Division, and Maui County Planning Department.

Chapter VIII

Comments Receiving During Public Comment Period and Applicable Responses

JAN 7, 1997

For the Protection of Hawaii's Native Wildlife

HAWAII AUDUBON SOCIETY

~~212 MERCHANT ST. #326 ~ HONOLULU, HAWAII 96813 ~ PHONE (808) 528-1432~~
850 Richards Street, Suite 505. Honolulu, Hawaii 96813-4709
Telephone/FAX (808) 528-1432

January 6, 1997

Mr. Charles Jencks
County of Maui
Department of Public Works and Waste Management
200 South High Street
Wailuku, Hawaii 96793

Dear Mr. Jencks,

The Hawai'i Audubon Society strongly supports the proposed enhancement plan for Ohiapilo Wetland. We are gladdened by the quality and degree of planning performed for this project and hope that it exceeds the outlined objectives. We do have a few concerns regarding plans for passive re-vegetation, signage, and biological monitoring of the enhanced areas.

Re-vegetation

Given the relative proximity to the landfill, unforeseen soil and water quality problems may arise due to grading and grubbing work. Thus, a fuller discussion of alternative re-vegetation plans is needed should species composition and densities not be achieved. Transplantings or on-site propagation of appropriate vegetation may be needed during or following the monitoring period to provide the needed barrier, food, and nesting resources for endangered waterbirds.

We realize the focus of the wetland enhancement plan is towards passive management given resource constraints. The Nature Conservancy of Hawai'i has recently launched a program to use the local school on Moloka'I to assist with the propagation of native plant species, and the Native Hawaiian Plant Society on Maui has also been experimentally successful in their efforts to re-vegetate Kanaha Pond with native species. Similar cost-effective approaches for this project could also be tried should the need arise.

Signage/Public Participation

It is unclear from the WEP whether signage will be placed around the fence perimeter to prevent human disturbances. While access to the site appears difficult at best, unambiguous, deterrent language may help prevent the kinds of vandalism and illegal stocking of refuge ponds witnessed on Kauai and O'ahu. Toward this end, a public education/participation effort could also help to minimize human disturbances. Inviting interested community groups (e.g. Nene O Moloka'i) for annual mangrove seeds and seedling removal projects could prove invaluable to long-term mangrove control efforts.

Biological Monitoring

Benthic surveys may also be needed on a quarterly basis during the monitoring period to determine invertebrate species composition and densities. The establishment of another lowland population of the endemic damselfly, *Megalagrion xanthomelas* would be an important step in its conservation. Additionally, invertebrate absence or developmental abnormalities might indicate unforeseen soil and water quality problems. Regularly monitoring salinity, pH, and temperature levels during periods of inundation would indicate whether the wetland serves as another breeding habitat for this species, as well as indicating whether salinity levels are tolerable for Hawaiian Coots.

Lastly, to facilitate the seasonal use of the Ohiapilo wetland by Hawaiian Coots, debris piles may need to be left near open water areas to serve as nest building material.

Thank you for this opportunity to comment on the proposed project. We look forward to its timely implementation and would be happy to answer any questions or concerns at our above address.

Sincerely,

Daniel K. Sailer
Conservation Chair

cc: Milton Arakawa, Munekiyo and Arakawa, Inc.
OEQC

BROWN AND CALDWELL

January 27, 1997

Mr. Daniel K. Sailer
Conservation Chair
Hawaii Audubon Society
850 Richards Street, Suite 505
Honolulu, Hawaii 96813-4709

Subject: **Ohiapilo Wetland Enhancement**

Dear Mr. Sailer:

We have received your letter of January 6, 1997 and would like to thank you for your support. With regard to your specific concerns, we provide the following response.

On the issue of revegetation, we would like to emphasize that the primary purpose of the project is to restore and enhance wetland conditions. Toward this end, hydrologic goals are critical to allow the seasonally variable system to adapt to landform alterations. Should the hydrology goals be reached, one of the indicators of success will be desired vegetation and bird use. We do not believe that revegetation will be successful if hydrology goals are not met. However, we will explore whether community groups would be interested in controlling unwanted vegetation such as mangrove, Indian pluchea, and pickleweed, under supervision of the County of Maui or its designated wetlands manager. Community groups may also be helpful in monitoring bird use.

Regarding the issue of signage, we will include signage near the perimeter of the project to deter people from vandalism and unnecessary access.

We have not included benthic surveys as part of the scope of work due to our primary purpose of restoring and enhancing the wetland itself rather than provision of specific species habitats. Since the hydrology varies on a seasonal as well as yearly basis, vegetation and wildlife are intended to adapt to natural hydrological conditions. With regard to debris piles for nesting material by Hawaiian Coots, we feel that such debris produces a greater risk of harboring predators and rodents which would not be beneficial to the wetland ecosystem.

Environmental Engineering And Consulting
WELLS PROFESSIONAL CENTER, 2145 WELLS STREET, SUITE 302, WAILUKU, HI 96793
(808) 244-7005 FAX (808) 244-9026

Thank you for your interest in the project. If you have any questions, please feel free to call me.

Very truly yours,

BROWN AND CALDWELL

Raymond Matasci, P.E.
Vice President

cc: Andy Engilis, Ducks Unlimited, Sacramento, CA
Andy Hirose, Solid Waste Division, County of Maui
Milton Arakawa, Munekiyo & Arakawa
Paul Scheidegger, Brown and Caldwell

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References

References

Brown & Caldwell Consultants, Kalamaula Landfill Closure Project - Final Environmental Impact Statement, prepared for the County of Maui, Department of Public Works and Waste Management, June 1993.

Brown & Caldwell Consultants/Ducks Unlimited Inc., Enhancement Site Assessment Report - Draft, prepared for the County of Maui, Department of Public Works and Waste Management, January 1995.

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Munekiyo & Arakawa, Inc., Draft Environmental Assessment, Maunaloa Town Center, prepared for Molokai Ranch, Limited, November 1995.

Telephone conversation with Department of Education employee, Joyce Ogawa, April 1996.

Telephone conversation with Maui Fire Department employee, Cindy Kagoshima, April 1996.

Telephone conversation with Maui Police Department employee, Mae Kitaoka, April 1996.

Telephone conversation with Agatha Fontes, Molokai General Hospital staff, May 1995.

CORRECTION

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

References

Brown & Caldwell Consultants, Kalamaula Landfill Closure Project - Final Environmental Impact Statement, prepared for the County of Maui, Department of Public Works and Waste Management, June 1993.

Brown & Caldwell Consultants/Ducks Unlimited Inc., Enhancement Site Assessment Report - Draft, prepared for the County of Maui, Department of Public Works and Waste Management, January 1995.

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Telephone conversation with Agatha Fontes, Molokai General Hospital staff, May 1995.

Appendices

Appendix A

Draft Wetlands Enhancement Plan

County of Maui

Ohiapilo Pond

Wetlands Enhancemei Plan

D R A F T

February 1996

BROWN AND CALDWELL

IN ASSOCIATION WITH

DUCKS UNLIMITED INC.

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CHAPTER 1

INTRODUCTION

The development of this Wetlands Enhancement Plan (WEP) culminates several years of studies revolving around closure of the Kalamaula Landfill and the unauthorized filling into the adjacent Ohiapilo Wetland. This chapter provides a brief discussion of the background to the project, the purpose of the WEP, and an overview of the wetlands enhancement concept. Chapter 2 discusses site conditions, Chapter 3 details the enhancement actions, and Chapters 4 and 5 provide the management plan and monitoring plan, respectively. A contingency plan is included in Chapter 6.

BACKGROUND

WEP development is the result of unauthorized wetlands encroachment at Maui County's (County) Kalamaula Landfill (Figure 1-1). The landfill was closed by the County on August 14, 1994, but filling had occurred on 6.5 acres of wetlands without the necessary permits and approval under Section 404 of the federal Clean Water Act (CWA). Following several years of studies involving both the landfill and surrounding wetlands, the County and U.S. Environmental Protection Agency (EPA) executed an Administrative Order on Consent (Consent Order) on June 17, 1994.[1] The Consent Order directs the County to prepare a Mitigation Plan to achieve specific mitigation objectives. The site where the mitigation activities will occur is the Ohiapilo Pond which is thought to represent the remnants of Ohiapilo Fishpond and is located between man-made berms (Figure 1-1).

The Mitigation Plan includes the following four components: (1) a Removal Report for the Disturbed Site, (2) an Enhancement Site Assessment Report, (3) this WEP, and (4) a Wetlands Monitoring Plan. Progress has been made on completing each of the components pursuant to the Consent Order. The Removal Report for the Disturbed Site was submitted to EPA in July 1994, and the Final Wetlands Monitoring Plan was approved by EPA on March 6, 1995. The Final Enhancement Site Assessment Report was submitted to EPA for approval on July 13, 1995.

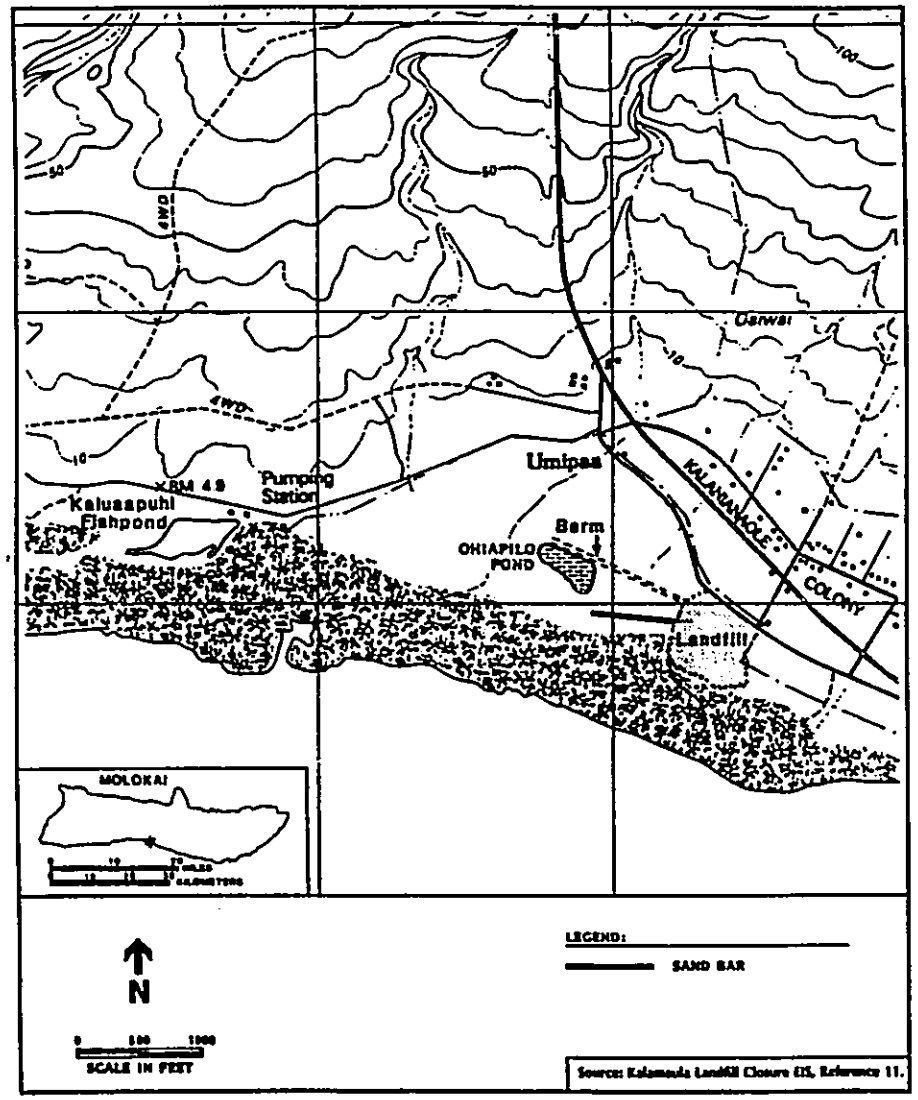

Figure 1-1 Location of the Kalamaula Landfill Relative to the Ohiapilo Pond Site

The purpose of the Enhancement Site Assessment Report was to document existing site conditions and to otherwise serve as a data source for development of the WEP.[2]. However, preparation of this WEP has involved development of an expanded database beyond that which was included in the Enhancement Site Assessment Report. Over the last several months, additional information has been obtained on site soils and groundwater hydrology and on waterbird use of the Molokai Playas.

PURPOSE OF THE WEP

Based on recommendations of the U.S. Fish and Wildlife Service (FWS), EPA has determined that the County must enhance, at a minimum, 19.67 acres of wetlands to compensate for the habitat losses from the filling of the 6.55 acres of CWA-regulated wetlands by past landfill operations. The purpose of the WEP is to provide a detailed plan for enhancement of the Ohiapilo Pond site, including physical and biological enhancement components, maintenance and monitoring components, implementation schedule, and contingency plan. The WEP has been prepared for the Maui County by Ducks Unlimited with assistance by Brown and Caldwell.

The specific requirements for the development of WEP were outlined in the EPA Consent Order. The WEP addresses the Consent Order items in various sections to allow for better flow of information. These items are listed in Table 1-1.

OVERVIEW OF THE WETLANDS ENHANCEMENT CONCEPT

The goal of the WEP is to fulfill the mitigation requirements established by EPA. The biological goals are to lengthen the duration in which open water and moist soil conditions remain on the site and developing a site that is both secure and provides habitat sought by Hawaiian stilt. A moat and fence is proposed to protect an internal nesting area. This area will be inundated in winter and, through evaporation, will become exposed. Small nest islands are not proposed because recent evidence from Hawaii and mainland habitats indicates that birds nesting on small islands can become impacted by aerial predators.

Table 1-1 Location of Consent Order Components in the WEP

Consent Order Components	WEP Location
1. Physical Component	Chapter 2
a. Enhance hydrology	Chapter 2 defines the site's hydrology. Chapter 3 defines the actions needed to enhance hydrology.
b. Establish a 300-foot buffer	Chapter 3
c. Procedures for work	Chapter 3
d. Design criteria Success criteria for work	Chapter 3 Chapter 5
2. Biological Component	Chapter 2
a. Measures to enhance site for plants and animals	Chapter 2 defines plant and bird use. Chapter 3 defines what biological criteria will be used to justify design considerations.
b. Waterbird surveys	Chapter 2 addresses baseline data collection. Chapter 5 addresses bird survey needs.
c. Measures to avoid disturbing endangered species	Chapter 3 and Implemenation Schedule.
d. Procedures for biological enhancement	Chapter 3
e. Biological monitoring and success criteria	Chapter 5
3. Maintenance and Monitoring Component	
a. Provisions for management and maintenance	Chapter 4 Chapter 5
b. Monitoring plan	Chapter 5
c. Provisions for management	Chapter 4 defines management actions. Chapter 5 defines monitoring actions to determine management needs.
4. Implementation Schedule	Chapter 3 restoration actions. Chapters 4 and 5 management and monitoring actions.
5. Contingency Plan	Chapter 6

Proper interspersion (vegetation cover to open mudflat) will be managed on the wetland. Excavation of the playa to variable elevations should provide different interspersion conditions. Below 0.7 feet mean sea level (msl), interspersion should reach and maintain, through natural hydrology, a 50 percent interspersion. Above this level, 70 to 100 percent is expected and, in some areas, 100 percent is desired to provide a barrier to small mammals. In the 0.8 feet msl area, interspersion is expected to reach 70 percent. Management of the playas may be needed to maintain the desired interspersion. This will be determined through the monitoring phase of the project.

The excavations will create variable depths to create deeper water. Excavations will provide a gentle slope exceeding 15:1. This shallow slope will provide variable water depths through the season that stilt, coot, shorebirds, and other waterfowl can exploit. In addition, it is anticipated that these shallowly sloping shorelines will provide the best habitat for emergent vegetation regrowth. The final shape and layout of the seasonal and semipermanent marsh are presented in this document. The restoration plan is followed by sections detailing management and monitoring requirements.

CHAPTER 2

SITE CONDITIONS

Site conditions are discussed in this chapter. Information is presented on topography, soils, and groundwater hydrology, surface hydrology, vegetation communities, and waterbird use of the Molokai Playas.

TOPOGRAPHY

An aerial survey of Ohiapilo Wetland was conducted by Maui County (County) in 1994. Later in 1994, the survey was updated and refined by Ducks Unlimited (DU). DU ground-truthed the elevations using a bench mark established by the County. Four transects were run, one on either side of the central dike, through the wetland. Two more, running south to north, bisected the first two transects. This grid system allowed for final mapping of the site's microtopography.

Full-scale drawings depicting the surface elevations of the site, corrected to account for variable vegetation cover, are included in Appendix B. The site is a 60-acre playa wetland dissected into two basins by an old levee. The basins are referred to in this document as the Mauka Basin (north of the levee) and the Makai Basin (south of the levee). The map showing topography provides a grid of 100-foot intervals, and cross sections were drawn of the area in a north-south direction at each 100-foot station.

SOILS AND GROUNDWATER HYDROLOGY

Figure 2-1 shows the locations of the sampling sites that have been used to gather additional information on the site's groundwater and soil characteristics. As discussed in the Enhancement Site Assessment Report,[2] four observation wells (MW1 through MW4) were installed by the County in September 1994 for gathering water depth information. An additional

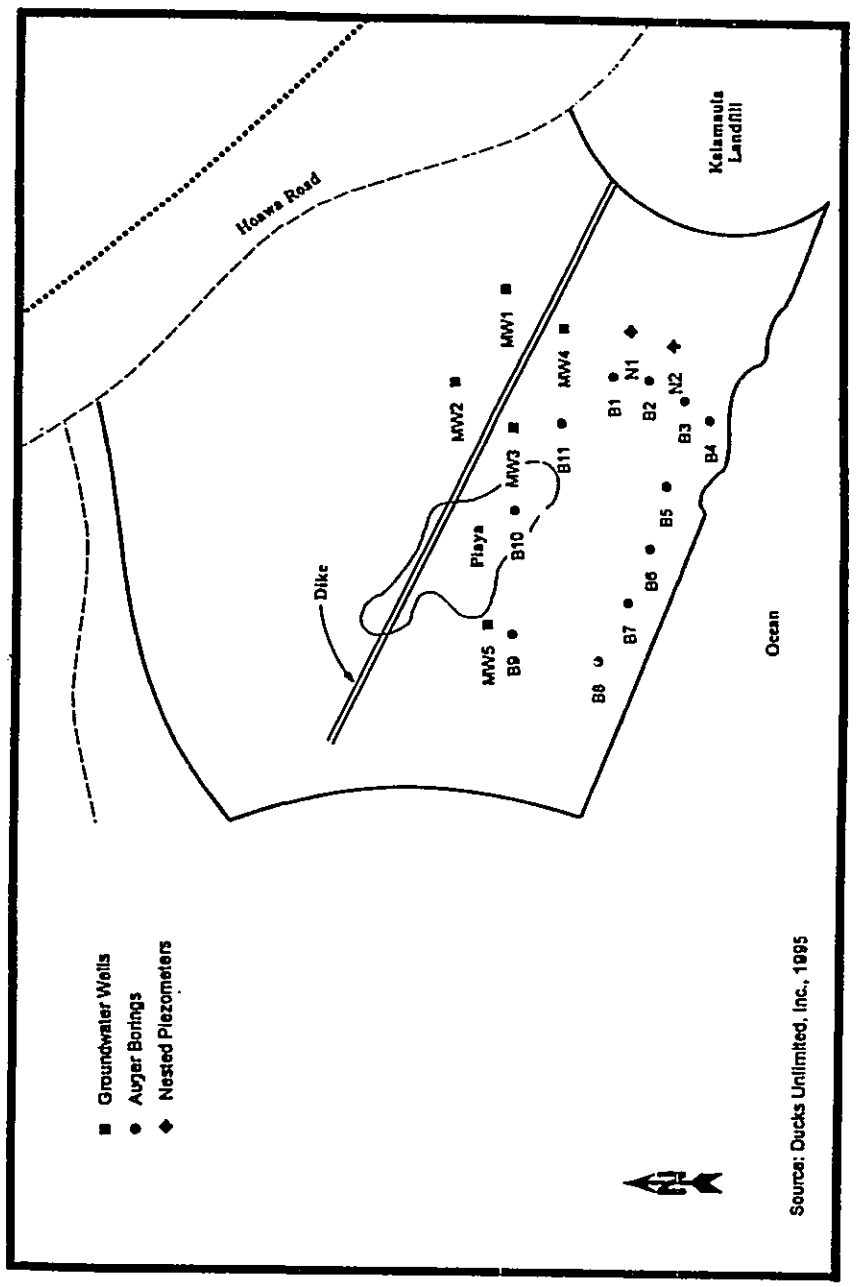

Figure 2-1 Location of Water Monitoring and Soil Testing Sites at the Ohiapilo Mitigation Site

well (MW5) was installed in August 1995. In addition, 11 hand-auger borings were placed at locations throughout the Ohiapilo Wetland playa on September 14 and 15, 1995, and 2 sets of piezometers were installed during the same time. Further information on the monitoring programs are presented in Appendix C.

The soil borings were placed to gain additional insight as to general soil lithology, the thickness of respective soil units, and the relative horizontal and vertical extent of any confining layers. This information will be used to assess the potential impacts of the planned enhancement activities outlined in the Wetlands Enhancement Plan (WEP). This includes considerations for depth of excavation required for establishment of open water areas and a predator-controlled moat, while addressing the potential for artesian conditions if and when the confining units are breached.

According to the Natural Resource Conservation Service (NRCS) and confirmed by DU, the Ohiapilo Wetland is underlain by silty clays and loams of the Mala, Holomua and Kealia soil series. Hand-auger borings were advanced with a 4-inch-diameter tool. Boring depths were limited to the location of the shallowest aquifer and static groundwater levels. Each boring extended about 3 feet below grade. A detailed discussion of the soil borings is presented below. Borehole logs and a map showing approximate borehole locations are included as Appendix C.

Borings B-1 Through B-4

From a point approximately 150 feet south of the central dike, and centered between existing monitoring wells three and four, borings B-1 through B-4 were placed in a line, extending north into the playa. Each boring was separated by about 150 feet. All borings were placed in the open areas formed in small, shallow basins amidst the pickleweed flats. All of the flats and shallow basins on the playa were dry at the time of the September 1995 site visit.

At all boring locations, the crusty alkali surficial layer was underlain by a very thin (less than 1 to 2 inches) layer of black organically rich peat or humus material. In B-1, this surficial layer was underlain to a depth of about 1 foot by a dark reddish brown organic clay. Below this horizon, the soil was a dark gray silty clay that included some weathered basalt. This clay layer

extended to approximately 2.5 feet below grade, or about elevation -1.5 mean seal level (msl). At this elevation, granular basaltic and coral fragments were encountered.

In borings B-2, B-3, and B-4, essentially the same surficial dark reddish brown clay horizon was encountered, but with diminishing thickness in the southern direction. In B-2 and B-3, approximately 150 and 300 feet north of B-1, respectively, the gray silty clay layer was encountered approximately 10 inches below grade and was less than 6 inches thick. This horizon was underlain in B-2 and B-3 by tan beach sand extending to about 3 feet below grade where the more granular basaltic and coral fragments were encountered. In B-4, the most northern of this series, the gray horizon was more granular. The tan beach sand horizon was encountered at essentially the same depth and to the same extent as in B-2 and B-3.

Borings B-5 Through B-8

Borings B-5 through B-8 extended in a line from B-4 to the west and were spaced approximately 150 feet apart. These four borings were placed primarily in the open alkali flats parallel to the southern berm.

In all borings extending west from and including B-4, (includes borings B-5, B-6, B-7, and B-8), the upper horizon was a dark reddish-brown clay. Coral sand was generally encountered less than 1 foot below grade. However, these borings showed marked heterogeneity in the lower horizons which included primarily granular sandy soils ranging in color from tan to gray. All of these borings were terminated at the granular basaltic and coral layer. The coarse sand layers were first encountered at elevations roughly between -0.5 and +0.5 feet msl.

Borings B-9, B-10, and B-11

Boring B-9 was placed in a small, seasonally wet depressed basin just south of the larger, seasonally wet playa area, about 400 feet north of B-8. Dark reddish brown organic clay extended from grade (approximate elevation 0.6 feet msl) to about sea level. This horizon was underlain to a depth of about 1.5 feet (to elevation -1 foot msl) by a silty clay sand, similar to B-3. This layer was underlain by a gray granular silty sand similar to that found in B-6, roughly

the same elevation. Boring B-10 was placed in the center of the main playa pond area. Clay and silty clay extended to about sea level to 1 foot below grade. Clay and silty sand transitioned to well graded beach sand with fines and finally to what appeared to be gray weathered basalt, but was probably a silty coral sand as found at similar depths in B-11. This last boring was comparable to B-10 with the main exception of the tan coral sand encountered at 1 to 1.5 feet below grade.

Conclusions

The Ohiapilo Wetland playa area has a complex and heterogeneous hydrogeology that makes prediction or development of generalized models of groundwater behavior difficult. Consecutive layering of dark brown organic clays, gray coral sand and gritty tan beach sand was encountered in more than one of the relatively shallow borings. The more confining clay and silty clay layers diminished as the borings proceeded toward the shoreline. The southern line of borings B-4 through B-8 exhibit similar soil horizons. Based on the lithology exhibited in the borings, a transition zone which may roughly define a historical shoreline may exist at or just south of B-1. The moat area defined in the WEP will penetrate the thinner, shallow clay layers in the southern portions of the playa and expose the more granular saturated horizons below. This should not result in a substantial pressure gradient-induced flooding of the playa. It may, however, allow for replenishment by groundwater of the playa area graded to 0.5 foot msl or less.

It should be noted that in the vicinity of monitoring well (MW) MW3, soil had been removed presumably during construction of the central dike. This location and at the toe of either side of the dike were the only areas in which standing water was observed during the September 1995 site visits. The apparent water elevation in the depression adjacent to MW3 appears to be just below the ground elevation at the base of the well, reported to be 0.85 foot msl. The clay horizon was no doubt breached during past grading activities and the resulting depression generally contains standing water. In September 1995, the depth of the water was observed to be about 1 to 2 inches. Additional discussion on site hydrogeology is provided below.

Nested Piezometers

In conjunction with the September 14-15, 1995, soil study, sets of nested piezometers were installed in the Ohiapilo Wetland playa (Figure 2-1). The piezometers consisted of sections of 1/2-inch diameter Schedule 40 PVC pipe cut into two sets each having three pipes measuring 2, 3, and 4 feet in length.

The two sets of nested piezometers, N-1 and N-2, were installed adjacent to borings B-1 and B-2, respectively. The locations were both in open dry areas within the pickleweed flats. N-1 was set approximately 150 feet south of the center berm, midway between MW3 and MW-4. N-2 was set approximately 150 feet south of N-2.

In nests N-1 and N-2, piezometers were set at 12-inch depths (P_{12}), 24-inch depths (P_{24}), and 36-inch depths (P_{36}). In N-1, piezometers were set to penetrate in succession the two clay horizons at 12-inch and 24-inch depths and the basalt and coral fragment zone at 36-inch depth. In N-2, the piezometers were set into the silty clay, beach sand, basalt, and coral fragment horizon (12-, 24-, and 36-inch depths). The ground elevations at these piezometer locations were estimated using the existing topographical map to be 0.9 foot msl for N-1 and N-2. A series of readings were taken of the water levels in the piezometers using a Solinst® water level sounder. Representative readings are listed in Table 2-1.

The water elevations in the piezometers show a gradient probably induced by the permeabilities of the soils at each level. The clay layers are shown to confine the groundwater. It is not until these clay layers are penetrated does the water elevation rise. The total gradient is about 6 inches at N-1, where the clay layer extends at least 2.5 feet below grade (see borehole logs in Appendix C). The total gradient in N-2 is closer to 2 inches. The clay/silty clay horizons were found to extend only about 1 foot below grade at this location. The piezometric surface is most likely indicated by the P_{36} piezometers. The assumptions made for ground elevations may or may be accurate. The piezometric surface elevation is shown to change by nearly 6 inches over a 150-foot horizontal interval. Such a magnitude of relative change in water level over a fairly short horizontal distance is also shown when comparing the water elevations in MW2 and MW3 as discussed below. Assuming an average piezometric water elevation of 0.5 foot msl would probably be a reasonable assumption and would represent the standing water elevation on the playa had it been dredged to that elevation on that date. This indicates the playa

Table 2-1 Water Level Readings at Piezometer Nests N-1 and N-2

Nest N-1[a]			Nest N-2[a]		
Piezometer[b]	Morphology	Estimated water elevation, ft msl	Piezometer[b]	Morphology	Estimated water elevation, ft msl
P_{12}	Clay	0.1	P_{12}	Clay	0.0
P_{24}	Silty clay	0.4	P_{24}	Sand	0.18
P_{36}	Gravel	0.7	P_{36}	Gravel	0.24

[a]See Figure 2-1 for location of piezometer nests.
[b]P_{12}, P_{24}, and P_{36} refer to the depths to which the piezometers were set, 12, 24, and 36 inches, respectively.

Source: Brown and Caldwell and DU, 1995.

should not be inundated by water to an elevation exceeding the piezometric surface by an artesian-like phenomenon after the grading activities defined in the WEP have been completed.

The water level in newly placed MW5 (set 2.1 feet above estimated ground elevation 1.0 foot msl) at the time of the September 1995 site visit was about 0.0 foot msl. The water level in MW3 on the same day was 0.9 foot msl. In MW3, approximately 300 feet north (upgradient), the water elevation was 1.5 feet msl. This is similar to the relative gradient in piezometric surface when comparing the deeper probes at N-1 and N-2.

This apparent gradient and the fact that the confining clay horizon diminishes toward the ocean (as discussed earlier) strengthens the assertion that grading activities as defined in the WEP will not cause the wetland to be inundated with water substantially beyond the desired limits. However, the degree of the apparent groundwater gradient and the many unknown factors that are creating the diverse and heterogeneous hydrogeological conditions observed at the playa will probably create conditions within the planned wetlands that were not foreseen.

SURFACE HYDROLOGY

The Ohiapilo Wetland is located on the leeward shore of the Island of Molokai. The weather patterns that dominate Hawaiian weather also drive the hydrologic cycle of Molokai. The predominant weather pattern, northwesterly trade winds provide for high rainfall on the island's windward and mountain areas. Portions of Molokai receive greater than 300 inches of rainfall annually. Being in the lee of the highlands, Molokai's south coast is arid.

The Ohiapilo Wetland is served by a small watershed, totaling 311 acres (Figure 2-2). Recent planning maps show 8 acres have been urbanized and 303 acres are undeveloped. Rainfall was determined from the isohyet maps in the NRCS Erosion and Sediment Control publication.[3] Ohiapilo receives 12 inches of rainfall annually, and supports a xeric vegetation community. The wet period in normal winters is from December through April. The driest period is August through October. As such, the wetland generally floods during winter months and dries through evapotranspiration and subsiding groundwater. The marsh is generally dry by May.

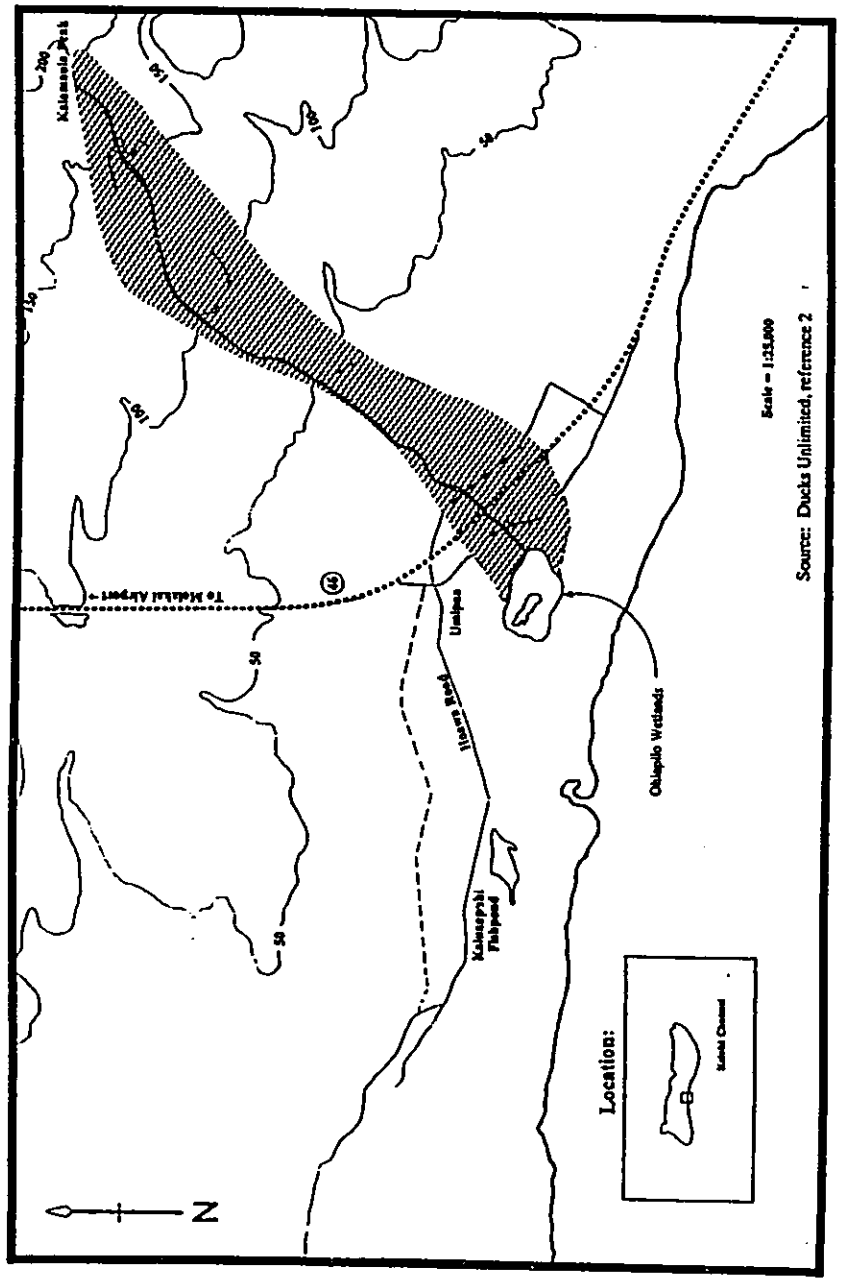

Figure 2-2 Location of the Ohiapilo Wetlands in the Kalamaula Watershed

The most common storm event (2 to 5 years) will result in a peak flow of 4 to 10 cubic feet per second (cfs).[2] This rate of flooding could fully inundate the Ohiapilo Wetland if peak discharge was maintained for a period of 2 to 3 days. However, because of the small watershed, this scenario is unlikely. Larger storm events are infrequent and although they might periodically be important to the long-term hydrologic cycle of the Molokai Playas, the short-term events are more important in driving the marsh hydrology and vegetation communities.

VEGETATION COMMUNITIES

Salt or brackish marsh vegetation in Hawaii is characterized by herbaceous vegetation dominated by species of sedges, grasses, and succulents. These wetlands are classified as coastal marshes due to their proximity to the ocean and are important habitats to waterbirds worldwide. Typically, coastal marshes in Hawaii occur on silty soils. The Palaau-Ooia Playa is characterized by two types. The first is a low coastal marsh, dominated by *Sesuvium, Bacopa, Paspalum,* and *Sporobolus,* with several species of small sedges and rushes. The other is a tall sedge marsh dominated by various species of *Scirpus* and *Typha.* The Ohiapilo Wetlands is characteristic of low marsh habitat in the islands. As with most of Hawaii's low wetlands the invasive, alien pickleweed (*Batis maritima*) has choked out native and indigenous species of plants. Where *Batis* has been removed to create borrows at Ohiapilo, other species of native plants have responded favorably. The Ohiapilo Wetland site is characterized by four habitats which are shown on Figure 2-3 and include *Batis* flats, open Alkali flats, mangrove (mature and young), and marginal terrestrial environments (*Kiawe, Batis-Prosopis,* and *Pluchia-Batis*). These habitats are discussed below.

Batis Flats

The majority of the Ohiapilo site is a broad mudflat covered by *Batis.* This light green, spreading shrub with brittle stems attains a height of 3 feet, thus excluding other low-growing species. Characteristically, *Batis* inhabits low-lying areas subject to flooding during heavy rains or tidal inundation. In these low-lying areas, *Batis* forms monotypic stands. *Batis* is missing from the lower basins of Ohiapilo. The period of inundation in these lower-lying areas might exclude *Batis* from growing. Some of the species of plants identified from the borrows along

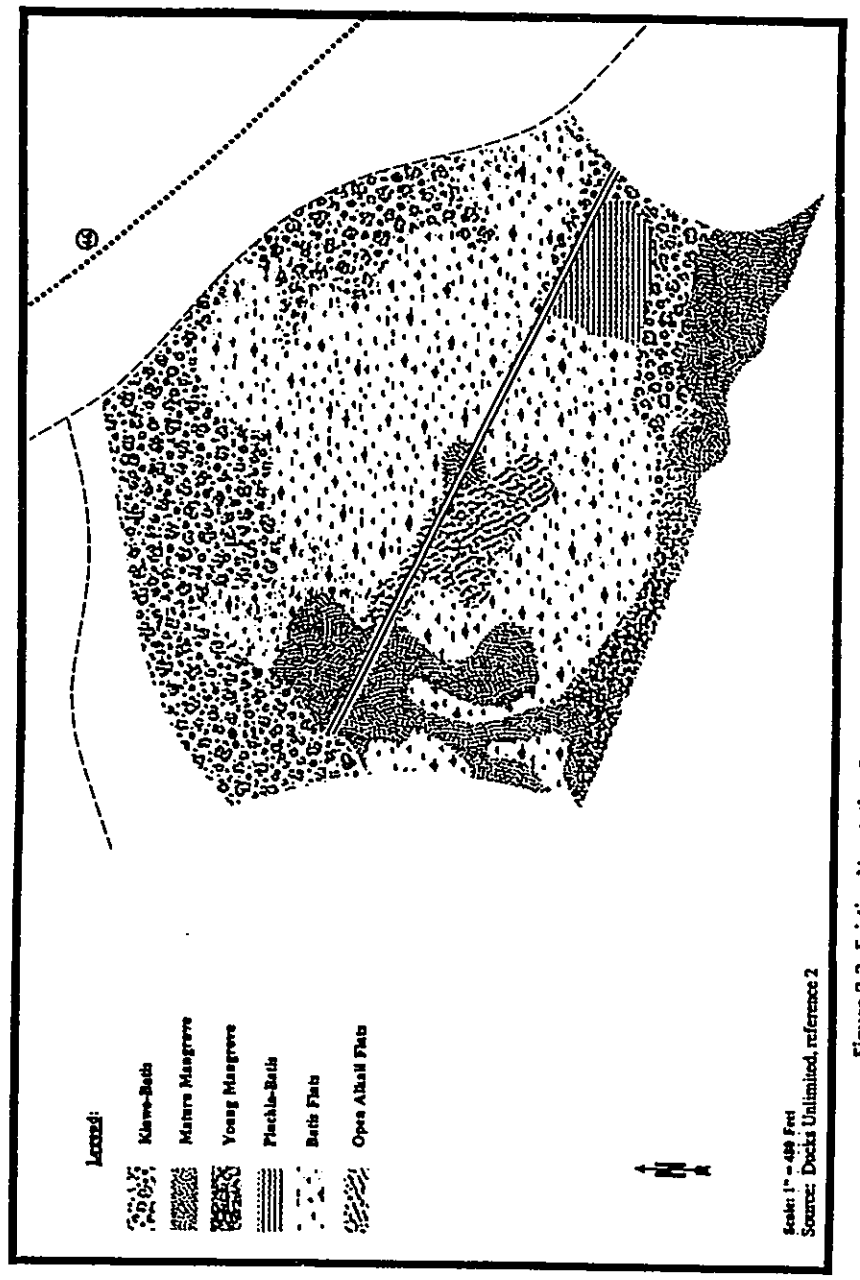

Figure 2-3 Existing Vegetation Communities at the Ohiapilo Wetlands Mitigation Site

the center dike of Ohiapilo are indicative of freshwater situations. Two pools have small mats of *Lemna, Cyperis difformis,* and *Eleocharis*. This freshwater represents the groundwater table on the site.

Open Alkali Flats

Ohiapilo is dominated by a large, open flat that is impacted by high water table and long periods of inundation. There is no vegetation in this habitat. When dry (May–November), the tuff-like soils readily blow away with the trade winds, thus maintaining a low sink. The large pond may represent the remnants of Ohiapilo Fishpond. A modern dike separates the pond into two distinctive hydrologic units.

Mangrove

Mangroves are introduced to the Hawaiian Islands and have become invasive in tidal, silty, and coralline habitats on Molokai. They have inundated valuable shoreline and fishpond habitat on the island and pose a threat to native waterbirds and the local humans dependent upon coastal fisheries. The mangroves have formed a wooded swamp habitat along the coast and inlets. These mangroves have obscured the coastline, yet seawater extends well in under the trees. Along the coast, mangroves attain a height of 20 to 40 feet. However, much larger trees can be found on the inlets. This plant community is extending out across the remaining reef flat. Along the seaward edge, large numbers of seedlings have become established in the seawater which is 1 to 2 feet deep. Between the outer edge of the mangrove belt and the shoreline is a tidal flat with creeks. For the most part, this area possesses a fine mud bottom held in place by the mangrove. Depending upon the tide, the mud may be exposed or submerged. However, even at low tide, pools and creeks can be found.

Mangrove has invaded up the tidal creeks well inland of the coast. Seedlings are not prevalent in the Ohiapilo Wetland, but planned excavation might provide a better environment for mangrove intrusion. Mangrove may also present a small management concern for the Ohiapilo Wetland Project.

Marginal Terrestrial Environments

Along the higher portions of Ohiapilo (above 3-foot elevation) occurs a transitional plant community made up of *Batis* and scattered kiawe trees (*Prosopis pallida*). Some patches of this *Batis/Prosopis* association are also found within the wetland ecosystem. Where the land elevation rises, the *Batis* disappears and the understory changes to various species of grasses. Less common, but also representative of marginal areas, is a *Pluchea/Batis* association comprised of scattered shrubs of Indian fleabane (*Pluchea indica*).

WATERBIRD USE OF THE MOLOKAI PLAYAS

The Hawaiian Islands are characterized by numerous types of wetlands. The most familiar are those associated with rivers and streams or lowland aquifers (Hanalei Valley, Kauai, Kawainui Marsh, Oahu, Kanaha Pond, and Maui). Montane bogs make up another well-known wetland resource due in part to their high degree of endemic plants and forest birds.

The Hawaiian playas are characterized as seasonal wetlands which fill during winter rains and empty through evaporation in summer. Only a few playa regions remain in the islands. The largest playa regions are on Niihau where three playas comprise 1,900 acres; Molokai, dominated by the Palaau-Ooia Playa (Molokai Playa) comprising 2,000 acres; and Kealia Pond on Maui comprising 600 acres. The latter playa has been modified to remain flooded year-round which has increased silt loading in the pond.

These playas remain the most important seasonal wetland resource in the Hawaiian Islands. The shallow conditions provide optimal foraging habitat for Hawaiian stilt, koloa, and Hawaiian coot, particularly during periods of drawdown when invertebrates are concentrated in shallows. State of Hawaii Division of Forestry and Wildlife biannual waterbird surveys have documented large numbers of stilts and coots utilizing playas.[4] Seasonally, depending upon rainfall regimes, numerous stilts and coots utilize these wetlands.[5] The variable weather patterns found in the Hawaiian Islands as a result of Southern Oscillations and El Niño weather patterns makes inundation of the playas somewhat unpredictable. However, the waterbirds seem able to know when the playas are flooded and readily move (even between islands) to exploit them.[5]

Hawaiian lowland wetlands are characterized by their flora and avian components. These are discussed in detail below. The Ohiapilo Wetland Project is designed to provide for the needs of waterbirds through habitat enhancement. For this reason, other terrestrial and aquatic vertebrates (except predators of waterbirds) are not considered in this biological assessment.

The Hawaiian Waterbird Recovery Plan (second revision in press) has identified the Palaau-Ooia Playa as an area of importance for protection.[6] Step-down Action 151 of this plan has recommended working with private and state landowners to protect and enhance (through removal of *Batis* and mangrove) this important resource. The plan also identifies the playa as potentially supporting reintroduced Koloa and Hawaiian Moorhen, an important action required to reestablish these two species into historic range. Thus, the restoration of the Ohiapilo Wetland will fill critical needs for Hawaii's endangered waterbirds.

Bird Surveys

DU began to survey the Molokai Playa in 1994 to better ascertain bird use on the island. The surveys, which are important input for development of the WEP, were begun in December 1994 and will continue through June 1996. Counts are taken monthly from the following localities (from east to west): Kaunakakai Flats, Kaunakakai Wastewater Treatment Ponds (WTP), Ohiapilo Playa, Kaluaapuhi Fishpond, O'oia Fishpond, Molokai Sea Farm, Pala'au Flats. Each site was surveyed for all birds observed in a designated route.

Findings

During the survey period, 20 species of waterbirds accounting for 1,290 birds observed were recorded on the playa. These included two native endemics (Hawaiian coot and stilt), one indigenous (night-heron), two introduced residents (Mallard, Cattle Egret), and 15 migratory species (Tables 2-2 and 2-3). Two man-maintained pond areas (Kaunakakai WTP and Molokai Sea Farms) supported 84 percent of the total observations. When flooded, Ohiapilo was heavily utilized by migratory waterfowl and Hawaiian stilts accounting for 30 percent of the total birds observed in February through May (Tables 2-2 and 2-3). If surveyed regularly, the Molokai Playa observations would probably account for 70 to 80 percent of the total waterbirds observed

Source: Ducks Unlimited, November 1995.

Table 2-2 Molokai Playa Waterbird Surveys, Total Waterbirds

Survey date	Kaluaapuhi Fish Pond	Kaunakakai	Kaunakakai WTP	Molokai Sea Farm	O'ola Fish Pond	Ohiapilo	Total
12/22/94	1	5	18	81		4	105
1/26/95			40	107		4	151
2/22/95			27	31		19	77
3/30/95	1		32	28	1	93	155
4/11/95	1	17	38	74		37	167
5/30/95	1		48	45		11	103
6/27/95			32	61		5	98
7/18/95	1		26	57		4	88
8/29/95			51	113		6	170
9/28/95			45	129		2	176
Total	5	22	355	726	1	181	1,290

Source: Ducks Unlimited, November 1995.

Table 2-3 Molokai Playa Waterbird Surveys, Species Totals by Wetland Area
December 22, 1994, to September 28, 1995

Species	Kalusapuhi Fish Pond	Kaunakakai	Kaunakakai WTP	Molokai Sea Farm	O'Ola Fish Pond	Ohiapilo	Total
American Wigeon			1			4	4
Gadwall						1	2
Mallard			3				3
Northern Pintail			2				4
Garganey			2			1	3
Blue-winged Teal			2				2
Northern Shoveler		4	42	2			81
Cattle Egret	2	2	54			35	126
Black-Crowned Night-Heron	1	1	51	53	1	14	51
Hawaiian Coot	2		51	49			53
Bristle-Thighed Curlew							18
Wandering Tattler							22
Ruddy Turnstone		2	3	18			87
Short-Billed Dowitcher			29	19		1	1
Sanderling				55			69
Rufous-Necked Stint			10	1		1	1
Ruff			1	58			1
Semipalmated Plover				1			1
Pacific Golden-Plover				1			1
Hawaiian Stilt				18			18
Total	5	22	355	418	1	116	680

Source: Ducks Unlimited, November 1995.

on Molokai during state waterbird surveys. In past years, the Molokai Playa has not been adequately surveyed due to limited access. DU biologists coordinated with local land owners to assure a close working relationship, thus allowing for continued access. The data from these surveys will be made available to the landowners.

In general, the Molokai Playa supports 80 to 95 percent of the island's Hawaiian stilt population throughout the year. Observations of three banded birds clearly indicate that stilts readily move to exploit available habitat on the playa. The consistently high counts of stilts at the Molokai Sea Farm and Kaunakakai WTP (averaging 82 percent of all stilt observations on the playa) show an interdependence upon these man-maintained ponds through the course of a year (Table 2-4). This dependence places the stilt population on Molokai at jeopardy because of economic or agricultural changes that might impact these ponds. This problem has been identified as a limiting factor for Hawaiian waterbirds in the Hawaiian Endangered Waterbird Recovery Plan.[6] The importance of the Ohiapilo restoration thus dramatizes the need of providing wetlands dedicated to waterbirds. During the period of inundation (March–May), Ohiapilo provided outstanding conditions for Hawaiian stilts. Up to 30 percent of the island's population readily exploited, and preferred, habitat conditions in the natural playa to man-made ponds (Table 2-4). Note the pattern of use shown on Figure 2-4, where an increase in stilts at Ohiapilo corresponded with a decline at the Molokai Sea Farms. These data represent a movement of birds to the newly inundated playa. Among the birds that moved during this period were the three banded stilts. In addition to the movement of birds, the number of stilts increased on the Molokai Playa from March through June (Figure 2-4, Table 2-4). This increase may be due to immigration from Maui (supported by the banded bird observations) and/or movement of stilts from other localities of Molokai to the playa.

Thus, the playa is utilized by stilts only when inundated, a limitation that can be enhanced through planned restoration activities. Another season's data will document if this pattern is repeated. The creation of seasonal and semipermanent wetlands at Ohiapilo will provide Hawaiian stilts with year-round, protected conditions for foraging, loafing, and nesting, thus reducing their dependence upon man-maintained ponds.

Movements of stilts among the islands of Maui Nui (Molokai, Maui, Lanai, and Kahoolawe) have been inferred by several authors.[3,7,8] The dispersal of Hawaiian stilts from Maui to Molokai was confirmed during this survey as three birds, banded at Kanaha Pond, Maui

Table 2-4 Molokai Playa Waterbird Surveys, Total Hawaiian Stilts

Survey date	Kakuaapuhi Fish Pond	Kaunakakai	Kaunakakai WTP	Molokai Sea Farm	O'oia Fish Pond	Ohiapilo	Total
12/22/94		3		74			77
1/26/95			13	67			80
2/22/95			5	23		16	44
3/30/95			7			47	54
4/11/95		5	20	25		29	79
5/30/95			21	30		10	61
6/27/95			24	31		5	60
7/18/95			17	42		4	63
8/29/95			17	55		5	77
9/28/95			14	71			85
Total		8	138	418		116	680

Source: Ducks Unlimited, November 1995.

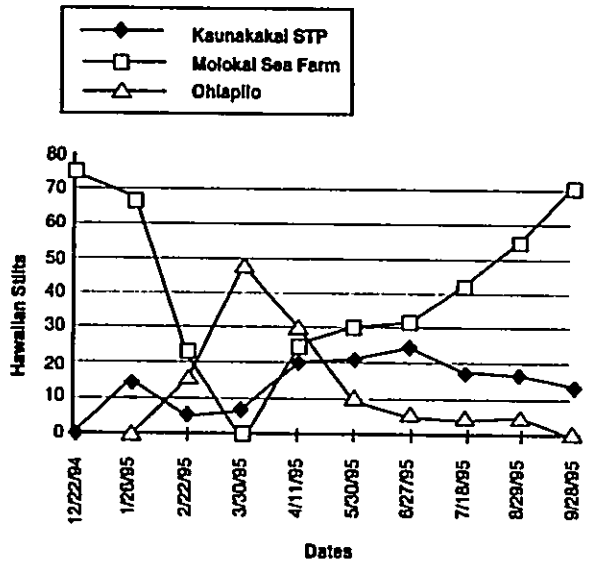

Figure 2-4 Hawaiian Stilt Patterns of Movement, Molokai Playa

(male alum/white: orange/green; female alum/white: orange/orange; male alum/white: white/red) were observed on the Molokai Playa and continue to move between the Molokai Sea Farm (17 observations), Ohiapilo (9 observations), and Kaunakakai WTP (2 observations). They did not return to Maui to renest but instead roamed the playa throughout the summer months and were still present as of October 1995.

Nesting attempts were confirmed at the Molokai Sea Farm where some chicks were reared, and at Ohiapilo where nests were abandoned due to the playa drying out. Stilts frequented Ohiapilo's small open ponds through August 1995 but did not attempt to renest. Predators observed at Ohiapilo included mongoose and dogs. Dogs were observed in March and April running through the open ponds of Ohiapilo chasing stilts. Planned habitat restoration is geared to provide open flats for nesting stilts as well as open water through August to provide foraging habitat for chicks and adults. Predator fencing, moats, and dense cover of pickleweed are designed to provide as many obstacles to predators as possible. Predator trapping and removal is planned as an ongoing management activity (see Chapter 4).

Hawaiian coots were not observed at Ohiapilo but were observed in small numbers at Kaunakakai WTP and Kaluaapuhi Fishpond (Table 2-3). The total number of coots counted represented 10 percent of the total number counted annually on Molokai (state waterbird survey results). Of more importance to coots are Kakahaia National Wildlife Refuge and Paiaioa Pond, both on Molokai's south coast. Planned excavations to open 1-acre ponds and channels will benefit coots. The coot's documented dispersal capabilities will allow for quick colonization of Ohiapilo after emergent vegetation responds to enhancement activities.

Ohiapilo was also important to migratory waterfowl and, as with stilt, migratory ducks utilized the playa in March and April prior to their departure to continental breeding grounds (Table 2-3). Ohiapilo was less important to migratory shorebirds, but the Molokai Playa did support numerous waders throughout the winter and spring (Table 2-5). Both ducks and shorebirds will benefit from planned excavations to open additional playa from its currently overgrown state.

Table 2-5 Molokai Waterbird Surveys, Total Migratory Shorebirds

Survey date	Kaluaapuhi Fish Pond	Kaunakakai	Kaunakakai WTP	Molokai Sea Farm	O'oia Fish Pond	Ohiapilo	Total
12/22/94				2			2
1/26/95			2	36		4	42
2/22/95			1	5		2	8
3/30/95			5	22			27
4/11/95		7	11	34		2	54
5/30/95			1	4			5
6/27/95				3			3
7/18/95				2			2
8/29/95			27	52			79
9/28/95			13	44		2	59
Total		7	60	204		10	281

Source: Ducks Unlimited, November 1995.

CHAPTER 3

ENHANCEMENT ACTIONS

The enhancement actions proposed for the Ohiapilo Wetland Project are discussed in this chapter. Information is presented on project objectives, construction techniques and considerations, and the delivery schedule for restoration work. The management plan is included in Chapter 4, and the monitoring plan is included in Chapter 5.

PROPOSED ENHANCEMENT SITE

The Ohiapilo Playa is located 2.1 miles northeast of Kaunakakai and is about 300 feet from the coast on the Island of Molokai, Hawaii. The main playa is approximately 60 acres. Elevations within the playa range from 0.2 to 2.8 feet above mean sea level (msl).

Several considerations were made in determining the final location of the wetland action. Habitat at Ohiapilo has lost, through time, those characteristics sought by waterbirds. Overgrown wetland basins, easy access by predators, limited nesting sites, and human disturbance have all contributed to the site's degradation. The proposed enhancement, followed by management, is designed to provide optimal foraging, loafing, and nesting habitat for Hawaiian stilt and Hawaiian coot. Migratory shorebirds and waterfowl will also benefit.

Habitat requirements for nesting and foraging by Hawaiian stilt will provide the primary criteria for marsh design and pond configuration presented below, including needs for nesting, foraging and loafing. The creation of semipermanent ponds on the site will benefit Hawaiian coot only if they are larger than 0.5 acre. The recolonization of the pond margins by emergent vegetation will provide the needed structure for coot colonization. Migratory waterfowl and shorebirds are also limited in the site due to its overgrown nature. Opening mudflats and water habitat will benefit migratory species.

The Ohiapilo Wetland Project mitigation design will enhance 25.4 acres of wetlands on the southern half of the Ohiapilo Playa (Appendix B, Sheet 2). This area was selected due to

its lower average elevation (1.7 feet msl vs. 2.5 feet msl in the north half) resulting in less fill removal, better accessibility for equipment needed for restoration, and providing a more protected location from human disturbance. The parameters listed above have defined the work area of the project, but the project design was driven by the biological considerations detailed in the Enhancement Site Assessment Report.[2] Providing habitat for Hawaiian stilt will create the desired, variable depths required to establish nesting and foraging habitat. Open water excavation was designed to minimize impacts to surface flow and to provide emergent wetland habitat for Hawaiian coot. Migratory waterbirds will benefit from both wetland restoration strategies. Some clearing of vegetation, including mangrove, fleabane, and *Batis* will be required to reach the desired acreage of enhancement and reduce future management problems associated with mangrove intrusion. Mangrove intrusion is a concern especially in the newly opened ponds and channels of the project. Finally, fencing will provide added predator control from dogs and mongoose.

Within the project areas, there are 3.5 contiguous acres of open mudflat and several other smaller bare areas. These areas have an average elevation of 0.64 feet msl. Some flats are at 0.2 feet msl where standing groundwater occurs nearly throughout the year. The balance of the restoration site is covered in *Batis*, and to a lesser degree mangrove, and Indian fleabane. These areas are above 0.8 feet msl. The remnants of a levee, which varies from 3 to 5 feet in height traverses the project area in a northeasterly direction. The levee is 1,470 feet long within the 25.4-acre restoration site.

The principal objective of the project is to protect and enhance 25 acres of wetlands on the playa. The final location calls for fencing 25.4 acres of the area. Within the 25.4 acres, 10.2 acres of open mudflats of various depths will be created. Added to the existing 3.5-acre flat, total available seasonally flooded mudflats will equal 13.7 acres. In addition, 2.9 acres of semipermanent and permanent marsh will be created. The balance of the 25.4 acres (8.8 acres) will remain in its current state. The 25.4-acre wetland will be protected by a 300-foot-wide buffer zone.

PROJECT OBJECTIVES

The following objectives are associated with the Ohiapilo Wetland Project (see Figure 3-1):

1. Create 1.7 acres of playa habitat at an elevation of 0.7 foot msl. This portion of the playa will flood from January through June 1 in normal rainfall years, thus providing seasonal wetland habitat. The existing playa (3.3 acres) has an elevation averaging 0.64 foot msl. Migratory waterbirds will utilize this habitat when flooded.

2. Create 2.3 acres of playa habitat at an elevation of 0.8 foot msl. This portion of the playa habitat will flood from January through May and will provide an interspersion of emergent vegetation with mudflats. This elevation is anticipated to become a primary nesting area for stilts. Migratory waterbirds will utilize this habitat when flooded.

3. Create 2.3 acres of playa habitat at an elevation of 0.5 foot msl. This portion of the playa will provide semipermanent wetlands that will remain inundated from February through July. These wetlands will provide additional foraging habitat for adult stilts and their broods. Migratory waterbirds will utilize this habitat when flooded.

4. Create 1.3 acres of open ponds to a depth of 0.2 foot msl. This portion of the playa will provide semipermanent wetlands that will flood from February through September. This area will provide open water to an average depth of 6 inches through the principle nesting and brood rearing period and will be utilized by stilt young and adults. Hawaiian coots may seasonally utilize this habitat during periods of deep (greater than 8 inches) inundation. Migratory waterfowl will utilize the deeper water for loafing and feeding habitat.

5. Create 1.6 acres of open channels to a depth of -0.1 foot msl. This portion of the playa will provide permanent open water throughout the year to variable depths

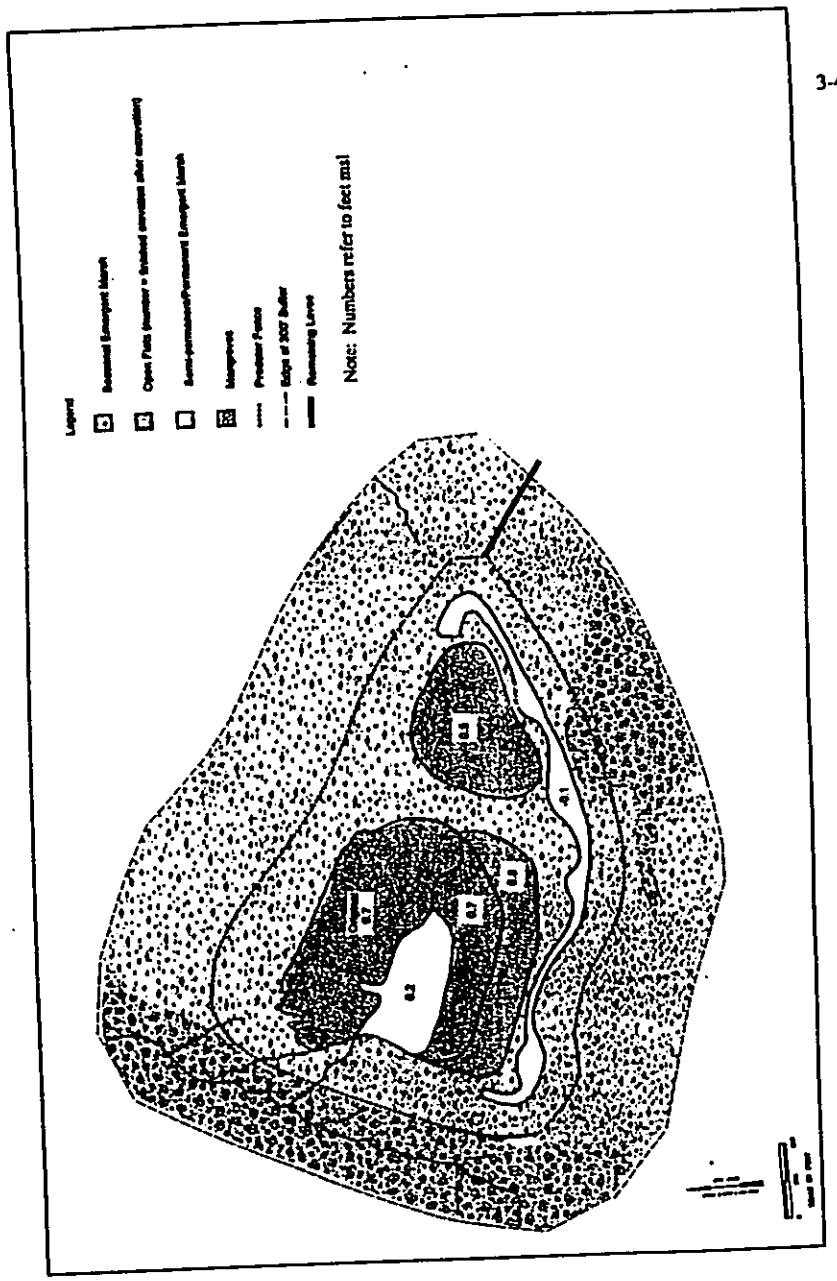

Figure 3-1 Created and Managed Habitat Types After Completion of the Project Objectives

of 6 inches to 2 feet. It will serve as a predator moat along the southern boundary of the wetland project. The excavation of this channel will be into the freshwater aquifer and, thus, will not be dependent upon surface inundation to maintain open water all year.

6. Remove the dike and restore 3.0 acres of seasonal wetlands. The removal of the dike upon completion of the project will restore seasonal habitat along the playa's northern boundary.

7. Remove 1.9 acres of mangrove. This is required to adequately protect the western boundary of the project area from mangrove intrusion. The management of this section will be required. Fencing is anticipated to reduce reintroduction to the wetland (see the management plan in Chapter 4).

8. Erect a predator-proof fence to enclose 25.4 acres of wetlands. The predator-proof fence will exclude dogs and limit mongoose from the interior of the project. Maintenance and predator removal within the fence boundary are anticipated to be required as a management action.

The modifications to the playa will create shallowly flooded flats that are exposed at differing water depths. This shoreline is essential to provide structure for invertebrates and increase bird use on the site. The planned excavations will create the following shoreline lengths:

Water depth, ft	<0.2	0.2	0.5	0.6	0.7	0.8
Feet of shore	1850	600	1150	1800	2250	1850

The site plans, included as Appendix B, include the following:

- Sheet 1: Original Topography
- Sheet 2: Plan of Mitigation
- Sheet 3: Crossections Lines A to F
- Sheet 4: Crossections Lines G to M
- Sheet 5: Proposed Temporary Haul Roads and Fence Detail

CONSTRUCTION CONSIDERATIONS AND TECHNIQUES

Site-specific considerations associated with the Wetlands Enhancement Plan (WEP) and techniques used during construction are discussed below.

Special Considerations

The area on which the project is located is designated as jurisdictional wetland by the Corps of Engineers. There will be no fill or waste material placed on the portion so designated. Temporary haul roads will be required to allow for planned playa excavations. Excavation will be permitted within the wetland but spoil will be removed. The area so designated will be removed upon completion of the excavation.

Due to the high water table, the entire project area will probably not support heavy rubber tire equipment. Light equipment will be needed as well as supports for equipment such as mats. A light drag scraper may be tried for the purpose of stripping the pickleweed on a portion of the site where the elevation is at or above 1.5 feet msl.

Due to limitations by flooding and nesting attempts by the endangered Hawaiian stilt, the habitat construction window will be from July 1 through November 1 of any given year. This period may be extended, but only after biological evaluation of stilt occurrence on the site.

A qualified biologist will provide supervision during construction to avoid potential impacts on endangered waterbirds. Clearance to proceed with construction will be given by a qualified biologist after it is determined that no stilt nests are present.

Mobilization of equipment will be a logistical hurdle due to the isolation of the site and lack of suitable equipment on the Island of Molokai. As part of the bid package, prospective contractors will need to include mobilization into their overall bid. This bid item will compensate the contractor for move-in and move-out costs. Payment could be in two increments: the first half at the time of the contractor's first estimate; the second half on the final estimate and after the work is approved.

Construction Techniques

The project site, as indicated by previous discussion, does have characteristics which must be addressed during construction. The various techniques that will be used during construction are discussed below.

Haul Road. A temporary haul road will be needed from the levee to Hoawa Road, a County of Maui (County) maintained dirt road. Hoawa Road is located on the north side of the project area (Appendix B, Sheet 2). Sheet 5 of Appendix B depicts the proposed location of all haul roads to be built on the site. These roads are necessary to complete the planned playa excavations and material removal from the site. The existing levee can be easily modified to accommodate equipment. Material for these can be obtained from the levee top and from excavation sites which will be cut to elevation 0.5 foot msl and from the east ends of the areas cut to elevations 0.7 and 0.8 foot msl. All haul road materials will be removed upon the completion of the restoration.

Material Disposal/Storage Site. The County anticipates abandoning a portion of Hoawa Road on the north side of the project area. This abandonment will permit the temporary placement of material until the material is dry enough for the County to haul it off site. The location of the disposal area is depicted on Sheet 2 of Appendix B.

Clearing. Site clearing will consist of removal of pickleweed and other organic materials covering areas to be excavated. It is estimated that clearing to 0.5 foot msl from ground surface will be required for pickleweed removal. The total area involved is 8.2 acres.

There will be 1.9 acres of mangrove on the west side of the project area to be removed. Mangroves will be cut by chain saw leaving the stumps. Care will be exercised to clean up all mangrove radicles (seeds) from the area. Cut trees will be removed from the site. Radicles from the mangrove areas will be carefully picked up to prevent dispersal into the project area. Patches of mangrove and Indian fleabane covering 1.17 acres exist along the existing levee and to the east of the 0.5 foot msl elevation site within the project area. These woody plants will be cleared and the roots grubbed. These trees will also be removed from the site with care being taken to remove all mangrove seeds. Total clearing will create 6,613 cubic yards of material.

Organic material removed from the site will be deposited away from the wetland area on the abandoned road. Eventually, the County will remove the dried material and dispose of it at the County landfill.

Excavation. Excavation will be to lines and grades as staked in the field. The yardage for the various features is 7,782 cubic yards in new wetland areas. The moat will have 3,428 cubic yards of excavation and the existing levee and haul road removal is estimated to total 4,349 cubic yards. These quantities may change when final construction staking is completed. Material excavated will be removed from the wetland area and deposited at the designated waste area along Hoawa Road.

As groundwater is encountered during excavation, and material from the excavated areas becomes too wet, it will be hauled off the site and spread along one side of the disposal site as designated by the County Road Department. This material may be placed on top of the stripped pickleweed. The use of mats to support equipment will be required even during the dry season for a major portion of the excavation.

Upon completion of excavation and all project work, all haul roads including the levee will be removed. Material will be hauled from the site, stockpiled, and dried on the existing road north of the project area, then removed and transported to the County landfill for disposal.

The moat will be excavated to a depth of -0.1 foot msl and will have a 15-foot-wide bottom width extending to as much as 35 feet wide in some areas (Appendix B, Sheet 2). The ocean side of the moat will have a side slope of 2:1, and the interior margin of the moat will have a side slope of 15:1. Total yardage is estimated to be 3,428 cubic yards.

This excavation depth and profile will create open water with an average depth of 0.5 foot at low water (assuming a water elevation of 0.4 foot msl). Depth will be greater during periods of inundation. During periods of drought, water elevations may subside to elevation 0.2 feet msl as it did in September 1995. The location of the moat and depth, which will not impact groundwater, will not impinge on the upslope groundwater hydrology of the site.

Dike Removal. The existing levee removal should be the last item of construction. This levee, if stripped, will serve as an access road to the sites to be excavated. The approximate

2 feet of material in the top of the levee, or to an elevation which is stable and not wet, could be used to construct temporary haul roads described below. The levee will permit partial access to the west end of the project area.

Predator Fencing. A predator fence will be installed around the site. It will be approximately 4,700 feet in length and consist of galvanized, PVC or other durable plastic coated fence. The fence will be 6.0 feet high and with a minimum 1.25-inch mesh. All material, including the fencing, bracing bands, tension bands, top and bottom wire and posts will be so coated. The path of the fence will be set by staking.

Fence posts will be 9 feet long and set 3 feet in the ground on 10-foot centers. Tension wires will be run from every 10th post to the one behind and the one ahead. A post will be set 10 feet out at right angles to this alignment at every 10th post with diagonal wire bracing in both directions and a top rail to it. Corner or tension posts (1.88-inch diameter) will be set every 1,000 feet or where the fence alignment bends with the corner post. The brace post will be on each side and no more than 10 feet away from the corner post. The brace post will be supported with guy wires from top to bottom from the corner post to the brace post and from the top of the brace post to the bottom of the corner post. Fencing will have no more than 1.25-inch openings between wires and will be 9-gauge wire coated with PVC.

Corner posts will be located along the alignment where the fence makes a bend of 30 degrees or more and will be set in concrete. Fencing will be installed such that at least 6 inches are below the ground surface in a trench which has been excavated to a 6-inch depth. The trench will be backfilled to ground surface after inspection and acceptance by the engineer. The fencing material will extend a minimum of 5.5 feet above ground.

Predator Removal. Fencing for control of dogs and mongoose will be an effective predator control mechanism. Still, provisions for predator removal must be made. As discussed in Chapter 4, predator control does not need to be an intensive year-round effort. Predators will be removed from the interior of the fence prior to the onset of the breeding season for stilts and coots. After project completion, the area will be heavily trapped for 3 weeks with predators removed. After this initial removal period, a specific schedule for trapping will be followed (see Figure 4-2).

IMPLEMENTATION SCHEDULE FOR RESTORATION WORK

The project will be delivered in phases of restoration. A start date of July 1996 is assumed at this time through construction activities will likely be delayed until the summer of 1997 because of the need to complete the local environmental review process and to obtain the necessary permits and approvals from local and state agencies. Specific work activities include the following:

1. Construction of haul roads—Begin work in July 1996, expected to be done concurrent with clearing and grubbing. Work will be completed by September 30, 1996.

2. Clearing and grubbing—Begin work in July 1996. All clearing and grubbing will be completed by September 30, 1996.

3. Mangrove removal—Hand removal to be done after haul roads are built to allow for material removal. Work will begin in September 15, 1996, and be completed October 30, 1996. This work will be done concurrent with excavations.

4. Excavation of playas—Begin work as areas are opened by haul roads. Anticipate begin removal of 0.5-foot msl playa zone (fill will be temporarily used as haul road) August 15, 1996. All 0.5-, 0.7-, and 0.8-foot msl zone excavations will be completed by October 15, 1996.

5. Excavation of deep water habitat and moat—Concurrent work with playa excavations using different equipment. Moat and pond excavation will begin September 15, 1996, and be completed by November 1, 1996.

6. Fence construction—Begin construction of fence with hand crews after all mangrove have been removed. This work will begin October 1, 1996, and will be completed November 1, 1996.

7. Haul road and dike removal site cleanup—Remove all fill and clean the site by November 15, 1996.

The construction period thus is expected to be July 15 through November 15. The period may be extended if (1) weather conditions allow for continued work or (2) biologists clear the project extension from impacting stilts. Work may continue as long as biologists maintain that stilts are not being impacted.

CHAPTER 4

MANAGEMENT PLAN FOR THE OHIAPILO WETLANDS

The success of the Ohiapilo Wetland Project is mostly dependent upon vegetation response to newly created hydrologic conditions. The construction phase will determine those conditions, however, planned management will be required in order to retain the characteristics of the wetland.

The project was designed to minimize the need for management, and the final degree required will be determined by monitoring the revegetation of the marsh (Chapter 5). Nonetheless, the recommendations included in this chapter will help Maui County (County) address anticipated management needs which include vegetation control, predator control, and control of human disturbances.

VEGETATION CONTROL

Specific design features in the Ohiapilo Wetland Project are expected to minimize the need for vegetation control. However, provisions for control of pickleweed, mangrove, and emergent vegetation are still important. Control of these vegetation types are discussed below.

Pickleweed Control

The invasion of pickleweed into the lowland, alkali wetlands of Hawaii has created a considerable loss of "available" habitat for Hawaiian waterbirds, particularly stilt. If left unchecked, pickleweed can encroach and eliminate open mudflat habitat. At Ohiapilo, elevations below 0.7 foot mean sea level (msl) are deprived of pickleweed. The cause of this is uncertain but two theories prevail:

1. The inundation period at lower elevations limits redox (oxygen and nutrient uptake) potential for the plants.

2. A high water table creates saturated soil conditions, raising alkalinity and reducing redox potential in plants.

Although pickleweed redox has not been studied in Hawaii, several other alkali plants have been studied, including mangrove. Mangrove has narrow growing parameters and suffers a loss of redox in soil and alkali conditions in the Ohiapilo playa. This may be the reason that mangrove has not fully invaded playa habitats in Hawaii. The tree seems limited to waterways that remain under tidal influence where flushing actions assist the plant's nutrient uptake. Pickleweed may be limited in a similar way, being almost excluded from any elevations where soils remain saturated and inundation periods are long. This limitation of growth has been observed on other Molokai, Maui, and Oahu coastal flats.

With this in mind, the restoration actions on Ohiapilo recreate elevations below 0.7 feet msl. Within these sites, pickleweed should not pose a problem in reestablishing itself. Monitoring stations will document regrowth in the 0.5 foot msl to 0.7 foot msl playa for up to 5 years. If interspersion exceeds 50 percent, pickleweed will have to be controlled either through mechanical or approved chemical means. Re-establishment of pickleweed in the 0.8 foot msl zone created by the project is expected to revegetate to a desired interspersion of 50 to 70 percent. This interspersion should be reached in 3 years, based on regrowth patterns seen on manipulated wetlands at federal refuges in Hawaii. The excavation to elevation 0.8 foot msl cannot be practically done to the 0.1 inch so some low and high zones are expected. The low zones should remain open, the high zones should recover in pickleweed. This interspersion will provide perfect nesting conditions for Hawaiian stilt. For example, at Nuupia Ponds, Oahu, the U.S. Marine Corps have managed pickleweed habitat to create just these conditions, and the area is the most important nesting area for stilts in Hawaii. Kealia Pond NWR on Maui also has areas of interspersed pickleweed and mudflats on the Maalaea Flat. Maalaea Flat is the single most important nesting area for stilt on that refuge. The refuge does not need to manage the Maalaea Flat as low elevations and frequent winter inundation appears to limit pickleweed. These are the habitat conditions we are striving to create at Ohiapilo.

Nonetheless, the County will monitor interspersion in the 0.8 foot msl zone for 5 years. The project is designed to minimize the need for management. However, if interspersion exceeds 75 percent, the County will seek to control regrowth through mechanical or approved chemical treatments.

Mangrove Control

Mangrove control is a key consideration for the success of the Ohiapilo Wetland Project. The removal of mangrove in the interior of the project site must be followed up in order to reduce the number of seedlings germinating on the site. The specifications of mangrove removal is to remove and limit, to the best of the contractor's ability, the dispersal of radicles (seeds) and seedlings. In addition, the creation of semi-permanent and permanent wetlands in the project area will provide shoreline habitat that can support mangroves, particularly the moat. Efforts to police and remove mangrove radicles from the shore of the canal will be an ongoing effort, one that should reduce with time.

The County will provide for hand crews to provide immediate post-construction removal of radicles and seedling mangroves. The immediate cleanup will then be followed by quarterly site visits to remove mangrove seedlings and radicles that have dispersed into the wetland. The erection of the fine mesh predator fence will provide a barrier to the dispersal of mangrove seeds into the playa during flood events. The County will remove seeds and seedlings that have accumulated along the western fence line. Quarterly inspections with appropriate cleaning efforts should eliminate mangrove from the wetland interior in two years. After this period, annual maintenance of canals, open water, and the fence line will be conducted to keep the wetland free of mangrove.

Emergent Vegetation Control

The creation of semi-permanent and permanent wetlands in the marsh will create new hydrologic conditions for plant growth at Ohiapilo. Where freshwater currently exists along the dike (in borrow channels), makai, spike rush, duck weed, and other emergent species occur. These emergent plants are expected to spread and populate the shore and slopes of the moat and open water ponds in the project. The desired interspersion within the moat and pond should not exceed 75 percent. When it does, mechanical or approved chemical methods must be used to reopen the wetland. The design of the moat is such that the shoreline that is most accessible to equipment is cut to a 2:1 slope (Figure 4-1). Mechanical removal of vegetation of the moat to a width of 20 feet can be easily accomplished with an excavator working on mats. The interior shoreline is designed to provide a slope of 15:1 and will never be manipulated, thus it will be

covered with emergent growth (Figure 4-1). The interior shoreline also widens and narrows to provide for thicker emergent habitat.

Removal of vegetation will not impact the invert of the canal, which will be set at -0.1 feet msl. To make the maintenance cost-effective, the County will side cast the vegetative materials, sediments, and root masses along the canal edge. Organic breakdown of this material will be rapid in the Hawaiian climate. Figure 4-1 provides a profile and dimensions for moat maintenance, locating the equipment path, and disposal area. Providing for a cost-effective method for material disposal is essential in order to maintain desired interspersion, high bird use, including Hawaiian coot nesting habitat, and effective management.

The growth rate of emergent plants will be determined during the monitoring phase. Once this is learned, biologists can determine the timing between maintenance actions. It is anticipated that cleaning will need to take place every 3 to 5 years. An access gate will allow for equipment entrance and egress.

PREDATOR CONTROL

The removal and control of predators is essential to attain the goal of providing secure nesting habitat for waterbirds. From field observations conducted by Ducks Unlimited (DU) biologists from 1994 to 1995, dogs present the highest disturbance and predator potential in the playa. The predator fence is designed to eliminate this problem. If a dog does get into the wetland it must be removed immediately.

In addition to dogs, mongoose are present on Molokai and have been seen along the perimeter of Ohiapilo. The mesh size for the fence should minimize the movements of mongoose into the wetland. In addition, a 50-foot buffer exists inside the fence. This buffer will be allowed to become overgrown in pickleweed thus creating another barrier to mongoose. Along the south end of the project the predator moat adds another barrier to mongoose.

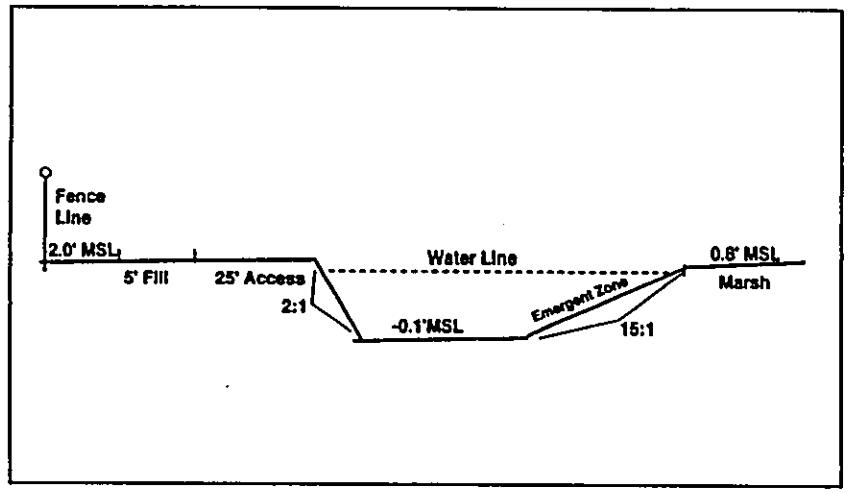

Figure 4-1 Profile of Moat

Still, mongoose do find their way into the wetland and trapping and removal will be essential. Live traps will be set and monitored. An effort to trap rats to assess their numbers in the marsh will be conducted within the marsh proper.

Predator control does not need to be an intensive year round effort. If predators are removed from the interior of the fence prior to the onset of the breeding season, stilts and coots should be able to successfully rear their young. After project completion, the area should be heavily trapped for 3 weeks, with predators removed. After this initial removal period, the trapping schedule illustrated on Figure 4-2 will be followed. This effort will include heavy trapping for rats and mongoose during March and light trapping in October. Dog monitoring and fence maintenance will be on ongoing effort. This calendar can be modified once the wetland is functioning after restoration.

Figure 4-2 Calendar for Trapping and Predator Control.

	J	F	M	A	M	J	J	A	S	O	N	D
Light Trapping Effort												
Rat - 3 days/mo.										—		
Mongoose -3 days/mo.										—		
Heavy Trapping Effort												
Rat - daily for 3 weeks			—									
Mongoose - daily for 3 weeks			—									
Dog monitoring	—	—	—	—	—	—	—	—	—	—	—	—
Fence Maintenance	—	—	—	—	—	—	—	—	—	—	—	—

Several agencies have been very successful in predator control on refuges in Hawaii. The U.S. Fish and Wildlife Service (FWS) has trapped and removed dogs, mongoose, and rats on refuges on Oahu, Kauai, and Molokai. In addition, U.S. Department of Agriculture (USDA) Animal Damage Control specialists can be contracted to conduct intensive efforts on a seasonal basis. The State Division of Forestry and Wildlife (DOFAW) has also successfully trapped and monitored predator levels on Kanaha Pond, Maui. The precise techniques for control will be designed by control experts after the project is completed.

FENCE MAINTENANCE

Since the fence is the primary deterrent for dogs and mongoose in Ohiapilo, its maintenance is essential. The materials for the fence are designed to minimize corrosion due to the harsh soil and salt air conditions that prevail at Ohiapilo. Still, periodic inspections and repairs will be required. In addition, vandalism may become a problem.

The County will monitor or cause to be monitored the condition of the fence. Repairs will be conducted in a timely manner as required. Materials for repair should be compatible, and meet, the original design specifications provided in the WEP.

HUMAN DISTURBANCE

Besides predator control, human disturbance, particularly in the breeding season may present a problem for successful mitigation. The project design, location of breeding sites (in elevation 0.8 and 0.7 feet msl), moat, and fence will help in limiting people access. In addition, the fence is placed 50 feet from the edge of the wetland site, thus allowing for dense pickleweed growth which can also act as a deterrent. Vandalism, directed to gates and fence lines, will have to be corrected. Fence lines will require periodic inspections. Trapping crews can provide this inspection service. Trash cleanup will be conducted as needed and effort will be driven by need. Illegal dumping may pose a problem for access roads and gates. The County can deter this through exterior fencing or other road blockages during the construction phase.

CHAPTER 5

MONITORING PLAN FOR THE OHIAPILO WETLANDS

Compensation wetlands will be monitored in conformance with the Consent Order to ensure that success criteria are met. Monitoring and maintenance activities shall be conducted for at least 5 years. These activities may cease at the end of 5 years only if the success criteria have been met in each of the last 3 years of monitoring. Otherwise, the monitoring and maintenance shall continue until the success criteria are met for 3 years in a row. Monitoring is designed to determine that:

- Naturally-occurring water levels are providing proper inundation of the mitigation site.
- The mitigation site has developed a diverse emergent plant community, including associated invertebrates.
- The mitigation area supports native waterbirds, migratory waterfowl, shorebirds, and other wildlife.

FLORA AND FAUNA MONITORING

Photo points will be established and photographs will be taken biannually to document seasonal changes within the wetland and confirm vegetation changes as a result of the mitigation work. Baseline biological data accumulated to date will be used to compare the development and establish success criteria of the mitigation area.

SUCCESS CRITERIA FOR MITIGATION WETLAND

Maui County (County), or a qualified consultant to the County, will establish a baseline inventory of the mitigation wetland site, documenting vegetative species occurrence after construction. A presence/absence, nested plot survey will be conducted using a line transect method through wetland habitat that provides multiple samples of each elevation in the site. The plant species list of Ohiapilo Wetland will be used as the baseline for expected species.[2] The variable depths created from this project should create conditions for high vegetative diversity. There are few adequate studies documenting response of wetlands to variable water depths in Hawaii, and there are none for coastal playa habitats. As such, there is no baseline information to draw comparative success criteria. Maintaining open flats, desired interspersion, and bird use are, therefore, going to be monitored and annually reported until said time that qualified biologists determine the area is successfully functioning both biologically and hydrologically.

The wetland mitigation will be determined successful when the following conditions are met:

1. Surface flows on the site must be adequate to inundate the mitigation site to design specifications.

2. Vegetation response to hydrology should result in species diversity equaling 80 percent of the wetland species recorded in Ohiapilo Playa.[3]

3. Interspersion of flats under 0.7 feet msl will not exceed 50 percent. Interspersion on flats excavated to 0.8 feet msl will not exceed 75 percent. Interspersion of open water habitats will not exceed 60 percent.

4. Mangrove intrusion will be controlled with no established trees allowed to grow in open water areas or marsh interiors.

5. The establishment of Hawaiian stilts as a permanent resident of the marsh, including successfully established breeding population. Stilt use should exceed 2,500 bird use days (10 stilts times 250 days).

6. Continued and increased use of the playa by migratory waterbirds. In average rainfall regimes, waterbird use should exceed 10,000 bird use days (100 birds per day times 100 days) per year.

MONITORING TECHNIQUES

The following will provide a baseline for the types of monitoring that is needed to address success criteria. The exact protocol and techniques should be formulated after the restoration is completed and biologists have had an opportunity to adapt known survey techniques to the site.

Hydrology

Hydrology goals will be monitored using a battery of three surface depth gauges. After project completion, readings will be taken six times per year during the months of January, March, May, July, September, and November. Because inundation depth and periodicity will be determined by storm events and will not be under management of humans, depths will vary from year to year. As designed, the project should not impact surface flow to the site. These data will be summarized annually.

Vegetation Transects

Vegetation transects will be permanently established in the wetlands. Transects will be randomly generated to sample different excavated elevations in the wetland. Along each transect, stations will be established every 15 feet. Habitat sampling should exceed 30 stations per type (e.g., open playa, open water, and pickleweed/mudflat). Vegetation surveys will be conducted once per year.

Plant Species Frequency, Composition, and Interspersion

Species composition will be determined once per year using a ranked nested plot survey technique. On each permanent transect and at each 15 foot station, a one square meter plot will be assessed for species composition (ranked for abundance) and percent cover. The total number of samples for each habitat type will then be statistically summarized and compared from year to year. From this data, frequency of occurrence, interspersion, and co-dominant species can be ascertained. The inventory will be conducted each year in order to document the vegetation response to the new hydrologic conditions on the site. Plant species determination will be accomplished in the field, but those species that are unidentifiable will be collected and pressed for identification in the laboratory. A complete species list will be compiled each year. Vegetation samples will be taken along permanently established transects.

The exact frequency of occurrence cannot be determined in advance due to subtle differences in soil type and existing seed bank. Some wetland plant species recruitment takes several years. Since this project will allow for passive wetland plant regeneration, some of these slow spreading species may become established outside the monitoring period.

WILDLIFE USE

Activities necessary to document wildlife use of the site are discussed below.

Waterbird Surveys

An inventory will be taken monthly for the duration of the survey period. Data from this survey will be used to document all native and migratory waterbird use of the mitigation area. The wetland will be surveyed using a point-count method and all birds observed from established viewing points will be counted and identified to species. Relative abundance codes can be derived and used for trend analysis. An attempt will also be made to classify habitat use (activity patterns) in the mitigation site. In addition, bird use days can be calculated for each species.

Bird use days equals the average number of birds utilizing the marsh multiplied by the number of days on the site.

> Example: On February 1, 30 stilts, and March 1, 35 stilts were counted. The bird use days would equal the average number of birds (30+35/2 = 33 birds) multiplied by the number of days in the period (in this case = 29 days) which equals 957 stilt use days.

A species list for all birds identified on the wetland will be compiled.

Stilt and Coot Nesting

Monthly surveys will determine the extent of nesting and fledgling success on the site. Monitoring will begin in January each year noting the following behaviors and activities:

- Courtship - Stilt and coot courtship behaviors including chases, territorial squabbles, pair formation and affirmation. The number of pairs of stilt and coots are nesting on the site will be determined.
- Nest building - Nest building refers to gathering of materials for nest platforms (coots and stilts). Surveys will include mapping in the playa where the nest is placed and the number of eggs at full clutch. If the nest and eggs are lost (perdition), the cause will be determined if possible.
- Fledgling success - Fledgling success refers to the number of chicks that survive to fledge (flight attained). Pairs and brood development will be monitored. If mortality occurs, the cause will be determined if possible.

The preceding information can be used to develop recruitment and survivorship indices for the wetland. If renesting attempts occur, the preceding information will be redocumented. The data from these surveys will be summarized annually.

Predator Monitoring

Predator monitoring will determine if continued trapping is necessary. Data for trapping success (number of animals captured divided by the number of trap nights) will be determined for each species of small mammal. These data can provide some indices on density of rats and mongoose and whether trapping reduces the number of animals captured.

Avian predation, if documented, will be monitored closely in case some preventative measures need to be taken. Avian predation is expected to increase after the first year of nesting by stilts and coots. Night-herons are of particular concern and, since they forage during twilight, they may be hard to monitor. Predator data will be reported annually.

CHAPTER 6

CONTINGENCY PLAN

The Administrative Order on Consent (Consent Order) requires Maui County (County) to include a contingency plan in this Wetlands Enhancement Plan (WEP). The purpose of the contingency plan is to describe the measures to be implemented to select an alternative enhancement site in the event the WEP as proposed does not meet the specified performance criteria. Discussion is included below on the County's approach for selecting alternative enhancement sites and a schedule for submitting a new WEP.

SELECTION OF ALTERNATIVE ENHANCEMENT SITES

The EIS for the Kalamaula Landfill Closure Project include an identification and analysis of alternative mitigation sites.[11] In addition to the Ohiapilo Pond site, the EIS included the Kaluaapihi Fishpond, the Molokai Sea Farms, Iloli Mudflats, and a site near Kamehameha Coconut Grove. All sites were within about 3 miles of the Kalamaula Landfill. Representatives of the U.S. Fish and Wildlife Services (FWS) and the U.S. Environmental Protection Agency (EPA) were included in the evaluation of alternative sites and selection of the preferred site (Ohiapilo Pond).

If it became necessary to select another mitigation site, the County anticipates that a process similar to that referred to above for selection of the Ohiapilo Pond site would be used. A consultant would be retained to work closely with the FWS and EPA to identify and evaluate alternative sites. One or more of the previously-identified sites would likely be considered, but the County anticipates that a new siting study would be conducted. Once a new site has been selected, a number of work activities would need to be conducted as follows:

Enhancement Site Assessment Report (ESAR)	A new ESAR would need to be prepared to document site conditions.
WEP	A new WEP would also need to be prepared which describes the preferred enhancement design.

Environmental Review — Pursuant to State regulations, environmental review of the WEP would need to be conducted. It is assumed an Environmental Impact Statement (EIS) would be required.

Permitting — Local and State permits and approvals would be obtained. The specific permits and requirements would be dependent on the location of the new mitigation site.

Construction — Once the above activities have been completed, construction activities could be initiated.

REPLACEMENT SCHEDULE

The mitigation site replacement schedule is shown on Figure 6-1. This schedule is approximate and is largely based on the time requirements for the existing WEP for the Ohiapilo Pond site. As can be seen from the figure, about 3 years would likely be needed to identify, evaluate, and construct a new mitigation site.

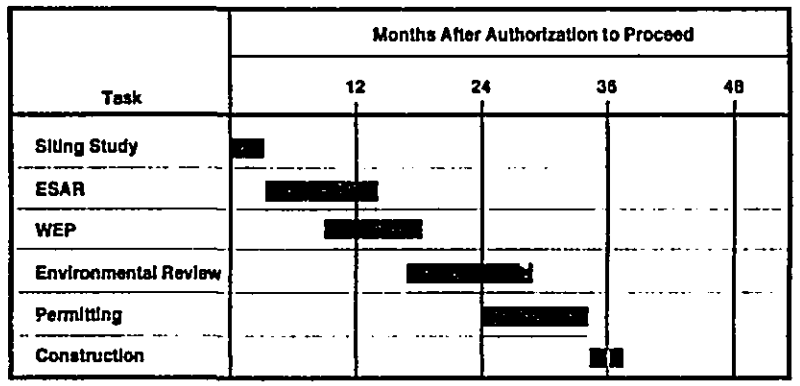

Figure 6-1 Mitigation Site Replacement Schedule

APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

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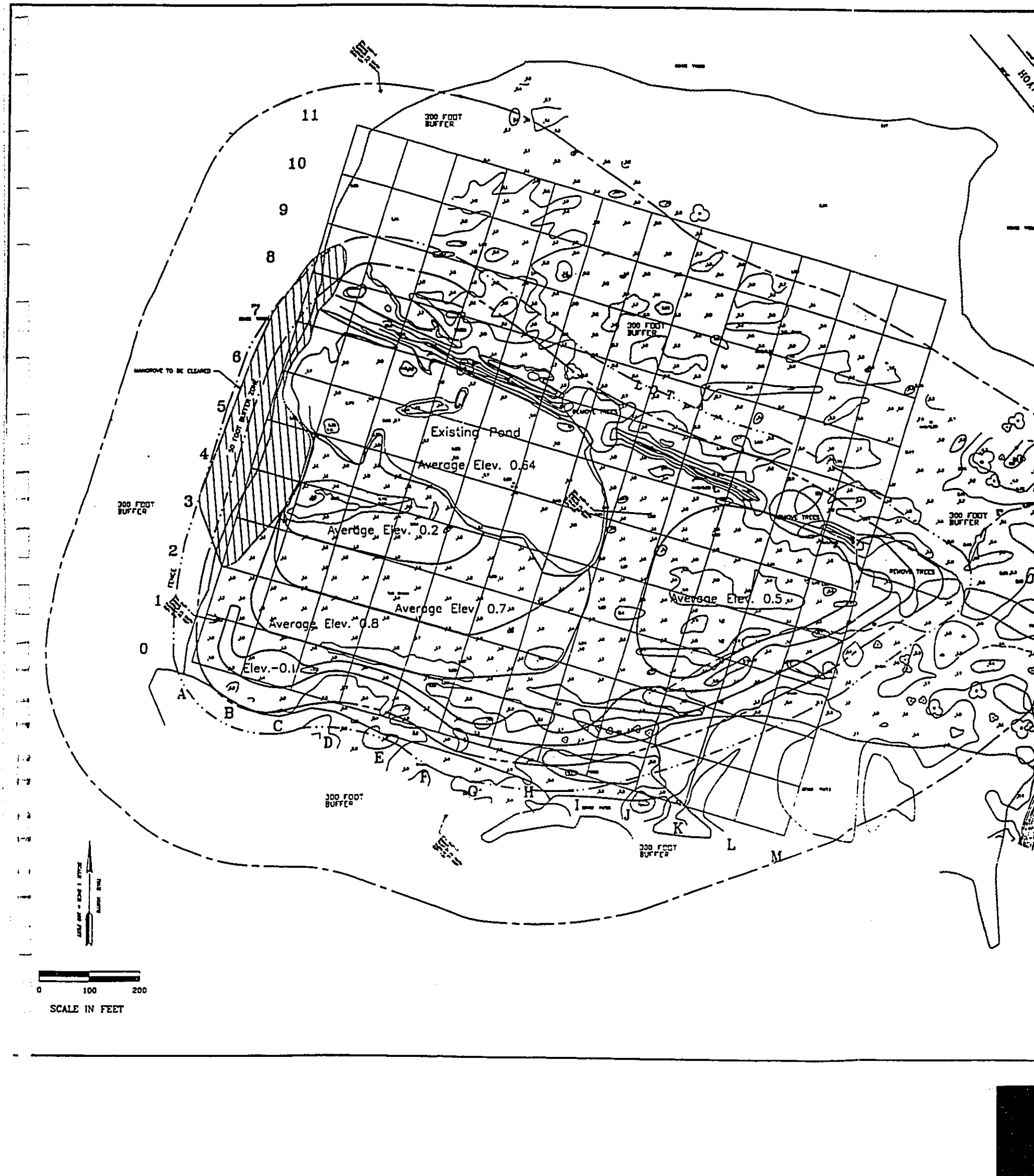
Appendix B

Proposed Mitigation Design


300 FOOT BUFFER
MANGROVE TO BE CLEARED
50 FOOT BUFFER ZONE
Existing Pond
Average Elev. 0.64
Average Elev. 0.2
Average Elev. 0.7
Average Elev. 0.8
Average Elev. 0.5
Elev.-0.1
REMOVE TREES
11
10
9
8
7
6
5
4
3
2
1
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100
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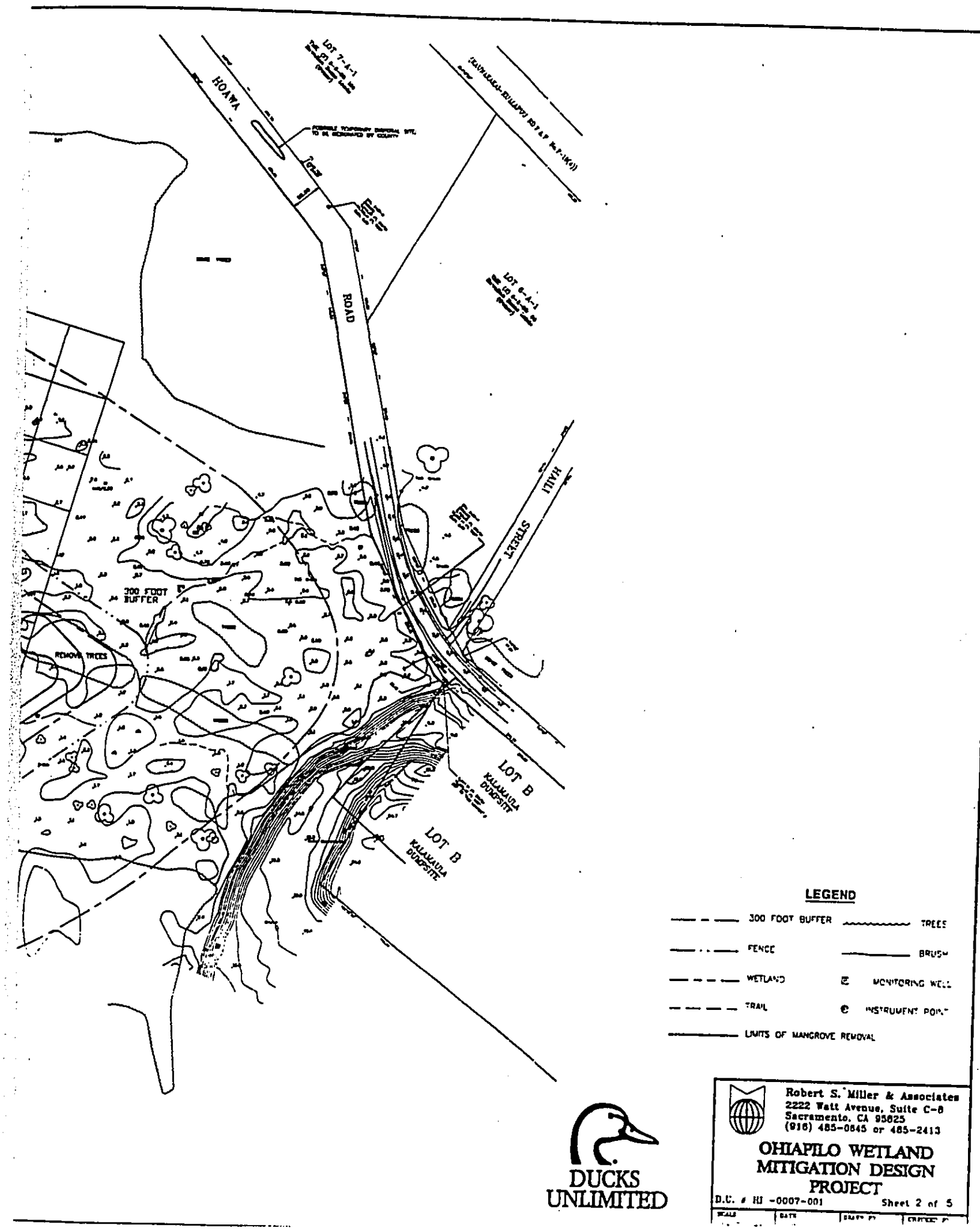
SCALE IN FEET



DUCKS UNLIMITED

Robert S. Miller & Associates
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(916) 485-0845 or 485-2413

OHIAPILO WETLAND MITIGATION DESIGN PROJECT

D.U. # HI -0007-001

Appendix C

Letter from Department of Land and Natural Resources, State Historic Preservation Division

J. CAYETANO
OR OF HAWAII

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

MICHAEL D. WILSON, CHAIRPERSON
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LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

1848-01/6
1848-06/1

July 8, 1996

LOG NO: 17521
DOC NO: 9607SC08

Mr. Francis Eble
Garcia and Associates
1051 Keolu Dr., Suite 104B
Kailua, Hawaii 96734

Dear Mr. Eble:

SUBJECT: **Historic Preservation Review — End of Data Recovery Fieldwork at 'Ohiapili Fishpond,**
Kalamaula, Moloka'i
TMK: 5-2-11: 1

The following assessment is based on file records maintained at the State Historic Preservation Division (SHPD) and a meeting between yourself and Sara Collins of our staff on 1 July 1996.

Our office approved the plan for archaeological data recovery work at 'Ohiapili Fishpond in December 1994. Garcia and Associates (GANDA) carried out the field work in May 1996. In the interim, through consultation and agreement between GANDA and the SHPD, two elements of the data recovery plan was changed: instead of 8 - 10 PVC and 1 - 2 Livingston cores, all core samples were collected with the modified Livingston corer. This change was also made with the approval with Dr. Jerome Ward, the paleoenvironmental consultant to GANDA who is processing all core samples. In addition to the core samples, data recovery fieldwork at 'Ohiapili Fishpond included a trench through the *makai* sand dike in order to determine its origin and possibly locate the original fishpond wall. According to profiles you provided at the July 1, 1996 meeting, it appears that the trench crosscut the original fishpond wall. Additional shovel probes, extending about 50 - 75 meters west from the trench revealed further evidence of the fishpond wall. Currently, the core samples are undergoing analysis and additional samples have been sent for radiocarbon assay; results are expected in August 1996.

In view of these facts, we can conclude that the data recovery fieldwork has been successfully executed. Thus, land altering actions can proceed, with the understanding that data recovery work will not be fully completed until an acceptable data recovery report is received by our office.

However, since the Wetlands Enhancement Plan currently calls for the installation of an access road around the perimeter of 'Ohiapili Fishpond, and the road's proposed course seems to follow that of the original fishpond walls, we recommend that on-site monitoring be conducted by a qualified archaeologist during ground-disturbing activities in the vicinity of the *makai* sand dike and *mauka* historic sand levee, so the pond wall's location can be documented. This should be able to be achieved at a minimal cost. Prior to beginning construction, an acceptable monitoring plan (scope) needs to submitted to the SHPD to review and approve. Alternatively, we understand that your client may consider altering the proposed route of the access road so as to avoid impacts to the sand dike and historic sand levee. If this should be the case, monitoring would not be needed, and we would certainly support such passive preservation efforts, and be pleased to assist in any way.

Should you have any questions, please feel free to call Sara Collins at 587-0013.

Aloha,

for DON HIBBARD, Administrator
State Historic Preservation Division

SC:jen

cc: Mr. Paul Scheidegger, Brown & Caldwell Consultants, 3480 Buskirk Avenue
Pleasant Hill, CA 95423