MAUNAWILI DITCH IMPROVEMENTS

FINAL ENVIRONMENTAL IMPACT STATEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER AND LAND DEVELOPMENT

FINAL

ENVIRONMENTAL IMPACT STATEMENT

FOR THE

MAUNAWILI DITCH IMPROVEMENTS

LOCATION: Maunawili Valley, Koolaupoko
Island of Oahu
State of Hawaii

PROPOSING AGENCY: Division of Water and Land Development
Department of Land and Natural Resources
State of Hawaii

ACCEPTING AUTHORITY: Governor
State of Hawaii

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RESPONSIBLE OFFICIAL: _____
SUSUMU ONO, Chairperson of the Board
Department of Land and Natural Resources
State of Hawaii

JUN 1984

SUMMARY SHEET

The Waimanalo Watershed Plan, prepared as a joint effort by the U.S. Department of Agriculture - Soil Conservation Service (SCS), State of Hawaii - Department of Land and Natural Resources (DLNR), and Windward Oahu Soil and Water Conservation District, was developed to optimize use of the prime agricultural lands in Waimanalo and ensure the viability of diversified agriculture in the area. The Waimanalo Watershed Plan recognized the fragile condition of the Maunawili Ditch System, the major source of irrigation water to the Waimanalo Watershed, and thus recommended rehabilitation of the existing system. As part of the formal Watershed Agreement between the SCS and DLNR, the improvements to the Maunawili Collection System are the responsibility of DLNR.

Much of the existing Maunawili Ditch System has been in operation for over 100 years and has performed adequately throughout most of its history. However, with the proposed agricultural development in the Waimanalo area, increased demands have been placed on the reliability and performance of the system. The proposed improvements should make the system less vulnerable to breakdown and more efficient in transporting high-quality irrigation water. The intent of this project is to minimize losses from the existing transmission system so that the required irrigation water flows necessary to support the Waimanalo Watershed Plan can be attained.

The project is situated along the slopes of Maunawili Valley in the Koolaupoko District on the island of Oahu. The Maunawili Ditch System lies entirely in lands owned by the Harold K. L. Castle Trust Estate, and leased to the Kaneohe Ranch Co., Ltd. and Hawaii Sugar Planters' Association. The site is in Conservation lands and is part of the Waimanalo Forest Reserve.

Maunawili Valley is primarily drained by two perrenial streams, the Maunawili and Kahanaiki Streams and their numerous tributaries. The two streams are the major contributors of flow into Kawainui Marsh, a critical wetland and Special Management Area. The Maunawili Ditch System intercepts virtually all of the dry-weather flows of the Ainoni, Makawao, and East Maunawili Streams (all tributaries of Maunawili Stream) above the 440-480 ft. elevation. The Clark, Fault, and Korean Tunnels and the Pikoakea Spring are the major dry-weather streamflow sources to the affected streams, and thus provide most of the dry-weather flow diverted by the ditch to Waimanalo.

The effects of the proposed improvements on the Maunawili Watershed and Kawainui Marsh appear to be minimal. The increased yield to Waimanalo as a result of the proposed improvements is projected to be about 2.4 MGD during high demand periods, an increase of 0.7 MGD more than is presently withdrawn from Maunawili. No additional water source development is proposed in this project. The increased yield will be the result of minimizing losses through the existing transmission system. (Based on field measurements, it is estimated that about 2.7 MGD

are diverted by the five existing intakes. Of this flow, approximately 1.0 MGD (38% of the total inflow) is lost through leakage from the existing ditch system.) Field observations indicate that most of the water currently leaking out of the system never re-enters the stream, but instead is consumed by the lush vegetation along the ditch system and is lost through evapotranspiration. Therefore, no significant effects on streamflow are anticipated.

Based on available information, no endangered species of flora or fauna are believed to inhabit the area along the project site. No archaeological sites are believed to be endangered by the proposed project. Any sites or artifacts which may have been present at the project area were probably destroyed during the initial construction of the Maunawili Ditch System.

The proposed project is essential for the implementation of the Waimanalo Watershed Plan. It will satisfy the Watershed Agreement requirement of providing a reliable source of water to Waimanalo and to secure Federal funding of 50% matching funds for a $12 million project to upgrade the Waimanalo Irrigation System. The improvements will enhance agricultural development and productivity in Waimanalo. The result of not implementing the Waimanalo Watershed Plan is that the viability of diversified agriculture in Waimanalo would decline while pressures to urbanize prime and important farmlands would increase.

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A. Purpose of the Project

The main objective of this project is to provide a dependable, high-quality irrigation water supply to support agricultural operations in the Waimanalo area. The existing Maunawili Ditch System is old, and requires considerable amount of maintenance to remain operational. Existing wooden flumes are especially vulnerable to vandalism, leakage and damage and are the major causes of operational problems. Sudden failure of any one of the flumes would result in the disruption of irrigation service to the agricultural operations in Waimanalo.

The Waimanalo Watershed Plan, prepared as a joint effort by the U.S. Department of Agriculture - Soil Conservation Service (SCS), State of Hawaii - Department of Land and Natural Resources (DLNR), and Windward Oahu Soil and Water Conservation District, was developed to optimize use of the prime agricultural lands in Waimanalo and ensure the viability of diversified agriculture in the area. Thirty-four alternative plans were considered. The recommended plan selected for implementation will ultimately involve a total of 1252 acres of land (including over 100 farm units) to be serviced by an improved irrigation system. Improvements in Waimanalo will include the installation of a piped irrigation water distribution system providing continuous service at full supply to 890 acres. A deep, 60 million gallon reservoir will be used for storage, regulation, and nematode control. Additional irrigation water will be obtained from the Board of Water Supply system, and from the Waimanalo Sewage Treatment Plant (treated sewage effluent).

Under the recommended Waimanalo Watershed Plan, the estimated net amount of irrigation water necessary to satisfy crop requirements is 725 million gallons per year. Of this total, 575 million gallons per year is to be supplied by the Maunawili Ditch System. During high demand periods, it is estimated that a sustained flow of 2.4 MGD is required for optimal system operation. During low demand periods, little water will be needed from Maunawili. Through system management, and especially with the added flexibility provided by the proposed storage reservoir, the Waimanalo irrigation system will be much more efficient and reliable.

The Waimanalo Watershed Plan, recognized the fragile condition of the major irrigation supply to the Waimanalo Watershed and thus recommended rehabilitation of the existing Maunawili Ditch System. As part of the formal Watershed Agreement between the SCS and DLNR, the improvements to the Maunawili Collection System are the responsibility of DLNR. The proposed project will

rehabilitate and upgrade the existing ditch into an efficient, low-maintenance water collection and conveyance system.

B. Existing System

The Maunawili Ditch was constructed in 1878 by the Waimanalo Sugar Company to carry irrigation water from Maunawili Valley to the Waimanalo area. The Waimanalo Sugar Company remained in operation until 1947. The Waimanalo Agricultural Development Company was subsequenty formed and acquired the water licenses for the Maunawili Ditch System. In 1953, the licenses expired and the Territory of Hawaii, now the State of Hawaii, had jurisdiction of the System. Since then, the State has been maintaining and operating the System and providing irrigation water to the farmers in the Waimanalo Area at low cost.

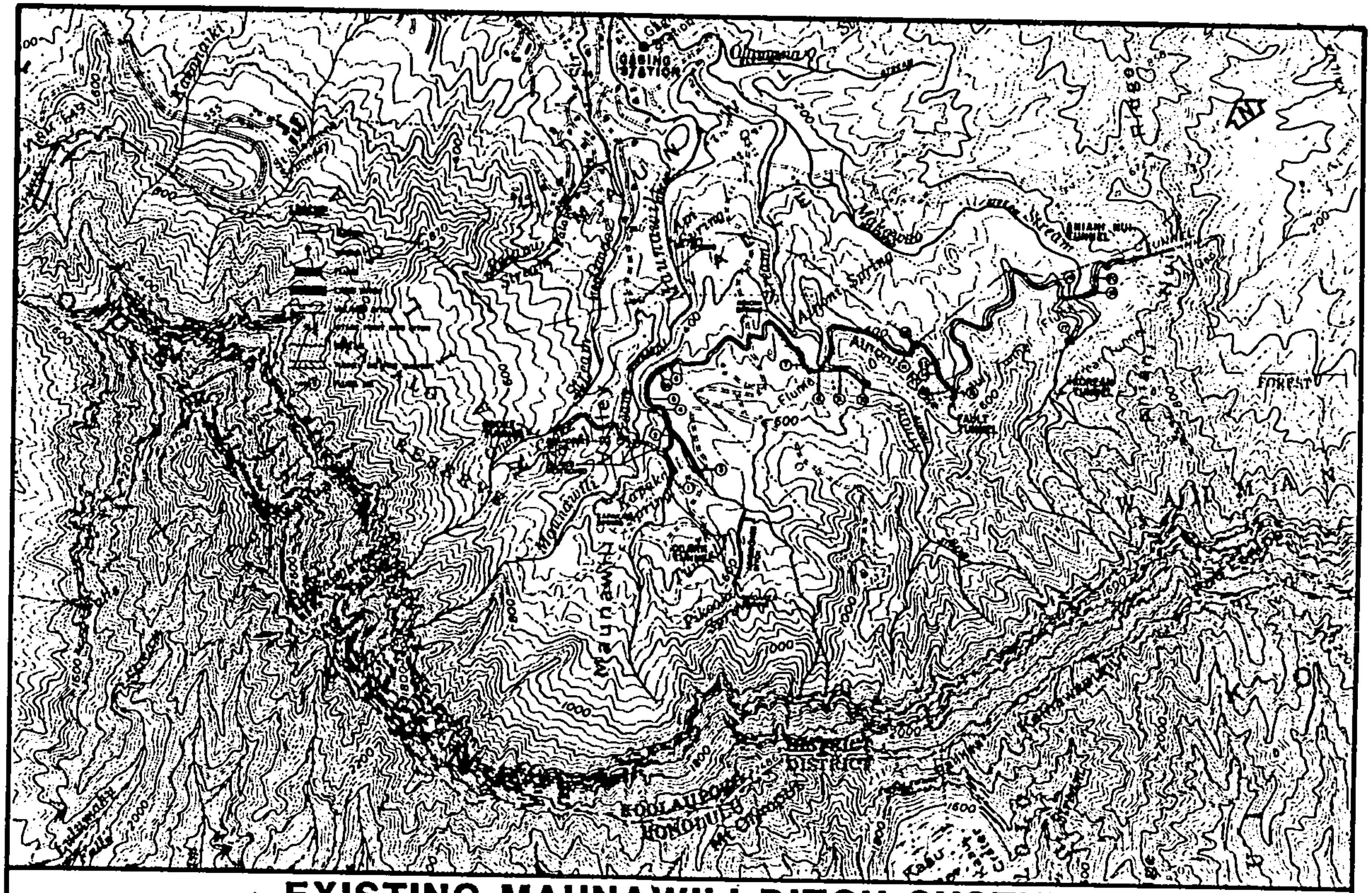
The Maunawili Ditch System is the primary source of irrigation water for the Waimanalo Area. The system currently delivers an average of about 1.7 million gallons per day from Maunawili Valley to Waimanalo thru the Aniani Nui Tunnel. Historical records indicate that the average flow from Maunawili was between 3 and 4 million gallons per day when the Waimanalo Sugar Company was in operation.

The Ditch System consists of over 16,000 ft. of lined and unlined ditches, tunnels, and elevated wooden flumes. (See Figure I-1). The System intercepts much of the stream and spring or tunnel flows above the 400 ft. elevation in Maunawili Valley. Spring or tunnel flows constitute virtually all of the dry-weather flow within the ditch. The major feeder sources into the ditch are the Clark, Fault, and Korean Tunnels, Pikoakea Spring, and Maunawili, Ainoni and Makawao Streams.

Elevated wooden flumes act as aqueducts, carrying water over adverse terrain, primarily across gullies and along the sides of steeper slopes.

The existing system utilizes a total of 21 wooden flumes. Ten other flumes and connecting ditch system located on the Kaneohe side of the valley were abandoned in the 1950's when two of the major flumes were heavily damaged and because of their remote location, considered unfeasible to repair. The abandoned portion of the system formerly collected water from Omao Stream and Cooke Tunnel.

The wooden flumes appear to be the "weakest link" in the existing Maunawili Ditch System. The flumes are old and require constant maintenance to remain functional. Many of the flumes span across gullies and/or streambeds making them especially vulnerable to stormflow damage. Vandalism has also been a problem. A breakdown in any one of the



EXISTING MAUNAWILI DITCH SYSTEM

1000 0 1000 2000 3000 4000
GRAPHIC SCALE

FIGURE I-1

flumes would result in significant losses of irrigation water. The remote locations of most of the flumes make them inaccessible to motor vehicles, and therefore, make it even more difficult to conduct repair operations. Materials and equipment must be hand-carried to the site, often over relatively treacherous terrain.

Most of the existing Maunawili Ditch System is composed of unlined, earth ditches. These ditches are basically man-made streams which are hydraulically inefficient in terms of transmitting water with minimal losses. Leakage thru the earthen ditch walls and bottom are significant, considering the total length of unlined ditches, especially during dry weather periods when ditch flow is low and surrounding soils are unsaturated. Theoretical leakage losses through the unlined ditch sections are estimated to be 120 gallons per day per linear foot of unlined ditch. (Based on 4 foot wide ditch and 2.0 inch/hr. infiltration rate.) With the estimated 10,000 LF of unlined ditches, infiltration leakage losses could be in the order of 1.2 MGD. As part of this study, flow measurements were made along the ditch system and showed significant leakage losses along the transmission system. Losses at the time of measurement were estimated to be about 1.0 MGD or about 38% of the total inflow diverted by the system.

The unlined ditch sections are also unstable; subject to channel erosion and accretion. Accumulation of eroded sediments at certain sections restrict the carrying capacity of the system and require periodic maintenance to restore the flow rate. Leakage over eroded ditch sides occurs and result in significant losses if left unchecked.

Open ditches, both lined and unlined, present a secondary problem for the existing Maunawili Ditch System. The open ditch sections are exposed to surface runoff which often carry debris, sediments, parasitic organisms, and other contaminants that degrade the quality of the irrigation water.

Debris entering the ditch system thru open channel sections often accumulate and create blockages which result in overflowing of the upstream reaches and loss of irrigation water. Frequent removal of debris is required to prevent the formation of major blockages in the ditch system.

Plant-parasitic nematodes in the irrigation water have been a problem for farmers serviced by the Waimanalo Irrigation System. The nematodes may cause extensive crop damage; decreasing farm production. Infestation of nematodes also jeopardize the U.S. Department of Agriculture certification for export of plant products to out-of-state markets. For this reason, many of the farmers have been forced to use Board of Water Supply domestic quality water to assure that their irrigation supply is nematode-free. Studies by the

University of Hawaii have indicated that plant-parasitic nematodes most probably enter the open ditch system during periods of storm runoff. Runoff from agricultural fields are more likely to contain the particular "problem" species of nematodes than runoff from forest areas.

C. Proposed Project

The existing Maunawili Ditch System has been in operation for over 100 years and has performed adequately for most of its history. However, with the proposed agricultural development in the Waimanalo area, increased demands have been placed on the reliability and performance of the system. The proposed improvements should make the system less vulnerable to breakdown and more efficient in transporting high-quality irrigation water.

In the Waimanalo Watershed Plan, the U.S. Soil Conservation Service has developed the irrigation system to operate based on a sustained dry-weather flow of 2.4 MGD. The intent of this project is to minimize losses from the existing transmission system so that the required irrigation water flows necessary to support the Waimanalo Watershed Plan can be attained.

The proposed project will focus on the following items (listed in order of importance):

1. Make the System less vulnerable to sudden breakdown.

   - Replacement of existing wooden flumes with more durable structures.

2. Minimize leakage losses thru system

   - Stabilize unlined ditch sections; eg. install lining, replace with pipes or other conduits, reinforce critical ditch banks where breakdown would result in "spillover".

3. Prevent the intrusion of undesirable matter into the irrigation system; i.e., debris, sediments, pesticides, parasitic organisms (especially plant-parasitic nematodes), and/or fertilizers.

   - Provide closed system (covered ditch or piped), especially where intrusion is probable.

4. Reduce maintenance requirements and make the System less vulnerable to vandalism.

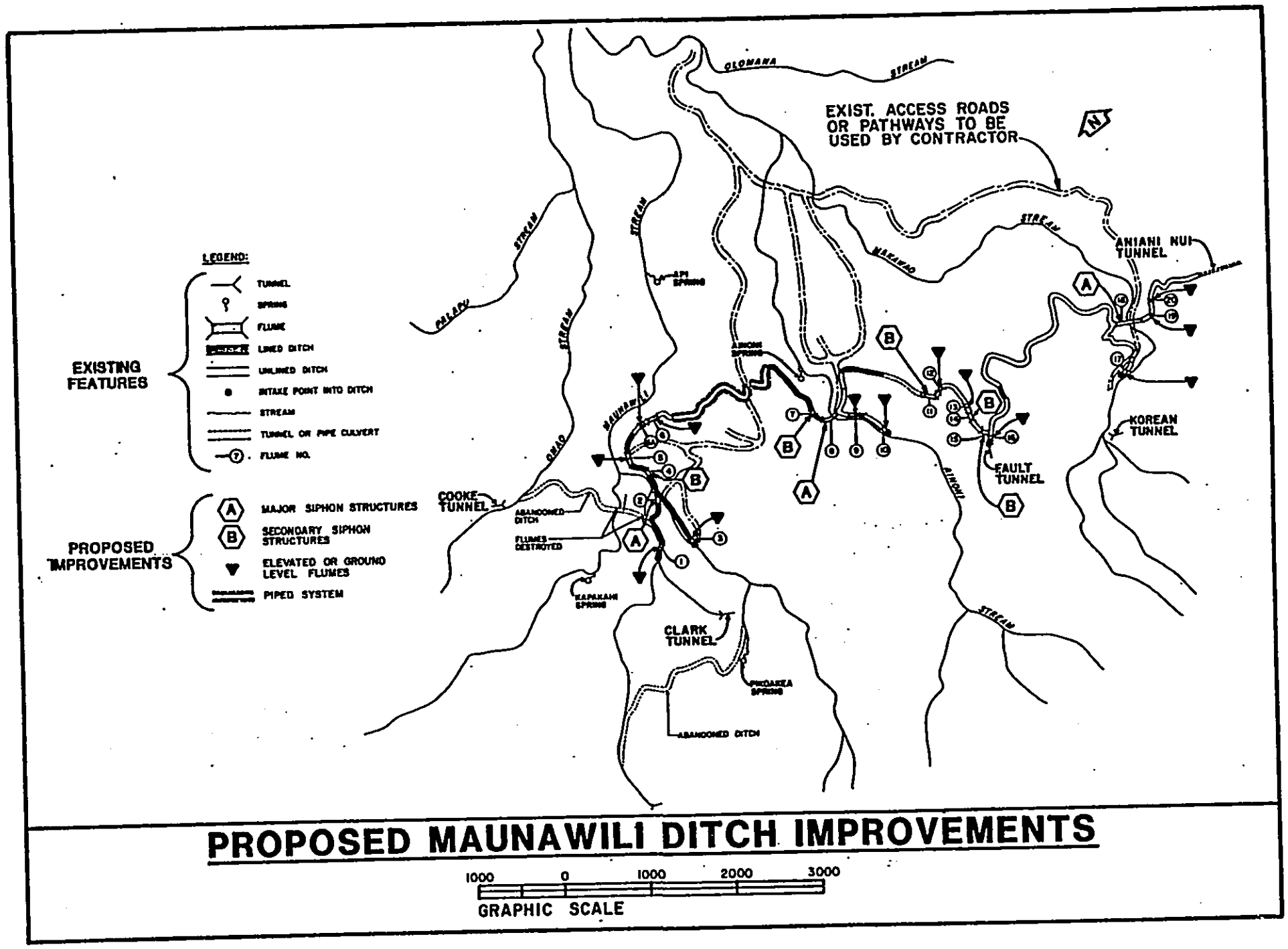
Based on the above priorities and depending upon available funding, the proposed project shall include the following (See Figure 1-2):

1. Replacement of all 21 existing wooden flumes with more durable structures; typically inverted siphons constructed of reinforced concrete inlet and outlet structures and steel pipe conduits supported on concrete piers, or elevated or ground level flumes constructed of full or half section corrugated metal pipe supported on concrete piers.

2. Provide channel lining in approximately 25% of the unlined ditch lengths. Proposed lining material is either half section corrugated metal pipe, or concrete or concrete-rubble masonry.

3. Install enclosed conduit system in unlined ditch section downslope of agricultural lands (portion between Flume nos. 6 and 7), to prevent intrusion of plant parasitic nematodes, chemical and sediment runoff. Approximately 2000 LF of 24-inch diameter corrugated metal pipe and manhole structures are proposed.

4. Installation of access roads for construction and maintenance operations. Roadways shall generally follow existing or former unimproved trails and pathways.



PROPOSED MAUNAWILI DITCH IMPROVEMENTS

FIGURE I-2

II. DESCRIPTION OF THE ENVIRONMENT

A. Location

The project is located along the slopes of Maunawili Valley in the Koolaupoko District on the island of Oahu. Most of the project site is limited within the immediate vicinity of the 400 ft elevation contour along the southern slopes of the valley. See Figure II-1.

B. Land Ownership

The Maunawili Ditch System lies entirely in lands owned by the Harold K. L. Castle Trust Estate. The land is designated by tax map key numbers 4-2-10:1 and 4-2-10:4.

These large parcels are leased to the Kaneohe Ranch Co., Ltd. and Hawaii Sugar Planters' Association respectively. Water is purchased by the State of Hawaii from the Kaneohe Ranch Co., Ltd. on a year-to-year basis. See Figure II-2.

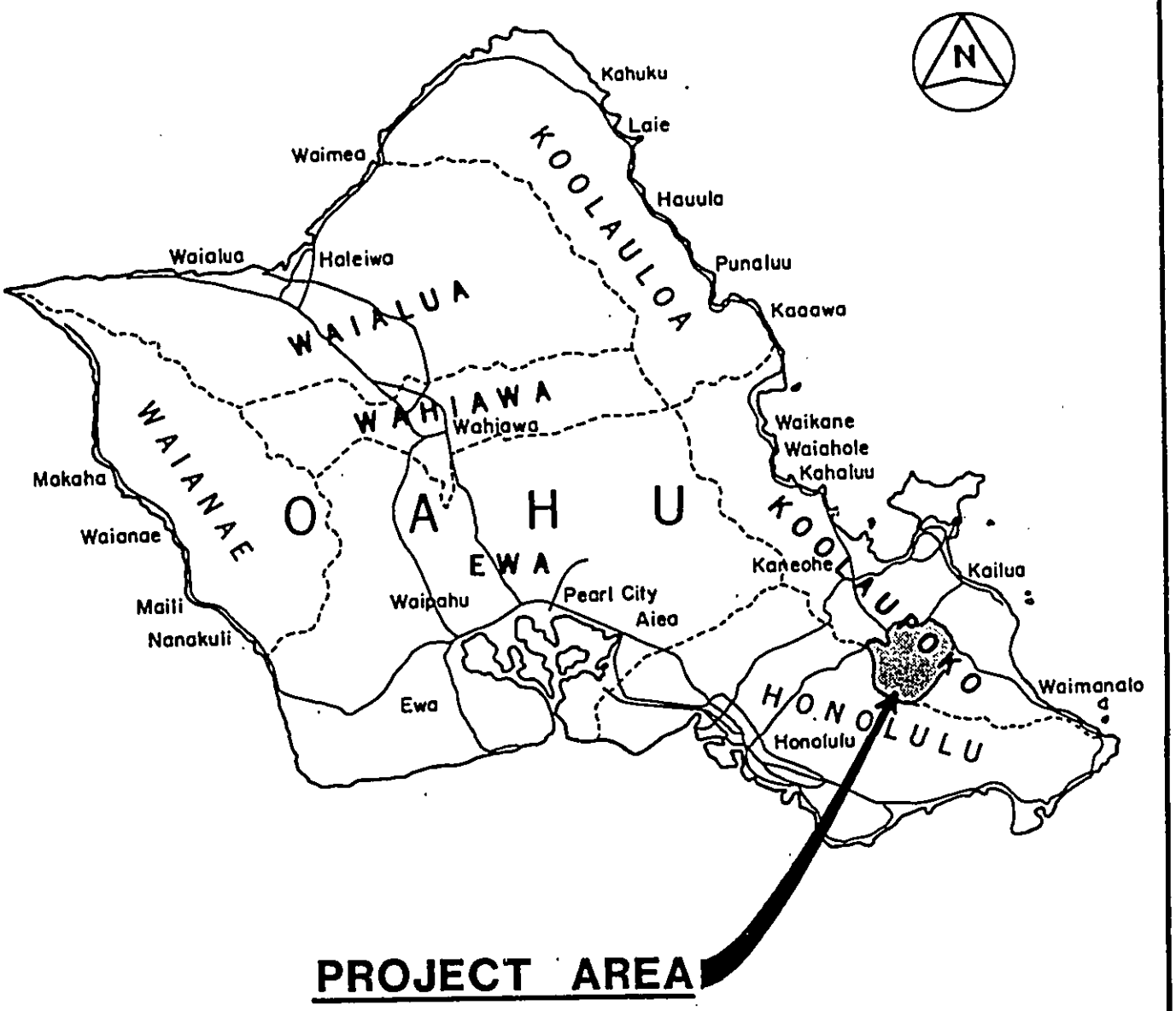
C. Topographical Characteristics

1. Geology

The Maunawili Ditch System is located on remnants of the Koolau Volcano caldera structure. Following the Koolau Volcanics era was a period of extensive erosion and elevated sea levels, accounting for layers of alluvial and calcareous material. Renewed volcanic activity from the more recent Honolulu Volcanics resulted in scattered volcanic formations over alluvial and sedimentary layers. See Figure II-3.

2. Soil

The soils in the project area include soil types from the Kaneohe, Lolekaa, and Waikane series. See Figure II-4. Selected soil characteristics are shown in Table II-1. The soils to be encountered are primarily silty clays or silty clay loams. Permeability for these soils should be moderately rapid. Soil runoff should vary from slow-medium for areas designated KHMC, medium rapid for areas designated KHME and KHMF, rapid for areas designated LoE, and rapid-very rapid for soils designated WpF. The erosion hazard should be slight for areas designated KHMC, moderate-severe for areas designated KHME and KHMF, and severe for areas designated LoE and WpF.

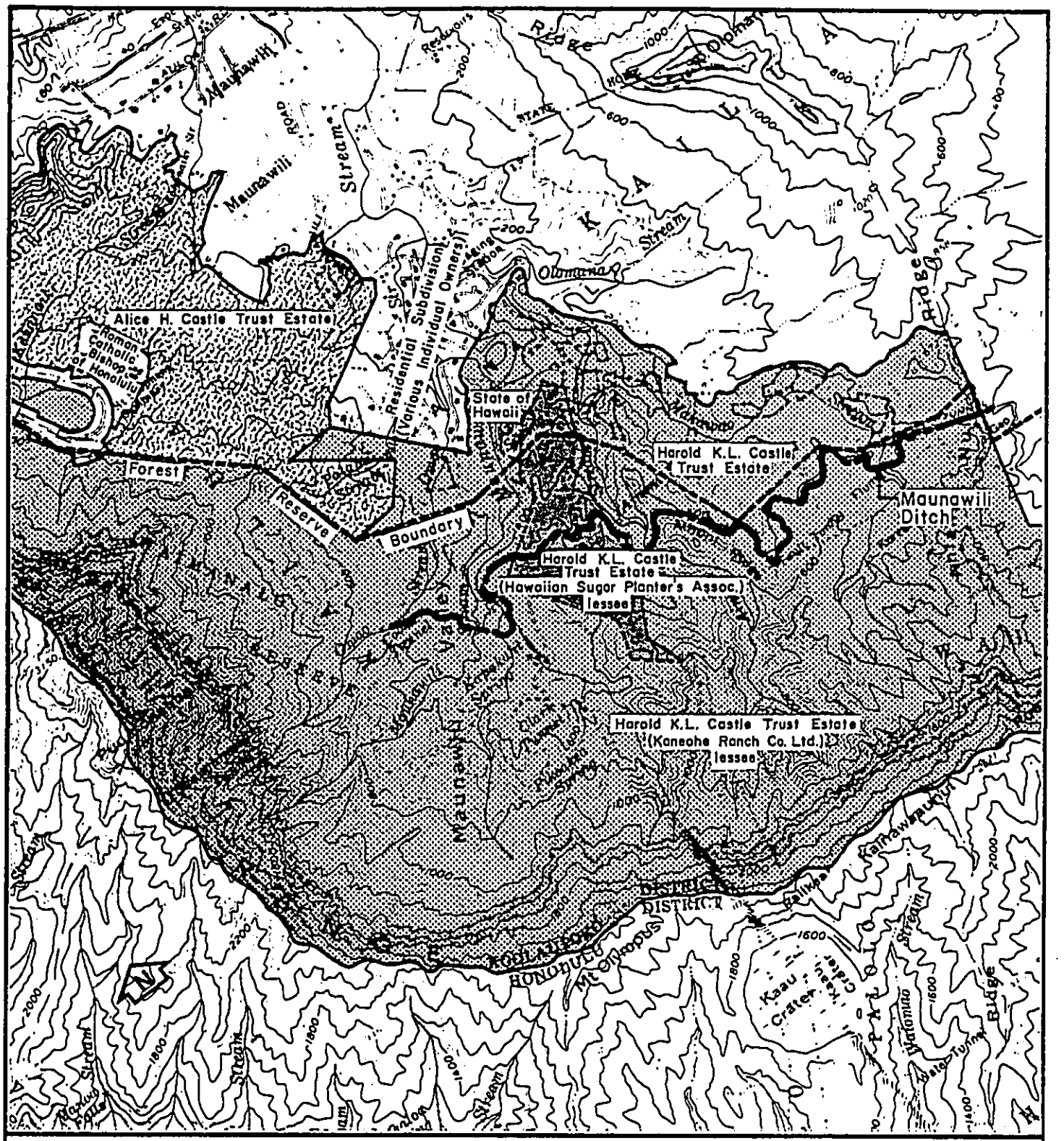


LOCATION MAP

4 0 4 8

SCALE IN MILES

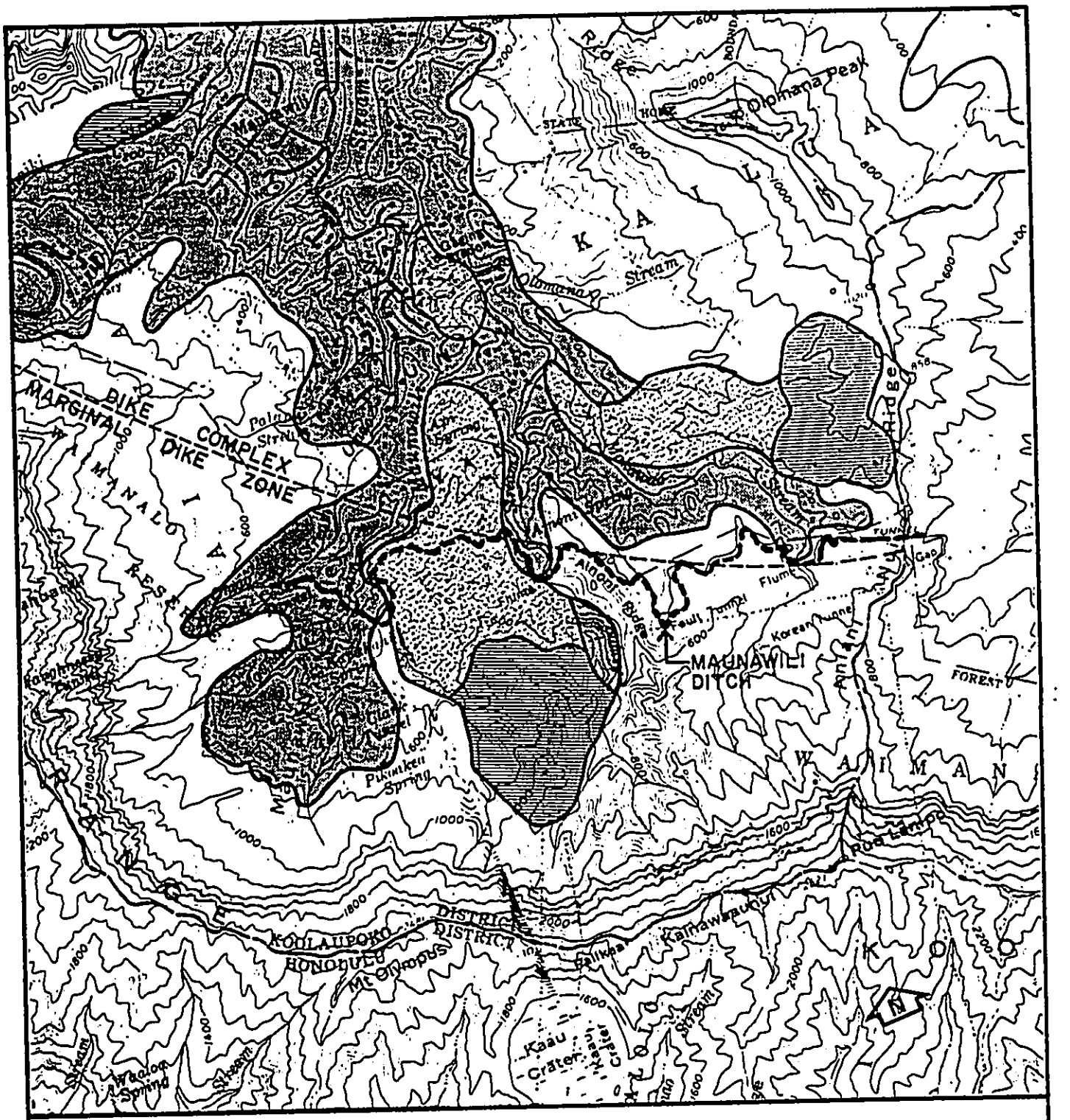
FIGURE II-1



MAJOR LAND OWNERSHIP MAP

SCALE: 1" = 2000'

FIGURE II-2

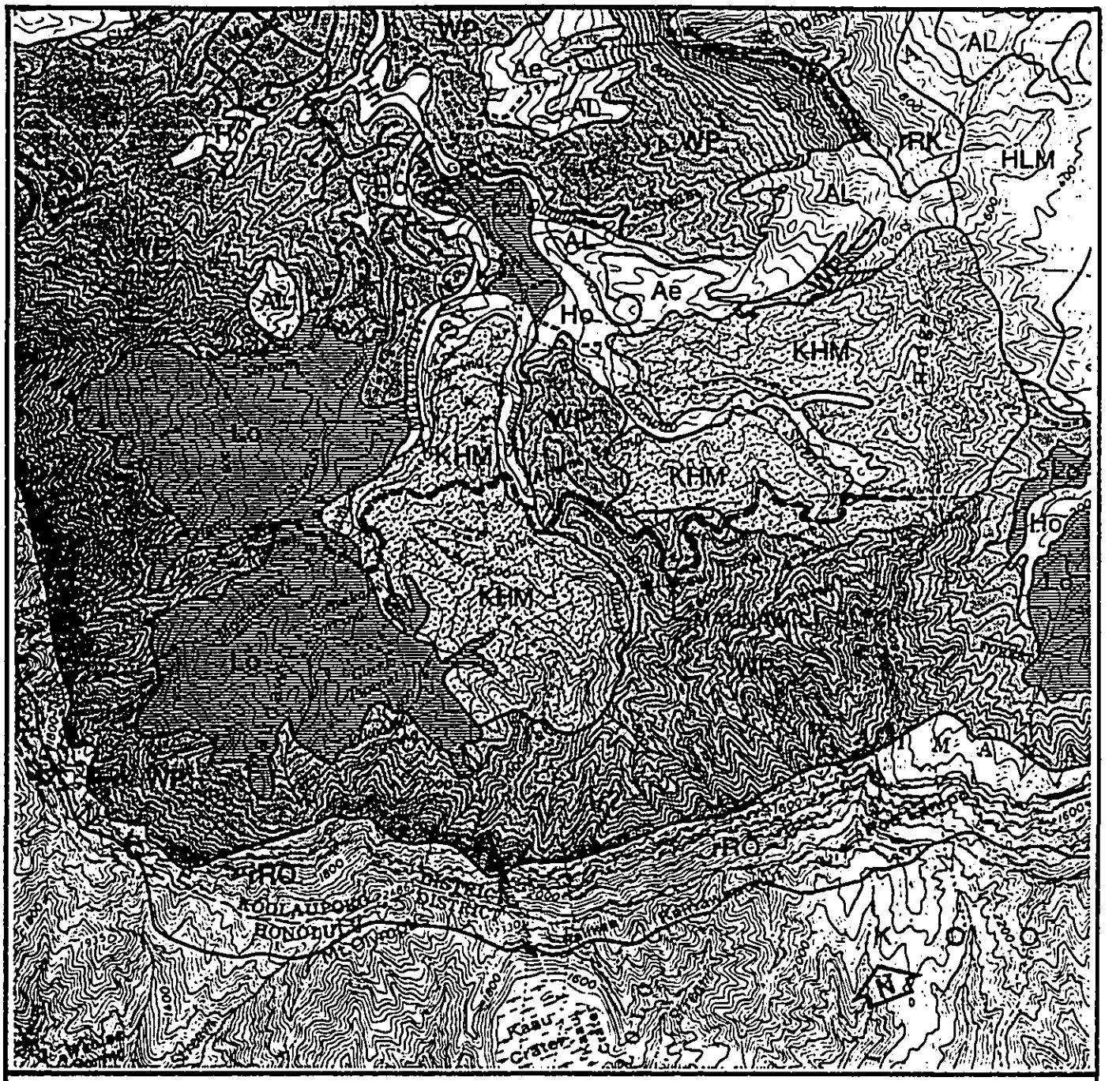


GEOLOGIC MAP OF PROJECT AREA

SCALE: 1" = 2000'

SOURCE:
Geology from Stearns, 1939

FIGURE II-3



LEGEND:

Ae = Alaeloa silty clay	KHM = Kaneohe silty clay loam
AL = Alaeloa silty clay	Lo = Lolekaa silty clay
HLM = Helemano silty clay	rRK = Rock land
Hn = Hanalei silty clay	rRO = Rock outcrop
Ho = Hanalei stony silty clay	rSY = Stony steep land
	Wp = Waikane silty clay

SOIL SURVEY MAP

SCALE: 1" = 2000'

SOURCE:

Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, August 1972.

FIGURE II-4

TABLE II-1

MAUNAWILI DITCH
SOIL TYPES AND CHARACTERISTICS

SOIL SERIES Symbol	WAIKANE WpF	LOLEKAA LoE	KANEOHE KHMF KHMC KHME
USDA Classification	Silty clay	Silty clay	Silty Clay loam
Unified Classification	MH	MH	MH
Depth from surface (inches)	0-60	0-42	0-60
Depth to Bedrock (ft)	>5	>5	>5
Depth to High Water Table (ft.)	>5	>5	>5
Permeability (in/hr)	2.0-6.3	2.0-6.3	2.0-6.3
pH	4.5-4.0	4.0-4.5	5.1-6.5
Shrink-swell potential	Low	Moderate	Moderate
Corrosivity			
Uncoated steel	High	High	High
Concrete	High	Moderate	Moderate

SOURCE: U.S. Dept. of Agriculture, Soil Conservation Service, Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii, August 1972.

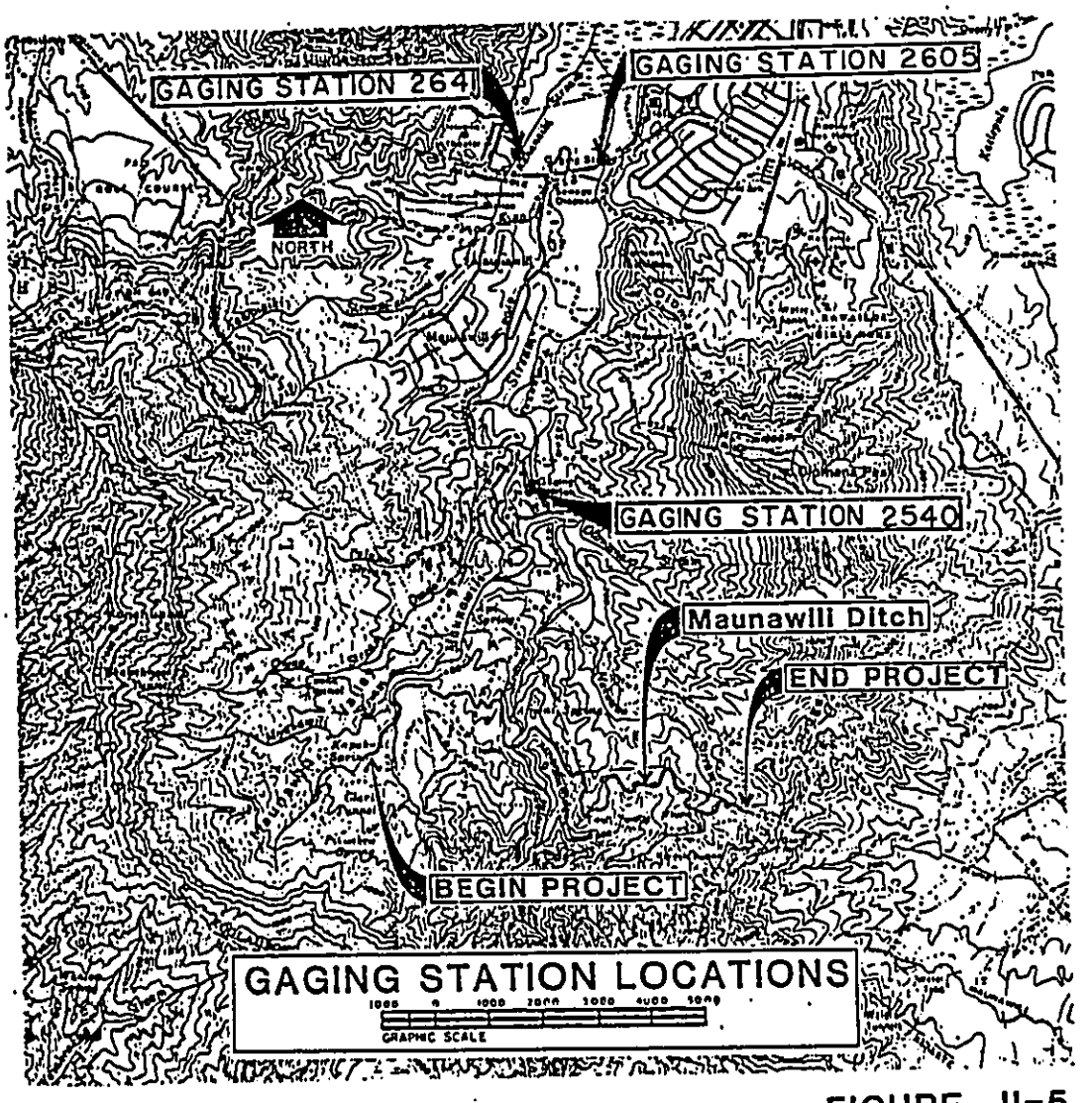


FIGURE II-5

D. Land Classification, Zoning and other Regulatory Considerations

1. County

The Maunawili Ditch System is situated in land zoned P-1 Preservation, part of the Waimanalo Forest Reserve. See Figure II-5. The proposed improvements would enhance diversified agricultural development in the Waimanalo area and would be in conformance with several objectives and policies of the General Plan. The proposed site is designated "Preservation" by the proposed Development Plan.

2. State

The project site is situated in land designated for Conservation by the State Land Use Commission. See Figure II-6. A Conservation District Use Application (CDUA) is being processed. The improvements to the Maunawili Ditch System would enhance diversified agriculture in Waimanalo, especially the Waimanalo Agricultural Subdivision. The subdivision is in direct compliance with several policies and policy directions detailed in the Hawaii State Plan.

E. *Hydrological Characteristics*

1. Surface Water

Maunawili Valley is primarily drained by two perrenial streams, the Maunawili and Kahanaiki Streams and their numerous tributaries. The two streams are the major contributors of flow into Kawainui Marsh. Average discharge into the marsh is estimated at 5.8 MGD from Maunawili Stream and 1.0 MGD from Kahanaiki Stream.

The Maunawili Ditch System intercepts virtually all of the dry-weather flows of the Alnoni, Makawao, and East Maunawili Streams (all tributaries of Maunawili Stream) above the 440-480 ft. elevation. Other streams in the valley are unaffected by the ditch system. These include the Palapu, Omao, West Maunawili, Olomana Streams (all tributaries of Maunawili Stream) and the Kahanaiki Stream and its tributaries.

The U.S. Geological Survey operates three stream gaging stations to monitor streamflows in Maunawili Valley. The three stations are listed below.

STATION NO.	STREAM	GAGE TYPE
16254000	Makawao	Daily Flow Record
16260500	Maunawili	Peak Flow (crest gage)
16264100	Kahanaiki	Base Flow (periodic low flow)

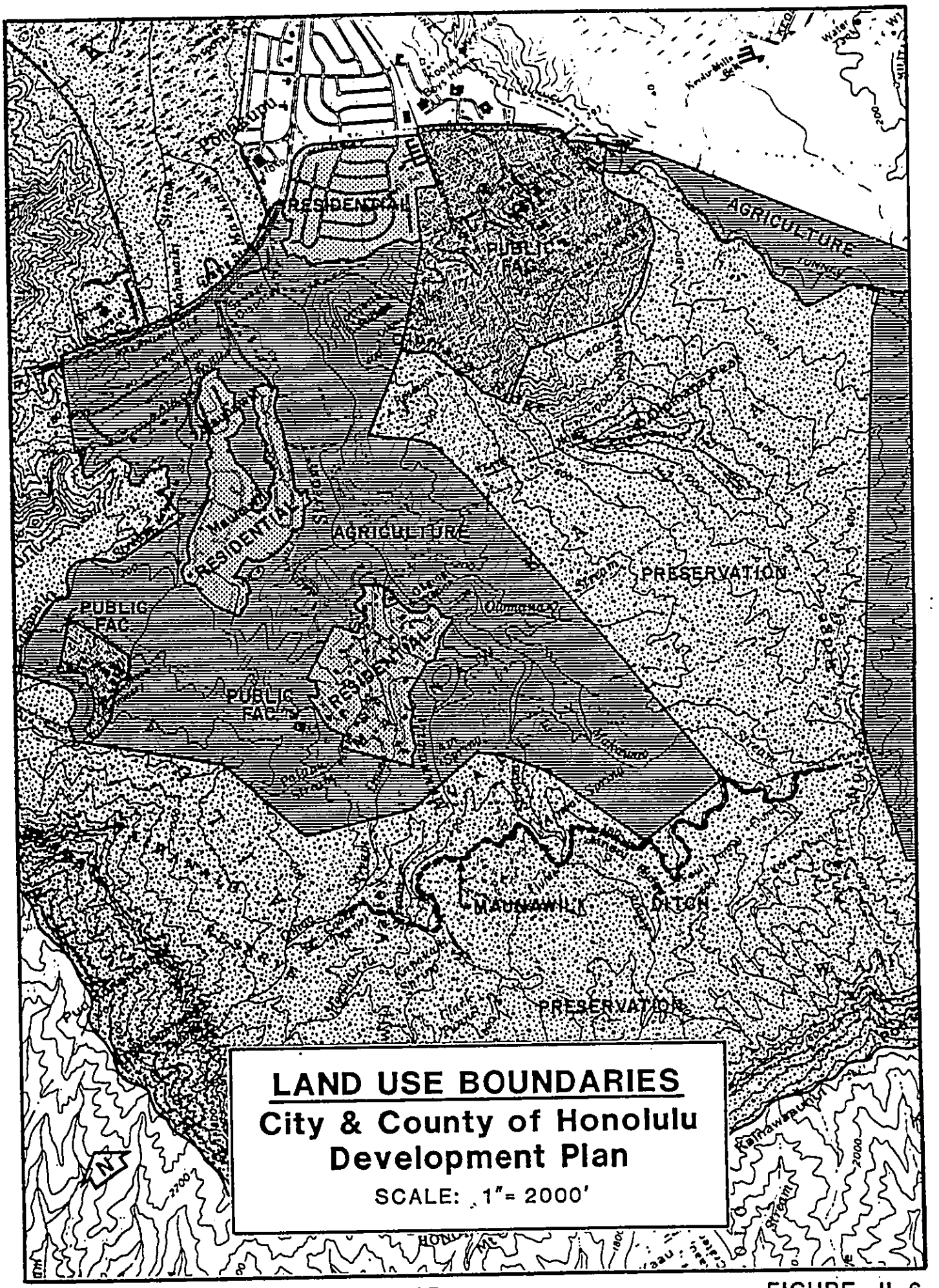
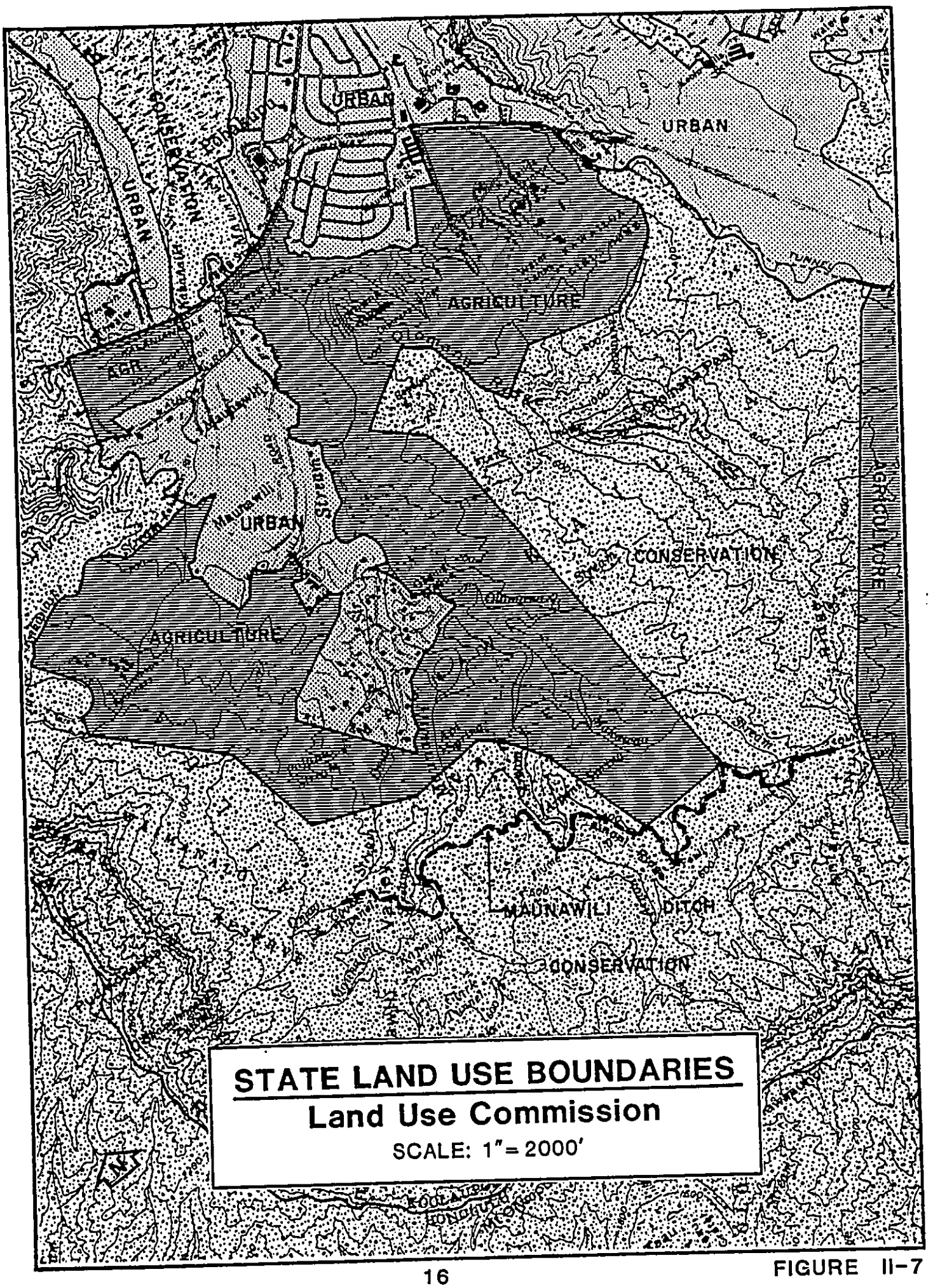

RESIDENTIAL
PUBLIC FAC.
AGRICULTURE
PRESERVATION
LAND USE BOUNDARIES
City & County of Honolulu
Development Plan
SCALE: 1"= 2000'

FIGURE II-6


URBAN
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AGRICULTURE
CONSERVATION
AGRICULTURE
MAUNAWILI DITCH
CONSERVATION
STATE LAND USE BOUNDARIES
Land Use Commission
SCALE: 1" = 2000'

FIGURE II-7

2. Ground Water

Ground water in Maunawili Valley appears to be readily available as evidenced by the numerous springs and seeps in the area. Among the major springs in the valley are the Pikoakea, Omao, Kapakahi, Api, and Alnoni Springs. This abundance of water probably instigated the development of groundwater sources in the early 1900's, primarily by Waimanalo Sugar Company and the old Maunawili Ranch. Several water development tunnels were dug into the Koolau dike and marginal dike zones and produced fairly substantial amounts of high quality water. The major tunnel sources in Maunawili are the Cooke, Clark, Fault, and Korean Tunnels. Of the major groundwater sources in Maunawili Valley, the Maunawili Ditch System intercepts water from the Pikoakea Spring, and the Clark, Fault, and Korean Tunnels. These sources provide most of the flow diverted by the ditch to Waimanalo.

The groundwater resources in Maunawili Valley have recently been studied by Takasaki and Mink (1982). It was concluded that the maximum dependable flow (flow that is equalled or exceeded 90% of the time) that is currently available under the existing development scheme, which utilizes the discharge of free-flowing tunnels and springs and the remaining low flow of streams, is probably between 4 and 4.5 MGD. However, it was assessed that the flow could be significantly increased above 4.5 MGD for periods of high demand (dry-weather) if water were removed (pumped) from groundwater storage. The storage would then be restored during low demand periods (wet-weather). Therefore, by optimizing management of the Maunawili Valley groundwater reservoirs, significantly more water could be developed for use during high demand periods. The effects of this development plan on existing stream and spring flows may be significant. Because of lowered water levels, overflow may be small or absent. Existing tunnels and springs may cease to flow during high demand periods.

F. Climatical Characteristics

1. Rainfall

The mean annual rainfall in the area is approximately 83 inches a year.

2. Wind

The prevailing wind direction is approximately 60 degrees east northeast about 80 percent of the time. Wind data from the Kaneohe Marine Corps Air Station

indicate wind velocity at: 0-3 knots, 9 percent of the time; 4-10 knots, 43 percent of the time; 11-22 knots, 48 percent of the time, and over 22 knots, 1 percent of the time. 1 knot = 1.15 miles per hour.

3. Temperature

The temperatures at the project site are mild and uniform, ranging from an annual average low of 68.3 degrees F to an annual average high of 77.2 degrees F. The average annual temperature is approximately 72.8 degrees F.

4. Humidity

Relative humidity is estimated to be usually in the high 60 percent range during the day and in the high 80 percent range during the night. Humidity in this area seems to be more dependent on temperature than seasonal variations.

G. Flora and Fauna

1. Flora

Based on available information, no endangered species of vegetation are believed to inhabit the area along the project site. Initial construction of the Maunawili Ditch and introduction of exotic species of vegetation by farms in the area probably displaced any native flora in the vicinity of the project.

2. Fauna

Based on biological study of the Maunawili, Alnoni and Makawao Streams by Archer (1983) Appendix A, the following aquatic life was found to inhabit the waters:

SCIENTIFIC NAME	COMMON NAME
Atya bisulcata	mountain shrimp
Macrobrachium lar	Tahitian prawn
Procambarus clarkii	crayfish
Poecilia mexicana	short fin molly
Poecilia reticulata	guppy
Xiphophorus helleri	green swordtail
Melania sp	pond snail

None of the aquatic life found were considered to be endangered by Federal or State agencies. The streams were found to have been well exploited, modified or degraded years ago. The mostly introduced species of fishes found often inhabit highly degraded environments and small changes in stream flow should not inhibit these species' success in the streams.

Based on available data the site does not contain any significant wild life habitats or endangered species of birds or mammals.

H. Archaeological Sites

No archaeological sites are believed to be endangered by the proposed project. Any sites or artifacts which may have been present at the project area were probably destroyed during the initial construction of the Maunawili Ditch System.

I. Flood Hazards

1. Flooding

The Maunawili Ditch System is located in area designated Zone D or area of undetermined but possible flood hazards by the Federal Insurance Administration (FIA) in the Flood Insurance Study for Oahu.

2. Tsunami Inundation

Tsunami inundation should not occur at the project site.

J. Infrastructure and Utilities

1. Domestic Water System

There are no Board of Water Supply (BWS) connections to the project site. Adjacent areas are serviced by private water systems.

2. Electrical

Electricity to areas adjacent to the project site is supplied by Hawaiian Electric Company (HECO) via a 12 kilovolt line. Two overhead transmission mains, also from HECO, cross the project site. Each transmission main contains a 138 kilovolt line and a 46 kilovolt line.

3. Gas

There is no known gas connection to the project area or adjacent areas. Any gas service in the area is provided by private tanks.

4. Sewage

The Maunawili Estates Sewage Treatment Plant (STP) is located north (downstream) of the project site. The STP provides secondary treatment for residential areas

In the upper Maunawili Valley and currently disposes its treated effluent into Maunawili Stream. There are no known sewer connections to the County System which feeds the Maunawili Estates STP from the project area.

5. Solid Waste Disposal

Solid waste from the Maunawili Valley area is collected by the Refuse Collection and Disposal Division of the City and County of Honolulu and disposed at the Kapaa Sanitary Landfill. There is presently no County service to the project area. Areas adjacent to the project are serviced privately.

K. Public Facilities and Services

1. Police Protection

The project area is serviced by the Kailua Police Substation. Response time to the project site is ±10-15 minutes.

2. Fire Protection

The project area is serviced by the Kailua Fire Station. Response time to the lower sections of the project is ±10-15 minutes. Upper sections of the project are inaccessible by conventional fire fighting equipment.

3. Educational Services

The Maunawili Valley area is served by three public schools. These include Maunawili Elementary, Kailua Intermediate, and Kailua High School.

4. Access

Maunawili Road is the lone public access to the project site. The County mass transit system servicing the Maunawili area is the No. 70 route, Maunawili Shuttle bus. Other access roads near the project are maintained by the private land owners.

III. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATIVE MEASURES

A. Short Term Impacts and Mitigative Measures.

(Activities related and limited to the duration of the construction period.)

1. Economic

During the implementation of improvements to the Maunawili Ditch System there will be an expenditure of funds by the State Department of Land and Natural Resources (DLNR) to cover construction costs.

2. Air Quality

During construction, increased dust and vehicular equipment exhaust emissions can be anticipated. The dust generated should not occur at significant levels since the majority of soil types to be encountered should not be subject to excessive wind erosion. If dust is a significant problem it will be mitigated by the use of appropriate water sprinkling methods. Exhaust emissions from vehicular equipment should not significantly affect the area. Prevailing winds should be able to disperse any exhaust gas concentrations. The nearest residential area is over 2,000 feet from the project area and therefore, impacts should be insignificant.

3. Water Quality

Some soil runoff can be expected in areas requiring excavation work for irrigation structure foundations. The effect on stream water quality should be minimal due to the relatively small amount of soil runoff reaching the streams in reference to soil runoff during heavy rains. As stated earlier the aquatic life found in the streams often inhabit highly degraded environments; therefore, little biological change is anticipated. See Appendix A. Strict adherence to erosion control procedures and the prevention of hydrocarbon loss into the streams should also minimize effect on stream water quality. No signficant effect on groundwater is anticipated.

4. Erosion

Erosion will occur at areas where clearing is required for construction equipment access. Flora in the vicinity of the cleared area will be able to return upon completion of the project thereby reducing future erosion. Existing access roads and pathways will be used whenever practicable. Erosion will also occur at some irrigation structure foundations where excavation

work is required. Erosion effects will be minimized by using appropriate methods of erosion control.

5. Traffic

An increase in traffic from construction workers can be anticipated. Due to the remote location of the project site and the small increase in vehicles no major change in traffic in the Maunawili area is anticipated.

6. Noise

Increased noise due to construction can be anticipated. Noise impacts generated by construction can be minimized by adjusting working hours, using appropriate machinery and advising workers.

7. Biology

No vegetation or fauna known to exist at the project site are considered threatened or endangered by State or Federal agencies. Following construction the flora and fauna displaced by construction would be able to return to the affected areas.

A biological survey of the affected stream was performed by Archer (1983), and is included in Appendix A. Based on field observations and analyses, no significant impacts on the aquatic environment are anticipated.

8. Archaeology

No known archaeological sites are located near the project site. Any sites or artifacts which may have been present were probably destroyed during the initial construction of the Maunawili Ditch and by farms and plantations formerly in the area. However, if any stone walls or other kinds of archaeological sites are discovered during construction, the State Historic Preservation Officer shall be notified and work in the area shall cease until the site has been studied and appropriate measures are implemented.

The Waimanalo Irrigation System, which includes the Maunawili Ditch System, was determined to be eligible for inclusion in the National Register of Historic Places. However, since data in the form of photographs, maps, and narrative have been collected and are on file with the State Historic Preservation Officer, it was determined that the data on file will negate any adverse effects resulting from the undertaking of the project.

B. Long Term Impacts and Mitigative Measures

(Impacts resulting from the implementation and operation of the Maunawili Ditch System)

1. Economic

The proposed project would reduce maintenance requirements for the Maunawili Ditch System and provide a more reliable irrigation water source for the Waimanalo area. The improvements should enhance the Waimanalo Agricultural Park Plan which would increase jobs in diversified agriculture, purchases of agricultural supplies, revenues to the State from the long-term leasing of the land and taxes on the sale of supplies and produce, and revenue to the County from increased property taxes on agricultural lots. Reducing the amount of water loss due to seepage and spillage will allow an increase in water available to farmers and increase revenues by selling more water to farmers.

The proposed project is essential for the implementation of the Waimanalo Watershed Plan. It will satisfy the Watershed Agreement requirement of providing a reliable source of water to Waimanalo and to secure Federal funding of 50% matching funds for a $12 million project to upgrade the Waimanalo Irrigation System.

2. Air Quality

Ambient air quality should not be significantly affected by the project.

3. Hydrology and Water Quality

The effects of the proposed improvements on the hydrology of the Maunawili Watershed and Kawainui Marsh appear to be minimal. (See Appendix B - HYDROLOGIC IMPACTS.) The increased yield to Waimanalo as a result of the proposed improvements is projected to be about 2.4 MGD during high demand periods, an increase of between 0.4 and 0.7 MGD more than is presently withdrawn from Maunawili. No additional water source development is proposed in this project. The increased yield will be the result of minimizing losses through the existing transmission system. (Based on field measurements, it is estimated that about 2.7 MGD are diverted by the five existing intakes. Of this flow, approximately 1.0 MGD (38% of the total inflow) is lost through leakage from the existing ditch system.) Field observations indicate that most of the water currently leaking out of the system never re-enters the stream, but instead is consumed by the lush vegetation along

the ditch system and is lost through evapo-transpiration. Therefore, no significant effects on streamflow are anticipated. Actual impacts on streamflow will be determined through analysis of streamflow records from the three existing U.S.G.S. stream gaging stations after completion of the project.

Historical records indicate that much more water was extracted from the Maunawili-Kawainui Watershed in the past when the Waimanalo Sugar Company was in operation. (1880's thru 1940's). In addition to the 3 to 4 MGD diverted by the Maunawili Ditch System, up to 8 MGD was pumped directly out of Kawainui Swamp. Typical dry-weather irrigation flows to Waimanalo were between 8 and 10 MGD. The proposed improvements shall result in flows substantially less than were taken in the past when the plantation was in existence.

If some reduction in streamflow is experienced as a result of the project, dilution of sewage effluent presently discharged into Maunawili Stream may be affected. However, the City and County of Honolulu has made a commitment to discontinue effluent disharge into the stream in the future, and thereby improving the stream water quality discharging into Kawainui Marsh.

4. Erosion

The proposed Maunawili Ditch system improvements should reduce erosion resulting from seepage and spillage from the existing transmission system. No other significant effects on erosion are anticipated.

5. Noise

No significant change in noise is anticipated.

6. Biology

The project area is not considered to be a sensitive wildlife habitat area and is not known to contain any endangered species of plants or animals. Displaced flora and fauna would be able to return following construction. Long-term adverse impacts are not anticipated from the proposed improvements.

Based on a biological survey performed by Archer (1983) (Appendix A), no significant long-term impacts are anticipated for the stream environment.

7. Archaeology

The project area does not contain any known archaeological sites. Initial construction of the Maunawili Ditch has probably destroyed any possible

sites or artifacts. Adverse impacts are not anticipated from the proposed improvements. However, should any evidence of archaeologic sites be discovered during construction, work in the area shall cease until the State Historic Preservation Officer is consulted and appropriate measures are implemented.

8. Utilities

a. Irrigation. Much of the existing Maunawili Ditch System is well over 50 years old and requires considerable amount of maintenance to remain operational. Existing wooden flumes are especially vulnerable to damage and are the major causes of operational problems. The proposed improvements to the Ditch System should reduce maintenance required for the Ditch and provide a more reliable source of water for the Waimanalo area. Replacement of existing open ditches at selected locations with covered ditches or pipes should improve the irrigation water quality by decreasing the intrusion of undesireable matter into the irrigation system, i.e., debris, sediments, pesticides, fertilizers, parasitic nematodes, etc. The improvements should also decrease losses due to seepage and spillage from the transmission system thereby increasing the water available to the Waimanalo area.

b. Fire Protection Water Flow. Fire service to the Maunawili Valley area should not be affected. Improvements in reliability of the Maunawili Ditch System should improve fire protection in the Waimanalo area.

c. Liquid Waste Disposal. No significant effects on liquid waste disposal are anticipated.

d. Solid Waste Disposal. No significant effects on solid waste disposal are anticipated.

e. Potable Water. No significant effects on potable water service in the Maunawili area are anticipated.

f. Drainage. No significant effect on drainage in Maunawili Valley is anticipated.

g. Gas, Electric and Telephone. No siginficant effect on these utilities in Maunawili Valley is anticipated.

h. Traffic/Access. No significant effects on traffic in the Maunawili Area is anticipated. Access to the project site should not be significantly affected. Existing access will be used whenever possible or practicable to reduce effects on the environment.

9. Social Impacts

No significant effects on the adjacent communities are expected.

IV. ALTERNATIVES TO THE PROPOSED ACTION

A. No Project

A "do-nothing" approach will jeopardize the Waimanalo Watershed Plan and the viability of diversified agriculture in Walamanlo. A FWO (Future without project) was developed by SCS planning staff for Waimanalo Watershed and addressed the effects of not implementing the Waimanalo Watershed Plan. Basically the result of the FWO alternative is that the proposed Waimanalo Agricultural Park Plan could not be implemented and the viability of diversified agriculture in Waimanalo would decline while pressures to urbanize prime and important farmlands would increase. The improvements to the Maunawili Ditch System (Maunawili-side of Aniani Nui Tunnel) are the responsibility of the State of Hawaii (as stated in the Watershed Agreement) and are essential for the implementation of the Watershed Plan. Failure to fulfill the requirements of the Watershed Agreement may jeopardize the Federal funding (50% matching funds) of a $12 million dollar project to upgrade the Waimanalo Irrigation System.

B. Develop Additional Sources

The development of additional groundwater sources in Maunawili Valley has been studied by Takasaki and Mink (1982). It was concluded that the maximum dependable flow that is currently available under the existing development scheme, which utilizes the discharge of free-flowing tunnels and the remaining low flow of streams, is probably between 4 and 4.5 MGD. However, it was assessed that the flow could be significantly increased for periods of high demand (dry-weather) if water were removed (pumped) from groundwater storage. The storage would then be restored during low demand periods (wet-weather). Therefore, by optimizing management of the Maunawili Valley groundwater reservoirs, significant amounts of water could be developed for use during high demand periods.

Development of these additional sources for the proposed project is not necessary at this time. Existing sources appear to be adequate if transmission losses from the existing system can be minimized, or possibly eliminated altogether. Should additional water be required in the future or if transmission losses cannot be sufficiently reduced, development of the additional sources may be necessary. The additional water is available, but the impacts of such development must be further studied.

V. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Labor, construction building materials and fuel will be committed to the project.

VI. LIST OF APPROVALS

The following is a general list of approvals which may be needed to construct the proposed project:

APPROVAL	APPROVING AGENCY
Conservation District Use Permit	Department of Land and Natural Resources

VII. REFERENCES

Austin, H.A.R., Report to the Commissioner of Public Lands Territory of Hawaii covering the Availability of an Adequate Supply of Water for the Proposed House Lot and Farm Lot Subdivisions in Waimanalo, January 1953.

Hawaii Irrigation Authority, Irrigation Requirements and Available Water Resources - Waimanalo Irrigation System, Territory of Hawaii, 1956.

Kawainui Marsh Technical and Policy Advisory Committee, Resource Management Plan for Kawainui Marsh, State of Hawaii, Department of Planning and Economic Development, March 1983.

Park Engineering, Inc., Waimanalo Agricultural Park, Report R61, Division of Water and Land Development, DLNR, April 1980.

Park Engineering, Inc., et al., Waimanalo Agricultural Park - Phase 1 Increment - Final Environmental Impact Statement, March 1982.

State of Hawaii, Department of Health, An Ecosystem Approach to Water Quality Standards, Report of the Technical Committee on Water Quality Standards, December 1977.

State of Hawaii, Department of Land and Natural Resources, et al., Waimanalo Watershed, Final Watershed Plan and Environmental Impact Statement, U.S. Department of Agriculture, Soil Conservation Service, December 1981.

Stearns, H.T. and Vaksvik, K.N., Geology and Ground-Water Resources of Island of Oahu, Hawaii, Bulletin 1, U.S. Division of Hydrography, May 1935.

Stearns, H.T., Geology of the Hawaiian Islands, Bulletin 8, Department of Land and Natural Resources, State of Hawaii, 1974.

Takasaki, K.J., G.T. Hirashima, and E. R. Lubke, Water Resources of Windward Oahu, Hawaii, U.S. Geological Survey, WSP, 1894, 1969.

Takasaki, K.J., and J.F. Mink, Water Resources of Southeastern Oahu, Hawaii, U.S. Geological Survey, November 1982.

Timbol, Amadeo S., and J.A. Maciolek, Stream Channel Modification in Hawaii, "Part A: Statewide Inventory of Streams, Habitat Factors and Associated Biota", Hawaii Cooperative Fishery Research Unit, Honolulu, University of Hawaii, April 1978.

U.S. Soil Conservation Service, Investigation and Analysis Report in Support of Waimanalo Watershed Plan - EIS, Multistate Planning Staff, Portland, Oregon, December 1981.

Wilson Okamoto & Associates, Inc., Instream Use Study - Windward Oahu, Department of Land and Natural Resources, State of Hawaii, April 1983.

LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS CONTACTED
(EIS PREPARATION NOTICE SENT 10/21/83)

	Response Received
CITY & COUNTY OF HONOLULU:	
Board of Water Supply	11/22/83
Department of General Planning	11/18/83
Department of Land Utilization	11/16/83
Department of Parks and Recreation	11/ 9/83
Department of Public Works	11/ 8/83
Department of Transportation Services	12/22/83
STATE OF HAWAII:	
Department of Agriculture	11/ 2/83
Department of Education	11/ 4/83
Department of Health	11/ 8/83
Department of Planning & Economic Development	11/18/83
Department of Transportation	12/ 8/83
Office of Environmental Quality Control	--
U.H. Environmental Center	11/ 3/83
U.H. Water Resources Research Center	11/18/83
FEDERAL AGENCIES:	
U.S. Army Corps of Engineers	11/ 9/83
U.S. Fish and Wildlife Service	11/ 8/83
U.S. Geological Survey	11/21/83
U.S. Soil Conservation Service	11/18/83
ORGANIZATIONS:	
American Lung Association of Hawaii	--
Congress for Hawaiian Peoples	--
East County Waimanalo Center	--
Harold Castle Estate	--
Hawaii Association of Nurserymen	--
Hawaii Audubon Society	--
Hawaii Banana Growers Association	--
Hawaii Farm Bureau Federation	--
Hawaiian Sugar Planters' Association	11/ 2/83
Hui Malama Aina O' Koolau	--
Joint Planning Committee of the Waimanalo Council of Community Organizations and the Waimanalo Neighborhood Board	--
Kailua Neighborhood Board	12/19/83

ORGANIZATIONS (Continued) :

Kaneohe Ranch	--
Kawainui Heritage Foundation	--
Lani-Kailua Outdoor Circle	12/ 9/83
Life of the Land	12/ 5/83
Maunawili Farmers and Nurserymen's Association	--
Maunawili Valley Community Association	12/ 9/83
Oahu Banana Growers Association	--
Pacific Banana Growers Cooperative	--
The Sierra Club, Hawaii Chapter	12/ 5/83
Waimanalo Neighborhood Board No. 32	2/14/84
Windward Soil & Water Conservation District	--

963

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

RECEIVED
83 NOV 22 A10:27
DIV. OF WATER & LAND DEVELOPMENT

November 17, 1983

EILEEN R. ANDERSON, Mayor
GEORGE R. ARIYOSHI
YOSHIE H. FUJINAKA, Chairman
MILTON J. AGADER
MICHAEL J. CHUN
WALTER A. DODS, JR., Vice-Chairman
ERNEST A. MATARI
WAYNE J. YAMASAKI
KAZU HAYASHIDA
Manager and Chief Engineer

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

Dear Mr. Ono:

Subject: Your Letter of October 21, 1983, on the Environmental Impact Assessment for the Maunawili Ditch Improvements

Thank you for allowing us the opportunity to review the draft assessment.

We suggest that the EIS include a table or description of the users of the system, water quality data (if available) and the flows from the sources, existing system, and the proposed system.

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

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

Pure Water...man's greatest need - use it wisely

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

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83 NOV 22 A10:21
DIV. OF WATER & LAND DEVELOPMENT

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

Dear Mr. Hayashida:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

The following information is provided in response to your comments:

1. The ultimate users of the water from the Maunawili Ditch System are the customers of the Waimanalo Irrigation System (WIS), primarily banana and truck crop farmers. The WIS is scheduled for major improvements and will ultimately serve over 100 farm units.

2. A detailed description of the existing and proposed system is included in the Draft EIS.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

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

EILEEN R. ANDERSON
MAYOR

WILLARD T. CHOW
CHIEF PLANNING OFFICER

RALPH PORTMORE
DEPUTY CHIEF PLANNING OFFICER

November 17, 1983

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

Dear Mr. Ono:

EIS Preparation Notice for Maunawili Ditch Improvements

We agree with the assessment's determination as to the need for an impact statement. We too feel that environmental concern is warranted because the project alignment cuts through the sensitive Conservation District, the Waimanalo Forest Reserve and a watershed area. Additionally, the assessment noted that the project is situated upstream of Kawainui Marsh which is a critical wetland and Special Management Area.

Since the short term impacts which can be expected from this project will be associated principally with construction activity, additional details regarding the nature of construction work may need to be provided. Some items of interest include:

- type of improvements to existing and proposed pathways;
- description of construction/maintenance access roadways required to accommodate construction equipment and to allow delivery of materials to work sites;
- description of structure foundation when required;
- forest clearances likely to be done.

Sincerely,

Ralph Kawamoto

RALPH KAWAMOTO
Planner

APPROVED:

Ralph Portmore
for WILLARD T. CHOW

34

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'83 NOV 21 A10:25
HWY, DIV. WATER & LAND DEVELOPMENT

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
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AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Dr. Willard T. Chow
Chief Planning Officer
Department of General Planning
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Dr. Chow:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

The following information is provided in response to your comments:

1. Final alignments of the proposed construction-maintenance access roadways have not been established, as yet. We plan to restrict construction access to existing trails or pathways to minimize disturbances to existing forested areas. Improvements shall include some clearing and widening of pathways.

2. Detailed design of proposed structure footings are not yet available. However, it is anticipated that the foundations required will not involve significant amounts of excavation or ground disturbance.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

381

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

EILEEN R. ANDERSON
MAYOR

MICHAEL M. McELROY
DIRECTOR

ROBERT B. JONES
DEPUTY DIRECTOR

LU10/83-6059(LH)

November 16, 1983

83 NOV 16 P 3:21
STATE OF HAWAII
DIV OF WATER & LAND DEVELOPMENT
RECEIVED

Mr. Susumu Ono, Chairman
Board of Land & Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Maunawili Ditch Improvements
Environmental Impact Statement Preparation Notice (EISPN)
Tax Map Key 4-2-10: 1 and 4

We have reviewed the above proposed project and have the following comments to offer:

1. Will the proposed improvements divert more water from the Maunawili watershed area than the existing system?

2. The site is not within the Special Management Area (SMA).

3. The project site is zoned P-1 Preservation, and designated Preservation in the Koolaupoko Development Plan.

Thank you for the opportunity to review the EISPN. We would appreciate receiving a copy of the Draft EIS when it is completed. If you have any questions or comments, please contact Lorene Maki of our staff at 527-5349.

Very truly yours,

MICHAEL M. McELROY
Director of Land Utilization

MMM:sl

35

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
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CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Mr. Michael M. McElroy, Director
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. McElroy:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

The following information is provided in response to your comments and has been incorporated into the draft EIS:

The estimated yield from Maunawili Valley to Waimanalo as a result of the proposed improvements is 2.4 MGD, an increase of 0.4 to 0.7 MGD more than is currently taken (1.7 to 2.0 MGD). The additional yield will be the result of minimizing leakage losses from the existing transmission system, not from additional water development or diversions.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

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

EILEEN R. ANDERSON
MAYOR

EMIKO I. KUDO
DIRECTOR

SAM L. CARL
DEPUTY DIRECTOR

OSCAR K. ASAHINA
EXECUTIVE ASSISTANT

293

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83 NOV 15 A10:0
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10 P1:52
STATE OF HAWAII

November 9, 1983

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

36

Dear Mr. Ono:

SUBJECT: MAUNAWILI DITCH IMPROVEMENTS

As stated on Page 9, Paragraph 5, we are concerned of the impact that the possible loss of streamflow will have on the ecology of Kawainui Marsh.

Thank you for the opportunity to review the EIS Preparation Notice.

Sincerely yours,

(Mrs.) EMIKO I. KUDO, Director

EIK:vc

GEORGE R. ARITOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
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LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Mrs. Emiko I. Kudo, Director
Department of Parks and Recreation
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mrs. Kudo:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

We understand your concern about the preservation of Kawainui Marsh as a valuable ecological and cultural resource. It appears that the proposed project will have insignificant effects on the streamflow to Kawainui Marsh. The estimated yield from Maunawili Valley to Waimanalo as a result of the proposed improvements is 2.4 MGD, an increase of 0.4 to 0.7 MGD more than is currently taken (1.7 to 2.0 MGD). The additional yield will be the result of minimizing leakage losses from the existing transmission system. Based on field observations, very little, if any, of the water leaking from the existing ditch system re-enters the streams. Streamflow to the marsh should remain about the same. Average existing streamflow to the marsh is estimated to be about 6.8 MGD. No adverse impacts on the ecology of Kawainui Marsh are anticipated.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

Granted

256

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

EILEEN R. ANDERSON
MAYOR

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

MICHAEL J. CHUN, Ph.D.
DIRECTOR AND CHIEF ENGINEER

MAURICE H. KAYA
DEPUTY DIRECTOR

ENV 83-382

83 NOV 9 P1:04

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
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WATER AND LAND DEVELOPMENT

November 8, 1983

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83 NOV 15 AM 8:01
INV. OF WATER & LAND DEVELOPMENT

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

Dear Mr. Ono:

37

Re: EIS Preparation Notice for Maunawili Ditch Improvements, Koolaupoko, Oahu, Hawaii

The proposed improvements to Maunawili Ditch might reduce the natural flow of Maunawili Stream. Maunawili Stream presently serves as the receiving waters for two of our interim sewage treatment plants: one serving Maunawili Estate and the other serving Maunawili Park subdivision. Both plants are scheduled to be abandoned in the near future by the expansion of the Kailua sewer system.

Hence, any potential reduction of the assimilative capacity of Maunawili Stream will probably have no long-term adverse effects on the effluent disposal operation of the two treatment plants.

Me ke aloha pumehana,

for MICHAEL J. CHUN
Director and Chief Engineer

TO: JK
XEROX 1 copy/copies
Original to file
Copy to w/c

Dr. Michael J. Chun
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Dr. Chun:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

The following information is provided in response to your comments and has been incorporated into the draft EIS:

The estimated yield from Maunawili Valley to Waimanalo as a result of the proposed improvements is 2.4 MGD, an increase of 0.4 to 0.7 MGD more than is currently taken (1.7 to 2.0 MGD). The additional yield will be the result of minimizing leakage losses from the existing transmission system, not from additional water development or diversions.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

Bonnet

4

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

EILEEN R. ANDERSON
MAYOR

ANDREW I.T. CHANG
MANAGING DIRECTOR

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

WILLIAM A. BONNET
DIRECTOR

DAIL RHEE
DEPUTY DIRECTOR

December 22, 1983

TE 10/83-4352

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

Dear Mr. Ono:

Subject: Environmental Impact Assessment for the
Maunawili Ditch Improvements

We have no comments on the subject assessment.

Sincerely,

WILLIAM A. BONNET
Director

38

RECEIVED
84 JAN 3 P2:55
DIV OF WATER & LAND DEVELOPMENT

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Mr. William A. Bonnet
Director
Department of Transportation Services
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Bonnet:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your response on the EIS Preparation Notice for the proposed project.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

GEORGE R. ARIYOSHI
GOVERNOR

3 P 1: 35

JACK K. SUWA
CHAIRMAN, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRMAN

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

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

November 2, 1983

MEMORANDUM

TO: Mr. Susumu Ono, Chairman
Board of Land and Natural Resources

SUBJECT: Notice of Determination
Maunawili Ditch Improvements

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

Since the water is purchased by the State from the Kaneohe Ranch Co., Ltd., on a year-to-year basis and considering the financial investment that the State would be making for the ditch improvements, what steps are being taken to arrange a longer term lease to the water source?

We suggest that the Environmental Impact Statement include calculations of the additional acreage which can be serviced by the improved system. Also the effects of the increased flows on the existing Kailua Reservoir should be addressed.

Thank you for the opportunity to comment.

JACK K. SUWA, CHAIRMAN
Board of Agriculture

RECEIVED
83 NOV 4 A9: 52
DIV. OF WATER & LAND DEVELOPMENT

"Support Hawaiian Agricultural Products"

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
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HONOLULU, HAWAII 96809

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

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CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Honorable Jack K. Suwa, Chairman
Department of Agriculture
State of Hawaii
P.O. Box 22159
Honolulu, Hawaii 96822

Dear Mr. Suwa:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

The following information is provided in response to your comments:

1. The State is currently in the process of negotiating an agreement with the leasee and landowner to secure rights to the water.

2. The proposed project was developed in support of the Waimanalo Watershed Plan. Acreages to be serviced by the improved Waimanalo Irrigation System have been estimated by the U.S. Soil Conservation Service and are included in the Watershed Plan.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

GEORGE R. ARIYOSHI
GOVERNOR

Dowling

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

November 1, 1983

RECEIVED
83 NOV 7 P2:57
DIV. OF WATER & LAND DEVELOPMENT

MEMO TO: Honorable Susumu Ono, Chairman
Board of Land and Natural Resources

F R O M: Dr. Dennis H. Thompson, Superintendent
Department of Education

SUBJECT: Maunawili Ditch Improvements
Preparation Notice and Environmental Impact Assessment

The Department of Education does not have any comments to offer on the subject improvements for the Waimanalo area.

Thank you for the opportunity to review the matter.

DHT:HL:jl

cc: Mr. J. Edington
Windward District

AN EQUAL OPPORTUNITY EMPLOYER

40

151

DR. DONNIS H. THOMPSON
SUPERINTENDENT

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
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AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Mr. Francis Hatanaka
Acting Superintendent
Department of Education
State of Hawaii
P.O. Box 2360
Honolulu, Hawaii 96813

Dear Mr. Hatanaka:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your response on the EIS Preparation Notice for the proposed project.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

DOWAD

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

In reply, please refer to:
EPHSB-88

November 7, 1983

Mr. Susumu Ono
Chairman of the Board
Department of Land & Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Subject: Request for Comments on Environmental Assessment for Maunawili Ditch Improvements

Thank you for allowing us to review and comment on the subject environmental assessment. Please be informed that we do not have any objections to this project.

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

Sincerely,

MELVIN K. KOIZUMI
Deputy Director for
Environmental Health

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83 NOV 10 A 9:52
DIV. OF WATER & LAND DEVELOPMENT

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

CHARLES G. CLARK
DIRECTOR OF HEALTH

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
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LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

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

Dear Mr. Koizumi:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

KAMAMALU BUILDING, 250 SOUTH KING ST, HONOLULU HAWAII
MAILING ADDRESS: P.O. BOX 2359 HONOLULU HAWAII 96804

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

KENT M. KEITH
DIRECTOR

JOHN R. PINGREE
DEPUTY DIRECTOR

DIVISIONS
ECONOMIC DEVELOPMENT DIVISION
FOREIGN TRADE ZONE DIVISION
HAWAII INTERNATIONAL SERVICES AGENCY
LAND USE DIVISION
PLANNING DIVISION
RESEARCH AND ECONOMIC ANALYSIS DIVISION

OFFICES
CONVENTION SERVICES OFFICE
HAWAII FILM OFFICE
INFORMATION OFFICE
TOURISM OFFICE

Ref. No. 8391

November 18, 1983

MEMORANDUM

TO: The Honorable Susumu Ono, Chairperson
Department of Land and Natural Resources

FROM: Kent M. Keith, Director

SUBJECT: Maunawili Ditch Improvements
Preparation Notice and Environmental Assessment

We have reviewed the subject document and offer the following comments.

The Resource Management Plan for Kawainui Marsh offers specific recommendations with respect to maintenance of existing water levels in the Marsh:

Ecological Resources, Policy A1 - The natural water levels in the Marsh basin should be maintained in order to protect waterbird habitat and support potential agricultural activity.

Ecological Resources, Recommended Action D2 - Place a ban on any additional freshwater withdrawal from Kawainui Marsh.

While the subject document recognizes the resource concerns identified in the Marsh management plan, it provides only rough estimates of the volume of streamflow reduction. It estimates that the existing system delivers 1.5 mgd to Waimanalo and, after improvements, that the system will deliver an unspecified volume - but less than the historic high of 3 to 4 mgd when the Waimanalo Sugar Company was in operation. In addition, the document does not discuss the possible impacts that the proposed ditch improvements will have on the existing water levels.

We believe that it is important to determine more precise levels of dewatering in the Maunawili Watershed inasmuch as early photographs of the Marsh, taken when there were higher levels of water transport, indicate that the Marsh had very little surface water. We recommend that alternatives to the proposed system restoration and improvement be fully explored. Inasmuch as a plan for instream use and implementing rules and regulations are being developed for Windward Oahu, we also recommend that the proposed activity be described in terms of compliance with these recent controls as well.

Thank you for the opportunity to comment.

cc: Office of Environmental Quality Control

42

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
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FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Honorable Kent M. Keith, Director
Department of Planning and Economic Development
State of Hawaii
P.O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Keith:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

The following information is provided in response to your comments and has been incorporated into the draft EIS:

1. It appears that the proposed project will have insignificant effects on the streamflow to Kawainui Marsh. The estimated yield from Maunawili Valley to Waimanalo as a result of the proposed improvements is 2.4 MGD, an increase of 0.4 to 0.7 MGD more than is currently taken (1.7 to 2.0 MGD). The additional yield will be the result of minimizing leakage losses from the existing transmission system. Based on field observations, very little, if any, of the water leaking from the existing ditch system re-enters the streams. No additional water development or diversions are proposed as part of this project.

2. Effects of the proposed improvements on the hydrology of Kawainui Marsh are discussed in Appendix B of the Draft EIS.

3. The proposed improvements will be implemented in compliance with the instream use guidelines developed by the State.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

GEORGE R. ARIYOSHI
GOVERNOR

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

Wayne J. Yamasaki
DIRECTOR

DEPUTY DIRECTORS
Adam D. Vincent
JONATHAN K. SHIMADA, Ph.D
CHERYL D. SOON

IN REPLY REFER TO

STP 8.9533

December 8, 1983

RECEIVED
83 DEC 14 A6:51
DIV. OF WATER & LAND DEVELOPMENT

MEMORANDUM

TO: The Honorable Susumu Ono, Chairman
Department of Land and Natural Resources

FROM: Director of Transportation

SUBJECT: EIS PREPARATION NOTICE
MAUNAWILI DITCH IMPROVEMENTS

Thank you for the opportunity to be consulted on the subject matter.

Please be informed that the proposed action is not anticipated to adversely impact our existing or proposed program for the area.

Wayne J. Yamasaki

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

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DEPUTY TO THE CHAIRMAN

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LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

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

Dear Mr. Yamasaki:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your response on the EIS Preparation Notice for the proposed project.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

Dowtsd

126

University of Hawaii at Manoa

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

October 31, 1983

PN:0026

RECEIVED
83 NOV 4 A9:52
DIV. OF WATER & LAND DEVELOPMENT

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

Dear Mr. Ono:

Preparation Notice
Environmental Impact Statement
Maunawili Ditch Improvements
Maunawili Valley, Koolaupoko, Oahu

The EIS preparation notice for the proposed improvements to the Maunawili Ditch system appears to recognize the major potential impacts that may be anticipated to result from this action. We concur that due care needs to be given to the effects of this project on the downstream wetlands of Kawainui Swamp. In this regard, it would be well to address the potential cumulative effects of the decrease in water discharge to Kawainui resulting from this project, that which will occur when the new Kailua-Kaneohe sewer diversion is completed.

The historical data on the Maunawili Ditch System may provide information on the effects of the ditch system on Kawainui swamp at the time of the Waimanalo Sugar Co. operation.

The map provided in the EIS preparation notice indicates that the ditch crosses several streams. If the proposed improvements to the ditch will affect these streams it will likely be necessary to discuss, in the EIS, the effects of the diversion on the downstream users of this water as well as on the stream biota.

With regard to impacts on the conservation lands, we agree that surface archeological features or unique biological habitats along the ditch right-of-way were probably destroyed when the original ditch was constructed. However, if excavation for foundation work will occur in areas of potential archeological significance that were previously subject only to surface clearing, it may be prudent to have an archeologist examine those areas prior to excavation. This should avoid delays from the discovery of archeological materials during construction.

In addition to the short term erosion impacts at the foundation sites during excavation work the EIS should address the potential for erosion from the construction of the access roads and in particular outline the mitigating measures to contain both short and long term erosion from these roads.

We appreciate the opportunity to assist in the preparation of this EIS.

Yours truly,

Doak C. Cox
Director

cc: Jacquelin Miller

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
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AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Dr. Doak C. Cox, Director
Environmental Center
University of Hawaii at Manoa
2550 Campus Road Crawford 317
Honolulu, Hawaii 96822

Dear Dr. Cox:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

The following information is provided in response to your comments and has been incorporated into the draft EIS:

1. It appears that the proposed project will have insignificant effects on the streamflow to Kawainui Marsh. The estimated yield from Maunawili Valley to Waimanalo as a result of the proposed improvements is 2.4 MGD, an increase of 0.4 to 0.7 MGD more than is currently taken (1.7 to 2.0 MGD). The additional yield will be the result of minimizing leakage losses from the existing transmission system. Based on field observations, very little, if any, of the water leaking from the existing ditch system re-enters the streams. No additional water development or diversions are proposed as part of this project.

2. Historical data on the Maunawili Ditch System and Kawainui Marsh are included in Appendix B of the Draft EIS.

3. A biological stream survey has been conducted for this project. Results are included in Appendix A of the Draft EIS.

4. Should any evidence of archaeological sites or artifacts be discovered during construction, the State Historic Preservation Officer shall be notified and work in the area shall cease until the site has been studied and appropriate measures are implemented.

5. Appropriate erosion control measures will be implemented during construction.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

45

689

University of Hawaii at Manoa

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

18 November 1983

RECEIVED
83 NOV 30 A9:36
DEPT OF WATER & LAND DEVELOPMENT

Mr. Susumu Ono, Chairperson
Department of Land & Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

SUBJECT: Draft Notice of Determination and Environmental Impact Assessment, Maunawili Ditch Improvements, Maunawili, Oahu. October 1983

We have reviewed the subject Notice and have no comments to offer at this time. Thank you for the opportunity to comment. This material was reviewed by WRRC and affiliate personnel.

Sincerely,

Edwin T. Murabayashi
EIS Coordinator

ETH:jm

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

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

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

Dear Mr. Murabayashi:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your response on the EIS Preparation Notice for the proposed project.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

AN EQUAL OPPORTUNITY EMPLOYER

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT. SHAFTER, HAWAII 96858

November 9, 1983

Mr. Susumu Ono, Chairman
Board of Land and Natural
Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Thank you for the opportunity to review and comment on the Environmental Impact Statement Preparation Notice for Maunawili Ditch Improvements. The following comments are offered:

a. Construction plans for improvements at the stream crossing should be coordinated with the Corps of Engineers, Operations Branch to comply with the Department of the Army permit requirements.

b. The site of the proposed irrigation ditch system, which is located in the Forest Reserve and Conservation areas of Windward Oahu, is designated Zone D or area of undetermined but possible flood hazards. The flood designation is obtained from the Flood Insurance Study for Oahu prepared by the Federal Insurance Administration (FIA). Enclosure 1 is the Flood Insurance Rate Map for Maunawili area, prepared as part of the FIA Flood study.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

Enclosure

32

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
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STATE PARKS
WATER AND LAND DEVELOPMENT

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83 NOV 15 A10:41
DIV. OF WATER & LAND DEVELOPMENT

STATE OF HAWAII

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
Corps of Engineers
Pacific Ocean Division
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

The following information is provided in response to your comments:

1. Based on preliminary investigation, the proposed improvements are situated above the defined headwaters of the Maunawili Stream and will not require a Department of the Army Permit. However, we will be submitting plans for your review and concurrence regarding this matter.

2. Flood hazards will be considered during the design phase of the proposed project.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board
State Historic Preservation Officer

34 /

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P.O. BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES

RECEIVED
83 NOV 8 AM : 36
DIV. OF WATER & LAND DEVELOPMENT

83 OCT 31 A 9:
Room 6307

OCT 28 1983
BOARD OF LAND & NATURAL RESOURCES
STATE OF HAWAII

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

Re: Draft EISPN, Maunawili
Ditch Improvements,
Koolaupoko, Oahu

Dear Mr. Ono:

We have reviewed the draft Notice of Determination and Environmental Impact Assessment for Maunawili Ditch Improvements which was forwarded to us with your letter of October 21, 1983. Paragraph II.D. should include a current estimate of stream flow into Kawainui Marsh contributed by Maunawili, Ainoni and Makawao streams. Paragraph I.F. should list the freshwater animals known to inhabit these streams and the existing ditch system. Section III should include an evaluation of probable impacts upon existing instream uses, and should suggest appropriate mitigation measures to reduce fish and wildlife habitat loss during construction and operation of the new irrigation system inprovements. An estimate of probable flow reduction due to system improvements should be included in this document.

We assume that this action will be evaluated by the Board in light of recent State initiatives to protect instream uses of water in Windward Oahu. Thank you for providing the opportunity to comment.

Sincerely yours,

William R. Kramer

William R. Kramer
Project Leader
Office of Environmental Services

cc: NMFS - WPPO
HDF&W
HDAR
EPA, San Francisco

TO: _____
XEROX 3 copy/copies
Original to file
Copy to [redacted] F&W
A/R
NOV 8 1983

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Save Energy and You Serve America!

48

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
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AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Mr. William R. Kramer
Project Leader
Office of Environmental Services
U.S. Fish and Wildlife Service
P.O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Kramer:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

We have addressed your concerns regarding streamflows and aquatic life affected by the proposed project in the Draft EIS. Detailed studies were conducted as part of the investigation and are included in Appendices A and B of the Draft EIS.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board
State Historic Preservation Officer

United States Department of the Interior

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

November 21, 1983

RECEIVED
83 NOV 28 A8: 56
DIV. OF WATER & LAND DEVELOPMENT
STATE OF HAWAII

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

Dear Mr. Ono:

RE: Maunawili Ditch Improvements

The environmental impact assessment for the Maunawili Ditch Improvements has been reviewed and the following comment has been made regarding the existing system discussed on page 3:

> *The maximum fair weather flow of Maunawili Valley at ditch level is about two million gallons a day and improvements to be made on the existing ditch system will not increase the available flow. To provide a dependable irrigation water supply to support agricultural operations drilled wells above ditch level should be considered to augment ditch flow during dry weather.*

We appreciate the opportunity allowed to us to review the above subject matter.

Sincerely,

Stanley F. Kapustka
District Chief

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
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FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Mr. Stanley F. Kapustka
District Chief
Water Resources Division
U.S. Geological Survey
P.O. Box 50166
Honolulu, Hawaii 96850

Dear Mr. Kapustka:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

The following information is provided in response to your comments:

Based on field measurements, existing water sources appear to be adequate if transmission losses can be minimized and storage is constructed in Waimanalo. Should additional water be required in the future, or if transmission losses cannot be sufficiently reduced, development of additional sources may be necessary. The additional water appears to be available, however, the impacts of such development must be further studied.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board
State Historic Preservation Oficer

United States Department of Agriculture

Soil Conservation Service

P.O. Box 50004
Honolulu, Hawaii
96850

November 16, 1983

Mr. Susumu Ono
Chairperson of the Board
Board of Land & Natural Resources of HAWAII
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Ono:

Subject: Draft Notice of Determination - Proposed Maunawili Ditch Improvements, Maunawili Valley, Koolaupoko, Oahu, HI

The subject document has been reviewed as you requested.

We strongly endorse the proposal, as we feel it is an integral part of the PL-566, Waimanalo Watershed Project, of which you are a sponsor.

Thank you for the opportunity to review this document.

Sincerely,

FRANCIS C.H. LUM
State Conservationist

The Soil Conservation Service is an agency of the Department of Agriculture

RECEIVED
83 NOV 21 A 9:33
DIV. OF WATER & LAND DEVELOPMENT

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AGRICULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Mr. Francis Lum
State Conservationist
U.S. Soil Conservationist
P.O. Box 50004
Honolulu, Hawaii 96850

Dear Mr. Lum:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments in support of the proposed project.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board
State Historic Preservation Officer

HSPA

HAWAIIAN SUGAR PLANTERS' ASSOCIATION, 99-193 AIEA HEIGHTS DRIVE, AIEA, HAWAII
MAILING ADDRESS: P.O. BOX 1057, AIEA, HAWAII 96701, TELEPHONE: (808) 487-6561

DON J HEINZ
Vice President Director
Experiment Station

October 28, 1983

Mr. Susumu Ono, Chairman
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

Maunawili Ditch Improvements

We have reviewed the draft Notice of Determination and Enviromental Impact Assessment for the above project.

As lessees of land through which a part of the ditch is situated, we support the proposed project. The proposal should eliminate, or at least minimize, problems presently associated with maintenance of the ditch.

Sincerely yours,

Don J. Heinz

DJH:hb

RECEIVED
83 NOV 4 A9:52
DIV. OF WATER & LAND DEVELOPMENT

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
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LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Mr. Don J. Heinz
Vice President - Director
Experiment Station
Hawaii Sugar Planters' Association
P.O. Box 1957
Aiea, Hawaii 96701

Dear Mr. Heinz:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments in support of the proposed project.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

KAILUA NEIGHBORHOOD BOARD NO. 31
c/o Kailua Satellite City Hall
302 Kuulei Road
Kailua, HI 96734

RECEIVED
83 DEC 23 P 1:22
DIV. OF WATER & LAND DEVELOPMENT

December 19, 1983

Mr. Robert Chuck
Dept. Land & Natural Resources
1151 Punchbowl Street
Honolulu Hawaii 96813

Dear Mr. Chuck:

On behalf of the Kailua Neighborhood Board #31, this communication will inform you of the Board's major concern and opposition to the proposed Maunawili Ditch project.

We are extremely happy to respond to your request for comment of the preliminary environmental assessment provided by your department. We are anxious to have a full environmental impact assessment done by the department. Our major concern lies in the fact that the project will divert an overwhelming amount of water from the Kawai Nui Marsh, threatening the very existence of the Marsh itself and the habitat of the wildlife the Marsh supports. Maunawili Stream and its contributaries are the main water source for the Marsh. The E.A. appears to give very little attention to the effect caused by the diversion of almost 75% of the flow from that stream. 52

Also, we are concerned that this project seems to be in direct violation of your department's recently adopted instream use guidelines in which you yourself played so significant a role. We look forward to a full commentary and investigation of this project before it is considered for approval. We would request that the Department hold a full public hearing in the Maunawili area as soon as possible so that the maximum community input may be directed to this important issue.

Very truly yours,

Robert Carter per RM

Robert Carter
CoChair, Ctte on Community Concerns/Environment

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMABU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Mr. Robert Carter
Co-Chairman
Committee on Community Concerns/Environment
Kailua Neighborhood Board No. 31
c/o Kailua Satellite City Hall
302 Kuulei Road
Kailua, Hawaii 96734

Dear Mr. Carter:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

We understand your concern about the preservation of Kawainui Marsh as a valuable ecological and cultural resource. It appears that the proposed project will have insignificant effects on the streamflow to Kawainui Marsh. The estimated yield from Maunawili Valley to Waimanalo as a result of the proposed improvements is 2.4 MGD, an increase of 0.4 to 0.7 MGD more than is currently taken (1.7 to 2.0 MGD). The additional yield will be the result of minimizing leakage losses from the existing transmission system. Based on field observations, very little, if any, of the water leaking from the existing ditch system re-enters the streams. Streamflow to the marsh should remain about the same. Average existing streamflow to the marsh is estimated to be about 6.8 MGD.

The proposed improvements will be implemented in conformance with the instream use guidelines developed by the State. No additional water development or diversions, or stream channel alterations are proposed as part of this project.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

Dowmed

THE LANI-KAILUA OUTDOOR CIRCLE
P. O. BOX 261
KAILUA, HAWAII 96734

Susumu Ono, Chair

Dec. 9, 1983

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

'83 DEC 12 A9:05
STATE OF HAWAII

Aloha,

The Lani-Kailua Outdoor Circle objects to any sewage alignment for the Maunawili Estates STP that has an adverse impact on the Maunawili Stream, the wetlands, and the Kawai Nui Marsh.

We object to any treatment to the natural flow of waters from the Maunawili streams which feed into our most precious and our largest freshwater wetlands in the State of Hawaii.

The Maunawili Stream is one of two streams that feed into the Kawai Nui Marsh. Any activities that impact on the stream are considered as having an adverse impact on the watershed area.

It is certainly about time that the natural wetland, flood control, wildlife, and land use areas of this marsh is defined and upheld.

There must no longer be any threats of destruction and condemnation of these waters. The proposed project is completely imcompatable with the State's resource management plan for Kawai Nui and will prevent the implementation of this plan. A sizeable removal of these waters and a drying up of the important wetlands would greatly impact upon this most precious resource and most restful and most beautiful vista on the Windward side.

Aloha,
Marie Gormaine
Marie Gormaine, Chair
Public Affairs Committee
Robert P.L. Carter
Robert P.L. Carter
Committee Member

RECEIVED
83 DEC 14 A6:50
DIV. OF WATER & LAND DEVELOPMENT

53

811

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Ms. Marie Gormaine, Chairperson
Public Affairs Committee
The Lani-Kailua Outdoor Circle
P.O. Box 261
Kailua, Hawaii 96734

Dear Ms. Gormaine:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

We understand your concern about the preservation of Kawainui Marsh as a valuable ecological and cultural resource. It appears that the proposed project will have insignificant effects on the streamflow to Kawainui Marsh. The estimated yield from Maunawili Valley to Waimanalo as a result of the proposed improvements is 2.4 MGD, an increase of 0.4 to 0.7 MGD more than is currently taken (1.7 to 2.0 MGD). The additional yield will be the result of minimizing leakage losses from the existing transmission system. Based on field observations, very little, if any, of the water leaking from the existing ditch system re-enters the streams. No additional water development or diversions are proposed as part of this project.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

LIFE OF THE LAND

Mr. Robert T. Chuck
Manager and Chief Engineer
Division of Water and Land Development
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

RECEIVED
DEC 9 A 9:55
DIV. OF WATER & LAND DEVELOPMENT

December 5, 1983

Dear Mr. Chuck:

Subject: Environmental Impact Statement for the Maunawili Ditch Improvements

Life of the Land would like to be a consulted party for the subject EIS. Please send us a copy of the Draft EIS and the Revised EIS when they become available.

On page 10 of the EIS Preparation Notice for the Maunawili Ditch Improvements, your Department notes that:

> The project is also situated upstream of Kawainui Swamp which is a critical wetland and Special Management Area. Design considerations as mitigative measures of probable impacts need to be developed further. The public will be given an opportunity to provide input on available options.

For the record, Kawainui Marsh is a critical habitat for all four endangered endemic species of waterbirds. Unfortunately, because of excessive removal of water from the Marsh by the Waimanalo Sugar Company, Californiagrass became established throughout most of the wetland. In recent years, as a result of siltation and discharge of sewage effluent into the Marsh, the remaining wet areas in the Marsh are under serious threat of becoming a pasture. If this happens, then Kawainui Marsh will have no value as habitat for waterbirds.

The proposed Maunawili Ditch Improvements will remove water from the Marsh and potentially may further aggravate the problem. This issue needs to be directly addressed in the Draft EIS.

We also recommend that the Draft EIS seriously address the cost and potential benefits of artificial dredging of parts of Kawainui Marsh as a mitigation measure for impacts of the Maunawili Ditch Improvements. Artificial creation of areas of open water in the Marsh is one of the principal recommendations of the DPED Kawainui Marsh Plan, and on paper at least the Department of Land and Natural Resources is responsible to implement the Kawainui Marsh Plan. Ed Marcus at DPED has collected a price list for a variety of floating bulldozers and dreges adaptable for improvement of the Marsh.

Sincerely,

D. T. Callan

Dennis Callan
President

cc: OEQC

250 S. Hotel St. Rm. 211, Honolulu, Hawaii 96813. Tel. 521-1300

54

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Mr. Dennis Callan, President
Life of the Land
250 South Hotel Street Rm. 211
Honolulu, Hawaii 96813

Dear Mr. Callan:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

The following information is provided in response to your comments and has been incorporated into the draft EIS:

1. It appears that the proposed project will have insignificant effects on the streamflow to Kawainui Marsh. The estimated yield from Maunawili Valley to Waimanalo as a result of the proposed improvements is 2.4 MGD, an increase of 0.4 to 0.7 MGD more than is currently taken (1.7 to 2.0 MGD). The additional yield will be the result of minimizing leakage losses from the existing transmission system. Based on field observations, very little, if any, of the water leaking from the existing ditch system re-enters the streams. No additional water development or diversions are proposed as part of this project.

2. Effects of the proposed improvements on the hydrology of Kawainui Marsh are discussed in Appendix B of the Draft EIS.

3. Since impacts resulting from this project appear to be insignificant, the implementation of mitigating measures are not warranted at this time.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

MAUNAWILI COMMUNITY ASSOCIATION
P. O. Box 943 Kailua, Hawaii

810

STATE OF HAWAII

RECEIVED
83 DEC 14 A6:51
DIV. OF WATER & LAND DEVELOPMENT

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

December 9, 1983

Dear Mr. Ono,

Thank you for a copy of the Environmental Impact Assessment for the Maunawili Ditch Improvements project. After reading through it and making a presentation to the Board of Directors of our Community Association, we have some comments we'd like to make.

We do not like the idea of more water being diverted from Maunawili Valley. We feel that the water source for Kawai Nui Marsh should be protected. If Maunawili stream is depleated, the Marsh will become extinct.

Also, we would like to maintain agricultural production in Maunawili and to enhance it, not divert our water elsewhere so that farming becomes impossible because our water has been diverted to other areas.

We also question the cost of using enclosed pipelines for agricultural uses when Waimanalo residents are drinking water from an open ditch source.

We feel that roadways back in the mountains will sorely distort the hillsides and scare the area. Erosion will be a problem that will be difficult to handle. If other projects also go through, like the Maunawili Sewer Trunk Line, there will be too much construction in the Valley to allow regrowth.

We were also unhappy with the manner in which the project has been handled. Federal monies were approved for the Waimanalo side of the project, but the Maunawili side of the project didn't qualify (we were told, but not the reason why.). We are the most important side, since we have the water! Yet, the Waimanalo side of the project was started without assurance that the Maunawili side of the project would be approved. Doesn't sound right!

Thank for your consideration. We would like to be kept abreast of this development. Please send us the Environmental Impact Statement when it is available. Mahalo.

Sincerely,

President of the Maunawili Community Association

cc Maunawili Estates Community Association
Kailua Neighborhood Board
Kailua Community Council
Olomana Community Association
Pohakapu Community Association
Welcome Fawcett

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Ms. Barbara Locricchio, President
Maunawili Community Association
P.O. Box 943
Kailua, Hawaii 96734

Dear Ms. Locricchio:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments on the EIS Preparation Notice for the proposed project.

The following information is provided in response to your comments:

1. It appears that the proposed project will have insignificant effects on the streamflow to Kawainui Marsh. The estimated yield from Maunawili Valley to Waimanalo as a result of the proposed improvements is 2.4 MGD, an increase of 0.4 to 0.7 MGD more than is currently taken (1.7 to 2.0 MGD). The additional yield will be the result of minimizing leakage losses from the existing transmission system. Based on field observations, very little, if any, of the water leaking from the existing ditch system re-enters the streams. Streamflow should remain at current levels. No additional water development or diversions are proposed as part of this project.

2. The use of enclosed pipelines in this project is limited to applications where pressure pipeflow is required (i.e., inverted siphons), or where infiltration of undesirable matter (eg., sediment runoff or parasitic nematodes) must be eliminated.

Most of the Maunawili Ditch System will remain as an open channel. We are not aware of any Waimanalo residents who are using an open ditch as a source of potable water.

3. Final alignments of the proposed construction-maintenance access roadways have not been established, as yet. We plan to restrict construction access to existing trails or pathways to minimize disturbances to existing forested areas. Preventing erosion shall be of utmost importance during construction and will be closely monitored by field engineer.

4. The Waimanalo Watershed Plan had established definite geographical boundaries which limited the project scope to improvements in Waimanalo valley. The ultimate Waimanalo Watershed Plan may be implemented only if improvements to the Maunawili Ditch are performed, and the water source to Waimanalo is assured. Without a secured water source, the ultimate Watershed Plan will probably not be implemented.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

59

SIERRA CLUB, HAWAI'I CHAPTER
P.O. BOX 11070, HONOLULU, HAWAI'I 96828
(808) 946-8494

5 December 1983

Mr. Robert T. Chuck
Manager - Chief Engineer
Division of Water & Land Development
Department of Land & Natural Resources
P. O. Box 373
Honolulu, Hawai'i 96809

RECEIVED
'83 DEC 8 A11:10
DIV. OF WATER & LAND DEVELOPMENT

Dear Mr. Chuck:

The Conservation Committee of the Honolulu Group of the Sierra Club, Hawai'i Chapter, wishes to be a consulted party for the Environmental Impact Statement for the Maunawili Ditch Improvements. Please send all pertinent materials to my attention at the above address.

Sincerely,
Susan E. Miller
Susan E. Miller
for
Conservation Committee,
Honolulu Group, Sierra Club

57

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AGRICULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Ms. Susan E. Miller
Conservation Committee
Honolulu Group
Sierra Club
Hawaii Chapter
P.O. Box 11070
Honolulu, Hawaii 96828

Dear Ms. Miller:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your response on the EIS Preparation Notice for the proposed project.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

WAIMANALO NEIGHBORHOOD BOARD NO. 32
P. O. BOX 440
WAIMANALO, HAWAII 96795

RECEIVED
84 MAR 6 P3:01
DIV OF WATER & LAND DEVELOPMENT

February 14, 1984

Mr. Susumo Ono, Chief
Department of Land
and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Ono:

I wish to inform you of the Waimanalo Neighborhood Board's decision to support the proposed Maunawili Ditch Improvement project.

As you probably are already aware, the agricultural land in Waimanalo has been designated as "Agricultural Lands of Importance in the State of Hawaii" (ALISH), and the City and County Development Plan calls for continued retention of the valley in rural and agricultural use. These factors in addition to the Agricultural Park development dictate that an adequate supply of irrigation water be available to Waimanalo. None of the goals mentioned above can be achieved without it.

I therefore encourage implementation of the Maunawili Ditch Improvement project as soon as such is feasible.

Sincerely,

Allen Novak

Allen Novak, Chairman
Planning and Zoning Committee
Waimanalo Neighborhood Board

cc: Robert Chuck

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
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CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

Mr. Allen Novak, Chairman
Planning and Zoning Committee
Waimanalo Neighborhood Board No. 32
P.O. Box 440
Waimanalo, Hawaii 96795

Dear Mr. Novak:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

Thank you for your comments in support of the proposed project.

We are transmitting herewith, a copy of the Draft EIS for your review and comment.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

The following comments were received prior to our filing of the EIS submitted for review with the Environmental Quality Commission.

	Response Received
CITY & COUNTY OF HONOLULU:	
Board of Water Supply	4/18/84
Department of Land Utilization	4/23/84
STATE OF HAWAII:	
Department of Agriculture	3/29/84
Office of Environmental Quality Control	4/ 6/84
U.H. Environmental Center	4/23/84
U.H. Water Resources Research Center	4/11/84
FEDERAL AGENCIES:	
U.S. Fish and Wildlife Service	3/29/84
ORGANIZATIONS:	
Hawaiian Electric Company Inc.	5/ 2/84
Life of the Land	4/19/84
Sierra Club, Hawai'i Chapter	4/23/84

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

April 18, 1984

Ms. Letitia N. Uyehara
Interim Director
Office of Environmental
Quality Control
Room 301
550 Halekauwila Street
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Your Letter of March 19, 1984, on the Draft Environmental Impact Statement for the Haunawili Ditch Improvements

We have no objections to the proposed project. However, the statement on page 1 that "Additional irrigation water will be obtained from the Board of Water Supply system ..." conflicts with the statement on page 25 which states that "... the Waimanalo Watershed Plan should make available more irrigation water to the Waimanalo area thereby decreasing the use of potable water for irrigation from the Board of Water Supply (BWS) system.".

In our agreement dated September 10, 1982 with the State Board of Land and Natural Resources (BLNR), we agreed to furnish water for the potable needs for Waimanalo Agricultural Park, Phase I, and for irrigation for five (5) lots within Phase I. In addition, we agreed to reserve 180,000 gallons per day for future BLNR sponsored agricultural park developments in Waimanalo. The agreement will continue for a period not to exceed five (5) years, ending on September 9, 1987. However, this period may be extended by mutual consent of the parties.

59

The Haunawili Ditch will be the primary irrigation water source for agricultural developments in Waimanalo.

Thank you for allowing us to comment on the document.

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

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

cc: Division of Water and Land Development
Fukunaga & Assoc., Inc.

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
AGRICULTURE DEVELOPMENT
PROGRAM
AQUATIC RESOURCES
CONSERVATION AND
RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

MAY 17 1984

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

Dear Mr. Hayashida:

SUBJECT: Environmental Impact Statement for the Maunawili Ditch Improvements

Thank you for your comments on the Draft EIS.

The Final EIS will be revised as follows in response to your comments:

Statement on Page 25 (DEIS) shall be deleted: "Reduction of leakage from the Maunawili Ditch System and making the system more reliable in conjunction with the Waimanalo Watershed Plan should make available more irrigation water to the Waimanalo area thereby decreasing the use of potable water for irrigation from the Board of Water Supply (BWS) system."

Very truly yours,

SUSUMU ONO
Chairperson of the Board

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

EILEEN R. ANDERSON
MAYOR

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

MICHAEL M. McELROY
DIRECTOR

ROBERT B. JONES
DEPUTY DIRECTOR

April 23, 1984

LU3/84-1347(JDN)
84/EC-1

Ms. Letitia H. Uychara, Interim Director
Office of Environmental Quality Control
State of Hawaii
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uychara:

Draft Environmental Impact Statement (EIS)
For the Haunawili Ditch Improvements, Haunawili Valley
Koolaupoko, Oahu; Tax Map Keys 4-2-10: 1 and 4

We have reviewed the subject Draft EIS and have the following comments:

1. According to the EIS, minimizing leakage losses from the existing transmission system will result in an increased yield of 0.4 million gallons per day. Will this result in a reduction of groundwater recharge?

2. Reference: Access Roads, Page 6.

   Comment: When the access roads are installed, preservation of existing hiking trails should be ensured.

If there are any questions, please contact John Nakagawa of our staff at 523-4618.

Very truly yours,

Loretta Chee
for MICHAEL M. McELROY
Director of Land Utilization

MMM:sl

cc: Robert T. Chuck, DLNR
Fukunaga & Associates, Inc. ✓

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

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LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

MAY 17 1984

Mr. Michael M. McElroy
Director of Land Utilization
Department of Land Utilization
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. McElroy:

SUBJECT: Environmental Impact Statement for the Haunawili Ditch Improvements

Thank you for comments on the Draft EIS.

The following information is provided in response to your comments:

1. Groundwater recharge may be reduced somewhat as a result of minimizing leakage losses from the ditch system; however, this reduction appears to be negligible. (See Appendix B, Hydrologic Impacts-Kawainui Marsh).

2. No known hiking trails will be threatened by the proposed improvements. In any case, upon completion of the construction work all disturbed areas shall be restored to their original condition.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

GEORGE R. ARIYOSHI
GOVERNOR

JACK K. SUWA
CHAIRMAN, BOARD OF AGRICULTURE

SUZANNE D. PETERSON
DEPUTY TO THE CHAIRMAN

GEORGE R. ARIYOSHI
DIRECTOR OF WATER

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

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

March 29, 1984

MEMORANDUM

To: Ms. Letitia N. Uyehara, Director
Office of Environmental Quality Control

Subject: Draft Environmental Impact Statement (EIS) for
Maunawili Ditch Improvements
Department of Land and Natural Resources
TMK: 4-2-10: 1 and 4
Maunawili Valley, Oahu

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

We understand from the Department of Land and Natural Resources that the State is currently negotiating an agreement with the lessee (Kaneohe Ranch) and the landowner (Harold K. L. Castle Trust Estate) to secure rights to the water source.

We note that the Waimanalo Watershed Plan under which the proposed project will be developed, will provide benefits to approximately 1,252 acres of land (including over 100 farm units).

Thank you for the opportunity to comment.

JACK K. SUWA
Chairman, Board of Agriculture

cc: Mr. Robert T. Chuck
Fukunaga & Associates, Inc.

"Support Hawaiian Agricultural Products"

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

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

MAY 17 1984

Mr. Jack K. Suwa, Chairman
Board of Agriculture
1428 South King Street
Honolulu, Hawaii 96814

Dear Mr. Suwa:

Subject: Draft EIS
Maunawili Ditch Improvements

Thank you for your comments on the Draft EIS.

Your understanding of the status and scope of the project, as indicated in the comments forwarded, is correct.

Very truly yours,

Susumu Ono
Chairperson of the Board

62

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

Letitia N. Uyehara
Director

April 6, 1984

Mr. Robert T. Chuck, Manager and Chief Engineer
Division of Water and Land Development
Department of Land and Natural Resources
P.O. Box 373
Honolulu, Hawaii 96809

Dear Mr. Chuck:

Subject: Draft EIS for the Maunawili Ditch Improvements

We have reviewed your draft EIS and offer the following comment:

Historic Site

If the Waimanalo Irrigation System, of which Maunawili Ditch is a part, is being planned for inclusion in the National Register of Historic Places, then reconstructing the ditch to its original condition should be examined as an alternative.

Thank you for providing us the opportunity to review your draft EIS. We have no other comments to offer at this time.

Sincerely,

[illegible]

Letitia N. Uyehara
Director

cc: Fukunaga & Associates

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

Susumu Ono, Chairman
Board of Land & Natural Resources

Ms. Letitia Uyehara, Director
OEQC
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Draft EIS
Maunawili Ditch Improvements

Thank you for your comment on the Draft EIS.

Numerous photographs have been taken and filed of the Maunawili Ditch, so that historical documentation is available should the ditch be placed on the National Register of Historic Places.

Reconstructing the ditch to its original condition was not considered a viable alternative due to its current dilapidated condition. The existing flumes were originally constructed with lumber; consequently, the DLNR has had to replace decaying lumber on a continuous basis. Over the years the general condition of the wooden flumes has deteriorated to the point where we now need to reconstruct portions of the ditch with new materials that require less maintenance.

Very truly yours,

Susumu Ono
Chairperson of the Board

64

University of Hawaii at Manoa

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

April 23, 1984
RE:0401

Ms. Letitia N. Uyehara
Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Draft Environmental Impact Statement
Maunawili Ditch Improvements
Maunawili Valley, Koolaupoko, Oahu

The proposed improvements to Maunawili ditch will provide a dependable high-quality irrigation water supply to agricultural developments in Waimanalo, Oahu.

The Environmental Center review of this DEIS has been prepared with the assistance of Matthew Spriggs, Anthropology; Sheila Conant, General Science; James Parrish, Hawaii Cooperative Fisheries Unit; Jacquelin Miller and Antonio De Oteyza, Environmental Center.

In general, our reviewers have found this DEIS to be quite complete and to cover adequately the potentially significant issues related to the construction of improvements to the ditch. Some expansion and clarification in the revised EIS of a few specific points would be helpful. 1

Economics

The cost of the project is cited as $\$12 \times 10^6$ (p. 27). With the project the water delivery to the Waimanalo area is estimated at 2.4 mgd during high demand periods, an increase over the present delivery of between .4 and .7 mgd (p. 23). It would appear that the cost is excessive in light of the small benefit expected. A cost/benefit analysis should be included in the DEIS to provide the economic rationale of the project.

The sections on biology (flora and fauna) and archaeology adequately describe the existing conditions, potential impacts, and mitigative considerations.

There are a number of potentially significant impacts, both primary and secondary, principally those resulting from the potential effects of this project on stream flow. It is stated that "most of the water currently leaking out of the present system never re-enters the stream but instead is consumed by the lush vegetation along the ditch system and is lost through evapotranspiration". "Therefore, no significant effects on streamflow are anticipated." This suggests that revegetation of areas requiring excavation for construction of the ditch may not return to the pre-excavated condition since, without leakage, less water will be available. If this is the case, has consideration been given to watering requirements to minimize erosion problems?

We note that the impacts on streamflow will be determined from records at the three existing U.S.G.S. streamflow gauges after completion of the project. The location of these gauges should be shown on Figure 1-2 so that the geographical relationship between the gauges and the Maunawili Ditch are clearly indicated. If streamflow is significantly reduced, are there any mitigative measures envisioned to assure that diadromous fauna such as Macrobrachylum lar or Atya bisulta are not affected?

Probably the most significant impacts of this project will occur during the construction phase. Are there any alternative methods, such as helicopter transport of materials, to avoid or minimize the need for construction of new access roads? It would appear that the movement of heavy vehicles will require construction of a significant roadbed necessitating much grading and earth movement. Prompt re-vegetation of the graded areas will be required to minimize soil loss. The revised EIS should include a map of the existing access roads and the sites of the proposed new roads, culverts, and proposed grading requirements.

We appreciate the opportunity to comment on this DEIS and look forward to your response.

Yours truly,

Doak C. Cox
Director

cc: Robert T. Chuck, DLNR
Fukunaga & Associates, Inc.
Matthew Spriggs
Sheila Conant
James Parrish
Jacquelin Miller
Antonio De Oteyza

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

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FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

MAY 17 1984

Dr. Doak C. Cox, Director
Environmental Center
University of Hawaii at Manoa
Crawford 317
2550 Campus Road
Honolulu, Hawaii 96822

Dear Dr. Cox:

SUBJECT: Environmental Impact Statement for the Maunawili Ditch Improvements

65

Thank you for your comments on the Draft EIS.

The following information is provided in response to your comments:

1. ECONOMICS - The $12 million project cost cited (p. 27) is in reference to the overall Waimanalo Watershed Plan, of which the Maunawili Ditch Improvements are a part. The proposed Waimanalo Watershed Plan includes improvements to the irrigation system in the Waimanalo area, which involves the installation of irrigation pipelines to replace the old Waimanalo plantation ditch system and a 60 MG storage reservoir. The cost of improvements in Maunawili is estimated to be about $1.6 million. A benefit/cost analysis was prepared for the Waimanalo Watershed Plan by the Soil Conservation Service, and a benefit/cost ratio of 1.9:1 was calculated. As for the Maunawili Ditch Improvements, the justification is not in the incremental increase in delivery capacity, but in the need to rehabilitate a system badly in need of repair.

2. REVEGETATION - The project site is located in an area of fairly high rainfall (75 to 100 inches per year). Lack of water (rainfall) to enable revegetation of disturbed areas does not appear to be a major problem. During construction the contractor will be required to restore any disturbed areas to their original condition.

3. FAUNA - The diadromous species Macrobrachyium lar and Atya bisulta were discovered during the stream macrofauna survey performed for this project. As stated in the survey report, these species were found primarily upstream of existing Maunawili Ditch intakes, which divert virtually all of the stream flow above the 400 MSL level during dry-weather. It is thought that these species migrate to the upper reaches during wet-weather periods when streamflow exceeds the intake capacities. No alteration of the existing intakes are proposed; therefore, wet-weather flows should remain at current levels. As indicated in the biological stream survey (Archer, 1983), Appendix A of the DEIS, little biological change is anticipated due to the project.

4. CONSTRUCTION - It is acknowledged that the most significant impacts will probably occur during the construction phase. Access to the project site will be limited to existing roads and pathways to minimize the amount of grading and clearing required. All construction activities will be monitored continuously by qualified inspectors and engineers of the State Department of Land and Natural Resources to minimize adverse impacts. The project construction plans and specifications will require the Contractor to carry out the work with minimum disturbance to the environment and to promptly restore and revegetate disturbed areas.

5. Maps in the Final EIS will be revised to show the locations of existing U.S.G.S. stream gaging stations and existing access roads and pathways.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

University of Hawaii at Manoa

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

11 April 1984

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

SUBJECT: Draft Environmental Impact Statement,
Maunawili Ditch Improvements, Maunawili Valley,
Koolaupoko, Oahu, DLNR, DOWALD, no date.

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

1. P. 3, Fig. I-1 does not have map scale or north arrow.

2. P. 7, Fig. 1-2 does not have map scale.

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

Sincerely,

Edwin T. Murabayashi
EIS Coordinator

ETM:jm

cc: Robert Chuck
Fukunaga & Assoc.

99

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

MAY 17 1984

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

Dear Mr. Murabayashi:

SUBJECT: Environmental Impact Statement for the
Maunawili Ditch Improvements

Thank you for your comments on the Draft EIS. The Final EIS has been revised to incorporate your comments.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P.O. BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

MAR 29 1984

Fukunaga and Associates, Inc.
2615 South King Street
Room 2B
Honolulu, Hawaii 96826

Dear Sirs:

The Fish and Wildlife Service has reviewed the Draft Environmental Impact Statement (EIS) for the Haunawili Ditch Improvements. The generalized water budget model for the system predicts a 0.2 mgd decrease in the estimated groundwater flow and/or storage relative to present conditions. The predicted reduction of groundwater flow could decrease spring discharge and ultimately lower stream discharge into Kawainui Marsh. The discussion of estimated effects from this reduced flow into the marsh should be expanded in the final EIS.

Should significant loss of habitat due to reduced streamflow be anticipated, the Service recommends that the following measures be implemented as mitigation:

a. The ditch/intake system be improved to allow return of some flows to the stream system during periods of low irrigation demand or in the event that lowered streamflows threaten the physicochemical integrity of the Kawainui Marsh ecosystem.

b. A minimum, continuous instream flow be adopted based upon historical records to insure an adequate discharge into Kawainui.

c. The potential loss of habitat due to reduced streamflow may be partially mitigated by expanding open water habitat within Kawainui for waterbirds and migratory waterfowl.

We appreciate the opportunity to comment and look forward to reviewing the final document. Please contact us if we can be of further assistance to you.

Sincerely,

for Ernest Kosaka
Project Leader
Environmental Services

cc: RD, FWS, Portland, OR (AHR)

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Save Energy and You Serve America!

1

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

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FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

MAY 17 1984

Mr. Ernest Kosaka
Project Leader
Environmental Services
Fish and Wildlife Services
U. S. Department of the Interior
P. O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Kosaka:

Subject: Draft Environmental Impact Statement for the Haunawili Ditch Improvements

Thank you for your comments on the Draft EIS.

The following information is provided in response to your comments:

As indicated in the water budget analysis in the DEIS, the possible reduction in streamflow as a result of the proposed improvements appears to be relatively insignificant. Therefore, we do not feel that the Haunawili Ditch Improvements project will threaten the physicochemical integrity of the Kawainui Marsh ecosystem and that any mitigation measures are not necessary.

Impacts on streamflow after completion of the project will be monitored from records at three existing USGS streamflow gauges located on streams flowing into Kawainui Marsh.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

67

HAWAIIAN ELECTRIC COMPANY, INC.
Box 2750 / Honolulu, Hawaii / 96840

May 2, 1984

RICHARD L. O'CONNELL, P.E.
MANAGER, ENVIRONMENTAL DEPARTMENT
[illegible]

ENV 2-1
MV/G

Ms. Letitia N. Uyehara
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Draft Environmental Impact Statement for the Naunawili Ditch Improvements

We have reviewed the above Draft Environmental Impact Statement and offer the following comments:

1. The ditch improvements are very close to the 138 kv structures, especially Structures No. 19 and No. 2 (see attached Drawing 14329). The design for these improvements should be coordinated with HECO.

2. The existing HECO facilities are energized and shall remain so; therefore, for the protection of our facilities and for the safety and welfare of the contractor and his personnel, the following HECO Notes are to be included as part of the final construction plans.

   a. The existence and location of HECO's overhead facilities are as shown on the plans. The contractor is to exercise extreme caution when the excavation and construction crosses or is in close proximity of our lines and is to maintain adequate clearance for his equipment while working close to and/or under the overhead facilities.

   b. The contractor is to comply with the directions of the State of Hawaii Occupational Safety and Health Law (OOSH).

   c. When trench excavation is adjacent to or under existing structures or facilities, the contractor is responsible for properly sheeting and bracing the excavation and stabilizing the existing ground to render it safe and secure from possible slides, cave-ins and settlement, and for properly supporting existing structures and facilities with beams, struts or underpinning to fully protect it from damage.

   d. For pole bracing instructions should field conditions and/or construction procedures require that poles be braced to facilitate construction, the contractor is to contact Mr. Ralph Preston, HECO Koolau District Construction Superintendent, at 262-5454 a minimum of 72 hours in advance.

   e. Should it become necessary, any work required to relocate HECO facilities shall be done by HECO. The contractor shall be responsible for all coordination.

   f. The contractor shall be liable for any damages to HECO's facilities.

   g. The contractor shall report any damages to HECO's facilities to the HECO Trouble Dispatch at 548-7961.

Thank you for the opportunity to comment on this Draft Environmental Impact Statement.

Sincerely,

Richard L. O'Connell
Manager, Environmental Department

Attachment

cc: Mr. R.T. Chuck (DLNR)

Fukunaga & Assoc., Inc.

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

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DEPUTY TO THE CHAIRMAN

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CONVEYANCES
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LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

MAY 17 1984

Mr. Richard L. O'Connell, Manager
Environmental Department
Hawaiian Electric Company, Inc.
P. O. Box 2750
Honolulu, Hawaii 96840

Dear Mr. O'Connell:

Subject: Draft EIS
Maunawili Ditch Improvements

69

Thank you for your comments on the Draft EIS.

The following information is provided in response to your comments:

1. Construction plans will be submitted to HECo for review, and any ditch improvements that might have an impact on HECo facilities will be coordinated to avoid any problems.

2. The HECo construction notes you included in the comments will be put onto the construction plan documents.

Very truly yours,

Susumu Ono
Chairperson of the Board

LIFE OF THE LAND

Mr. Robert T. Chuck, Manager and
Chief Engineer
Division of Water and Land Development
Department of Land and Natural Resources
P.O. Box 373
Honolulu, Hawaii 96809

April 19, 1984

Dear Mr. Chuck:

Subject: Draft EIS for the Maunawili Ditch Improvements

Based on your analysis in the Draft EIS, we would agree with your conclusion that the proposed project will not significantly affect Kawainui Marsh. However, the Draft EIS raises several questions that we hope will be answered in the Revised EIS. In particular:

1. On page B-6, the Draft EIS suggests that an effective way to restore open water areas in Kawainui Marsh would be to install an outlet control such as a weir across the Oneawa drainage outlet channel. What would such a weir look like, how high would it have to be, and what might it cost to install?

2. Is it correct to say that the Department of Land and Natural Resources is responsible to manage and improve Kawainui Marsh in order to restore open water, create waterbird habitat, and otherwise implement the Kawainui Marsh Plan prepared by the State Department of Planning and Economic Development?

3. When does your Department propose to request funds from the State Legislature to improve Kawainui Marsh?

Sincerely,

Dennis Callan
President

250 S. Hotel St. Rm. 211, Honolulu, Hawaii 96813. Tel. 521-1300

70

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

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BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

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CONVEYANCES
FORESTRY AND WILDLIFE
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

MAY 17 1984

Mr. Dennis Callan, President
Life of the Land
250 South Hotel Street, Room 211
Honolulu, Hawaii 96813

Dear Mr. Callan:

Subject: Draft EIS
Maunawili Ditch Improvements

Thank you for your comments on the Draft EIS.

The following information is provided in response to your comments:

1. The design details of any outlet structure for the Kawainui Marsh would depend on numerous factors: water levels to be maintained, existing topography of the marsh, flood flow capacity requirements, etc. Determination of these items is beyond the scope of this project.

2. The management and improvement of Kawainui Marsh is a separate issue and is not related to the Maunawili Ditch Improvement project.

Very truly yours,

Susumu Ono
Chairperson of the Board

SIERRA CLUB, HAWAI'I CHAPTER
P.O. BOX 11070 HONOLULU, HAWAI'I 96828
(808) 946-8494

23 April 1984

Ms. Letitia N. Uyehara, Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawai'i 96813

Re: Draft Environmental Impact Statement for the Maunawili Ditch Improvements

Dear Ms. Uyehara:

The Conservation Committee of the Honolulu Group of the Sierra Club, Hawai'i Chapter, appreciates the opportunity to comment on the subject dEIS. There are four points we would like to touch upon.

1. We do not feel that the dEIS responds adequately to the very good questions raised by the Department of General Planning's letter of 17 November 1983 in response to the EISPN. These questions concerned the types of improvements to existing pathways and the alignment/description of the proposed construction/maintenance roadways. Our concerns about these matters are severalfold.

   a. Opening up of roadways (as opposed to pathways) increases the likelihood of introducing still more exotic plants in the area and in the mauka lands.

   b. The existence of roadways (even unpaved, rough-graded ones) increases the likelihood of development pressure expanding up Maunawili Valley into agricultural lands.

   c. Although the dEIS' statement (page 19) that "No archeological sites are believed to be endangered by the proposed project" may be true, widening of existing trails and pathways might affect such sites. For example, there are two documents in the files of the State Historic Preservation Office which indicate the presence of lo'i walls mauka of Api Springs along Maunawili Stream.

   d. If widening of trails and pathways is done mechanically, what is the erosion potential and the effect of that erosion on streams draining the area?

None of these questions and concerns can be answered until it is known where and how access will be provided and by what means it will be cleared.

2. Although the dEIS purports to show that elimination of leakage from from the existing transport system will not affect stream flow feeding into Kawai Nui Marsh, we remain unconvinced. How much of the vegetation purportedly benefitting from the current leakage is there? How far does it spread from the ditch? How much does it differ (in density/square foot) from the surrounding vegetation? What length of the flume actually

has leaks?

3. On page 18 of the dEIS, it is alleged that there are no endangered plants in the project area. However, no reference is given for the authority of that statement. We believe there should be such a reference, rather than relying on the catch-all excuse which is scattered through the document that prior construction activities must have led to the current condition.

4. In the Final Watershed Plan and Environmental Impact Statement for the Waimanalo Watershed (December 1981), engineering and construction costs are projected for the improvements to the Maunawili Ditch (p. iii). Are these figures still considered good by DLNR? If so, how will the $500,000+ be funded? We feel this is a legitimate question, because if the funds come from general appropriations to DLNR, other projects with environmental benefits may be cut out.

We look forward to receiving the final EIS and to the subsequent CDUA hearing.

Sincerely,

Susan E. Miller

Susan E. Miller
Member, Honolulu Group Conservation Committee

:sem

cc: Robert T. Chuck, DoWALD
Fukunaga & Associates
Councilwoman Welrome Faucett

7-1

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

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MAY 17 1984

Ms. Susan E. Miller
Honolulu Group Conservation Committee
Sierra Club - Hawaii Chapter
P. O. Box 11070
Honolulu, Hawaii 96828

Dear Ms. Miller:

Subject: Environmental Impact Statement for the Maunawili Ditch Improvements

Thank you for your comments on the Draft EIS.

The following information is provided in response to your comments:

1. In order to minimize land disturbing activities in the area, the contractor will be required to restrict access and operations to existing roads and pathways which will be defined on the construction plans. No new roads will be allowed. Widening of the existing roads and pathways will be performed only if necessary and shall be monitored and controlled by qualified inspectors and engineers of the State Department of Land and Natural Resources. The Contractor will be required to restore and revegetate disturbed areas and maintain erosion control.

2. The existing roads into the area are controlled by locked gates. This control will be continued.

3. The lo'i walls mauka of Api Springs along Maunawili Stream (as indicated by two documents in the files in the State Historic Preservation Office) are located considerably makai of the Maunawili Ditch and will not be impacted by the proposed project. There is no documentation in the files of the State Historic Preservation Office of any archaeological sites in the vicinity of the Maunawili Ditch.

4. The Maunawili Ditch System consists of approximately 16,500 LF of wooden flumes, ditches and pipe. Of this, about 9,900 LF are unlined, earthen ditches. Based on field mensurements, it is estimated that about 1.0 MGD is lost through leakage, throughout the system. The proposed project will primarily stabilize unlined ditch sections where leakage is most evident and

in the past has required constant maintenance. About 1000-2000 LF of unlined ditches will require stabilization. As indicated in the water budget analysis in the Draft EIS, minimal impact on the streamflow feeding Kawainui Marsh is anticipated from this reduction in leakage.

5. The Draft EIS stated that there are no known endangered plants along the project site. This statement is based on field observations of the project site to which construction activities will be limited. Only existing roads, pathways, and other areas which have been previously used for construction and maintenance operations will be utilized. With additional input from the staff botanist of the Division of Forestry and Wildlife, DLNR, we affirm the statement made on flora in the Draft EIS.

6. The current estimate for the project is $1,600,000, which will be financed by general obligation bond funds appropriated by Act 264, Session Laws of Hawaii, 1982, Item A-10, "Water Resources Development for Agriculture, Statewide". For your information, the cost estimate of $500,000 listed on page 111 for the Maunawili Collection System included only the construction of filtering and screening devices to screen out debris in Maunawili Valley, and does not include the improvements proposed for this project such as inverted siphons, lined ditches, and closed conduits.

Very truly yours,

SUSUMU ONO
Chairperson of the Board

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2

The following parties responded to solicitations for comments on the EIS submitted for review, but did not offer substantive remarks.

	Response Received
CITY & COUNTY OF HONOLULU	
Building Department	3/27/84
Department of General Planning	4/19/84
Department of Public Works	3/29/84
Department of Transportation Services	4/10/84
Fire Department	4/19/84
Police Department	4/ 2/84
STATE OF HAWAII	
Department of Accounting and General Services	4/17/84
Department of Education	3/29/84
Department of Health	4/ 4/84
Department of Planning and Economic Development	4/17/84
Department of Transportation	4/ 2/84
Office of Environmental Quality Control	4/ 2/84
FEDERAL AGENCIES:	
Department of Agriculture Soil Conservation Service	4/23/84
Department of the Air Force	4/ 6/84
Department of the Army	4/23/84
U.S. Department of the Interior Geological Survey	4/20/84

PB 84-213

March 27, 1984

Ms. Letitia N. Uyehara, Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Draft Environmental Impact Statement
Maunawili Ditch Improvements

We have reviewed the draft EIS for the Maunawili Ditch Improvements and have no comments.

Thank you for the opportunity to review the draft EIS.

Very truly yours,

ROY H. TANJI
Director and Building Superintendent

TH:jo
cc: Dept. of Land & Natural Resources
Fukunaga & Associates, Inc.
J. Harada

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

EILEEN R. ANDERSON
Mayor

WILLARD T. CHOW
Executive Planning Officer

MARY PATTEMORE
Deputy Executive Planning Officer

DGP3/84-1086

April 19, 1984

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Maunawili Ditch Improvements
Draft Environmental Impact Statement

We have no further comments on the subject environmental impact statement. Our earlier comments have been acknowledged by the applicant and are discussed in the EIS.

Sincerely,

Ralph Kawamoto

RALPH KAWAHOTO
Planner

APPROVED:

WILLARD T. CHOW

cc: DLNR
Fukunaga & Associates, Inc.

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

EILEEN R. ANDERSON
MAYOR

MICHAEL J. CHUN, Ph.D.
DIRECTOR AND CHIEF ENGINEER

MAURICE H. KAYA
DEPUTY DIRECTOR

ENV 84-89

March 29, 1984

Ms. Letitia N. Uyehara
Director
Office of Environmental Quality
Control
State of Hawaii
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Re: Draft EIS for Maunawili Ditch
Improvements, Koolaupoko, Oahu

We have reviewed the subject Draft EIS and have no additional comments.

He ke aloha pumehana,

MAURICE H. KAYA
Acting Director and
Chief Engineer

cc: Mr. Robert Chuck, DLNR
Fukunaga & Associates, Inc.

75

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

EILEEN R. ANDERSON
MAYOR

ANDREW T. T. CHANG
MANAGING DIRECTOR

WILLIAM A. ROBERT
DIRECTOR

DALE MIKE
DEPUTY DIRECTOR

April 10, 1984

TE3/84-1160

Ms. Letitia N. Uyehara
Interim Director
Office of Environmental
Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Draft Environmental Impact Statement for
the Maunawili Ditch Improvements

We have reviewed the subject draft and have no comments.

We thank you for providing us this opportunity to review and comment on the project.

Sincerely,

WILLIAM A. ROBERT
Director

cc: Robert T. Chuck
Fukunaga & Associates, Inc.

FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

1455 S. BERETANIA STREET, ROOM 305
HONOLULU, HAWAII 96814

EILEEN R. ANDERSON
MAYOR

MELVIN M. NONAKA
FIRE CHIEF

THOMAS C. BLONDIN
FIRE DEPUTY CHIEF

April 19, 1984

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE MAUNAWILI DITCH IMPROVEMENTS

We have reviewed the draft EIS for the subject project and find that fire protection services for the area of the subject project is adequate at this time.

The EIS is being returned to your office.

Very truly yours,

THOMAS C. BLONDIN,
Acting Fire Chief

TCB:ct
cc: Mr. Robert T. Chuck, Manager & Chief Engineer
Division of Water and Land Development
and
Fukunaga & Associates, Inc.

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CS-ES

April 2, 1984

Ms. Letitia Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Draft Environmental Impact Statement for the Maunawili Ditch Improvements

Thank you for the opportunity to review the draft Environmental Impact Statement for the Maunawili Ditch Improvements.

We have no comment to offer since police services in the area will not be affected.

The subject document is being returned as requested.

Sincerely,

DOUGLAS G. GIBB
Chief of Police

Encl.

cc: Mr. Robert T. Chuck
Manager and Chief Engineer
Division of Water and Land Development
Department of Land and Natural Resources
P. O. Box 373
Honolulu, Hawaii 96809

Fukunaga and Associates, Inc.
2615 So. King Street, Room 28
Honolulu, Hawaii 96826

APR 17 1984

(P)1134.4

Ms. Letitia N. Uyehara
Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Draft Environmental Impact Statement
for the Maunawili Ditch Improvements

We have reviewed the subject Environmental Impact Statement and have no comments to offer.

Very truly yours,

RIKIO HISHIOKA
State Public Works Engineer

/lm
cc: Mr. Robert T. Chuck
Fukunaga & Associates, Inc.

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GEORGE R. ARIYOSHI
Governor

OFFICE OF BUSINESS SERVICES

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

March 29, 1984

Acting Superintendent

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Draft EIS for Maunawili Ditch Improvements

The Department of Education does not have any comments to offer on the subject EIS.

Thank you for the opportunity to review the document.

Sincerely,

Vernon Honda, Assistant Superintendent
Office of Business Services

VH:HL:mh

cc Windward District
Mr. Robert Chuck
Fukunaga & Associates

AN EQUAL OPPORTUNITY EMPLOYER

GEORGE R. ARIYOSHI
Governor of Hawaii

CHARLES B. CLARK
Director of Health

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

In reply, please refer to:
EPHSB 55

April 4, 1984

Ms. Letitia Uyehara, Director
Office of Environmental Quality Control
550 Halekauwila St., Rm. 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Request for Comments on Draft Environmental Impact Statement (EIS) for Haunawili Ditch Improvements, Haunawili Valley, Koolaupoko, Oahu

Thank you for allowing us to review and comment on the subject proposed EIS. Please be informed that we do not have any comments or objections to this project at this time.

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

Sincerely,

MELVIN K. KOIZUMI
Deputy Director for
Environmental Health

cc Mr. Robert Chuck
Fukunaga & Associates ✓

78

STATE OF HAWAII
DEPARTMENT OF [illegible]
ECONOMIC [illegible]
P. O. Box [illegible]
Honolulu, Hawaii 968[illegible]

Ref. No. 9241

April 17, 1984

Ms. Letitia N. Uyehara
Director
Office of Environmental
Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Haunawili Ditch Improvements, DEIS, O[illegible]

We have reviewed the subject draft EIS and have no comments.

Thank you for the opportunity to review the document.

Very truly yours,

Kent N. Keith

cc: Mr. Robert T. Chuck,
Manager and Chief Engineer
DLNR, Division of Water and
Land Development
✓ Fukunaga and Associates, Inc.

GEORGE R. ARIYOSHI
GOVERNOR

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

WAYNE J. YAMASAKI
DIRECTOR

DEPUTY DIRECTORS
JONATHAN K. EHMADA, Ph.D.
WALTER T. M. HO
CHERYL D. SOON
ADAM D. VINCENT

IN REPLY REFER TO
STP 8.9810

April 2, 1984

MEMORANDUM

TO: Ms. Letitia N. Uyehara, Interim Director.
Office of Environmental Quality Control

FROM: Director of Transportation

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT
MAUNAWILI DITCH IMPROVEMENTS

We have no further comments to add to our previous statement that the proposed action is not likely to adversely impact our existing or proposed program for the area.

for Wayne J. Yamasaki

✓cc: Fukunaga & Associates, Inc.

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GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
550 HALEKAUWILA STREET
ROOM 301
HONOLULU, HAWAII 96813

Letitia N. Uyehara
Interim Director
TELEPHONE NO.
548-6915

March 19, 1984

April 2, 1984
No comments
Takeshi Uyehara
Energy Program Administrator
Energy Division - DPED

Dear Reviewer:

Attached for your review is an Environmental Impact Statement (EIS) that was prepared pursuant to Chapter 343, Hawaii Revised Statutes and the Rules and Regulations of the Environmental Quality Commission:

TITLE: Draft Environmental Impact Statement for the Maunawili Ditch Improvements

LOCATION: Maunawili Valley, Koolaupoko, Oahu

CLASSIFICATION: Agency Action

Your comments or acknowledgment of no comments on the EIS are welcomed. Please submit your reply to the accepting authority or approving agency:

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Please send a copy of your reply to the proposing party:

Mr. Robert T. Chuck, Manager & Chief Engineer [redacted]
Division of Water & Land Development AND 2615 S. King St., Room 208
Department of Land & Natural Resources Honolulu, Hawaii 96826
P.O. Box 373 Honolulu, Hawaii 96809

Your comments must be received or postmarked by: April 23, 1984.

If you have no further use for this EIS, please return it to the Office of Environmental Quality Control.

Thank you for your participation in the EIS process.

United States Department of Agriculture

Soil Conservation Service

P.O. Box 50004
Honolulu, Hawaii
96850

April 23, 1984

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

Subject: Draft EIS for the Haunawili Ditch Improvements
Haunawili Valley, Koolaupoko, Oahu

We reviewed the subject environmental impact statement as you requested. We have no additional comments to add to those found on page 50 of the draft.

Thank you for the opportunity to review this document.

Sincerely,

FRANCIS C.H. LUM
State Conservationist

cc:
Mr. Robert T. Chuck, Manager & Chief Engineer
Division of Water & Land Development
Department of Land & Natural Resources
P.O. Box 373
Honolulu, HI 96809

Fukunaga & Associates, Inc.
2615 S. King St., Room 2B
Honolulu, HI 96826

The Soil Conservation Service is an agency of the Department of Agriculture

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 15TH AIR BASE WING (PACAF)
HICKAM AIR FORCE BASE, HAWAII 96853

REPLY TO ATTN OF: DEEV (Mr Ogawa, 449-1831)

8 APR 1984

SUBJECT: Draft Environmental Impact Statement for the Haunawili Ditch Improvements, Haunawili Valley, Koolaupoko, Oahu

TO: Ms Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, HI 96813

1. This office has reviewed the subject draft EIS and has no comment ralative to the proposed project.

2. We greatly appreciate your cooperative efforts in keeping the Air Force apprised of your project and thank you for the opportunity to review the document. The draft EIS is returned for your file.

ROBERT M. OKAZAKI
Chief, Engrg & Envmtl Plng Div
Directorate of Civil Engineering

1 Atch
Draft EIS

cc: (wo Atch)
State Department of Land & Natural Resources
Division of Water and Land Development
ATTN: Mr Robert T. Chuck
P. O. Box 373
Honolulu, HI 96809

Fukunaga & Associates, Inc.
2615 South King Street. Room 2B
Honolulu, HI 96826

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FT. SHAFTER, HAWAII 96858

REPLY TO ATTENTION OF

April 23, 1984

Ms. Letitia N. Uyehara
Interim Director
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Ms. Uyehara:

The US Army Corps of Engineers has reviewed the Draft Environmental Impact Statement for the Maunawili Ditch Improvements, Oahu, Hawaii. Our previous comments have been incorporated in the DEIS, and we have no further comments.

Sincerely,

Kisuk Cheung
Chief, Engineering Division

Copy Furnished:

Mr. Robert T. Chuck
Manager & Chief Engineer
Division of Water & Land Development
Department of Land & Natural Resources
P. O. Box 373
Honolulu, HI 96809

✓Fukunaga & Associates, Inc.
2615 S. King St., Room 28
Honolulu, HI 96826

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United States Department of the Interior

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

April 20, 1984

Ms. Letitia N. Uyehara, Interim Director
Office of Environmental Quality Control
550 Halekauwila Street
Room 301
Honolulu, Hawaii 96813

Dear ~~Ms. Uyehara:~~ Tito

Subject: Draft Environmental Impact Statement for the Maunawili Ditch Improvements

The Hawaii District of the U.S. Geological Survey, Water Resources Division, staff has reviewed the above EIS and has no comments to make at this time.

Thank you for the opportunity to review the report. We are returning it for your further use.

Sincerely,

Stan

Stanley F. Kapuaala
District Chief

Enclosure

cc: Mr. Robert T. Chuck, DLNR, DOWALD, Honolulu, Hawaii
Fukunaga & Associates, Inc., Honolulu, Hawaii

APPENDIX A

Biological Survey of Maunawili, Ainoni and Makawao Streams Windward Oahu

Prepared for Fukunaga and Associates, Inc.

Prepared by Kelly M. Archer
Aquatic Biologist
December 1983

INTRODUCTION

During the month of December, 1983, a biological survey was completed of Maunawili Stream and two of its' tributaries, Ainoni and Makawao Streams. These streams are 3 of the 7 perennial streams to be found in Maunawili Valley, Oahu (Timbol and Maciolek 1978). Ultimately, all the streams within the watershed drain into Kawainui Swamp.

The purpose of this survey was to document the conspicuous stream fauna upstream and downstream of the existing Maunawili Irrigation Ditch, and to comment on the possible effect on stream biota of the proposed ditch improvement project. The irrigation system draws water from the streams and transports it to agricultural land in Waimanalo, the adjacent watershed to the east. The 5 existing ditch intakes are located on 2 branches of Maunawili Stream, as well as on Anioni and Makawao Streams. The fifth intake captures water from Fault tunnel, which does not directly feed into any of the streams in the watershed. During dry weather all of the stream flow at 122 m elevation is intercepted. The proposed improvements would not alter the existing intake system, but would focus on eliminating wastage of irrigation water through leaking flumes and seepage from earthen ditches.

METHODS

Study Sites

A total of 13 sampling stations were chosen to provide a comprehensive survey of the three streams. A 40 m station, representative of the given stream reach, was marked and sampling begun at the downstream boundary. Figure 1 shows the locations of the stations and a brief physical description of each station can be found in Table 1.

Two previous studies of the biological characteristics of the Maunawili Stream system have been made. Ford (1975) sampled stations from Kawainui Swamp to a site below the ditch intake on Makawao Stream. Timbol and Maciolek (1978) report collections made at the point where Makawao, Ainoni and Maunawili Streams join.

Sampling

Visual sampling was employed during this survey. This method involves careful, thorough examination of the entire 40 m station from alongside and within the stream. Visual sampling is an effective method for sampling small, shallow, pool studded stream reaches. The total number of individuals of each species seen within the station boundaries were recorded and included in the results for that station.

RESULTS

Table 2 is a list of the conspicuous aquatic fauna found in the 3 streams during this survey. Table 3 shows the organisms found and their relative abundances at each station. The figures are a result of an average sampling time of 1 hour per 40 m station.

Only two native species, the mountain shrimp Atya bisulcata and the mollusc Melania sp., were collected while the introduced species included 2 crustaceans and 3 fishes.

DISCUSSION

Maunawili, Ainoni and Makawao are highly modified streams whose biological complement is largely that of introduced species. The modifications which drastically lower the mid-reach stream flow have existed for over a century. How the construction of the irrigation system specifically altered these streams biologically is speculative; pre- and early post-construction data on in-stream fauna is apparently unavailable.

The study streams have been, and still are, completely dewatered during low flow at the 122 m elevation. Small flow then occurs due mainly to groundwater seepage, leaving a slow, pool-studded stream

reach. The decreased flow causes deposition of suspended solids leaving the substrate coated with a thick layer of silt. These stream characteristics are not suitable for many of the native fauna and large populations of introduced species, in particular Poecilids and crayfish, thrive. Flow increases downstream of the ditch intakes, however; conditions do not improve noticeably, as thick silt layers and frequent pooling are still the norm. This survey was completed during a period of dry weather when flow was totally dependent on spring and tunnel perched dikewater. Although some flushing of the silt layer would naturally occur during increased flow within the watershed, much of the silting and slow flow is due to the low longitudinal gradient of the Maunawili Stream system (45 m/ km, Timbol and Maciolek 1978).

Noticeably absent from the stream fauna were the native gobioid fishes. Ford (1975) proposed that Kawainui Swamp appears to be a significant barrier to migrations of diadromous species. Although two diadromous species, Atya bisulcata and Macrobrachium lar, were found during this survey, population levels were relatively small.

The results of this survey agree with that of both Ford (1975) and Timbol and Maciolek (1978). There is a distinct lack of native fauna within the middle to upper reaches of the stream system. The concentration of this survey was on the upstream area and, consequently two animals (A. bisulcata and M. lar) previously unreported, were found to exist in small populations. The second major difference between past studies and this survey is the collection of smallmouth bass

(Micropturus dolomieui), Chinese catfish (Clarias fuscus) and tilapia (Sarotherodon sp.) during both previous studies. Clarias fuscus is one species which could avoid detection during visual sampling and could very well have been present at station 6 or 13, in particular. However; the 3 species were previously collected at stations downstream of those monitored during this survey. The overall agreement of this survey with previous work done in the watershed indicates little, if any, change during the last 5 to 8 years.

In comparing the Maunawili Stream system with other windward, Oahu streams, Maunawili exhibits faunal characteristics which would place it in the lower third in biological quality of the 30 or so perennial streams from Waimanalo to Kahuku (Archer *in progress*). Low flow, substantial silt deposits, large populations of the predaceous crayfish and other exotics, channelized portions of the stream bed, and only one endemic stream species all support this ranking. Timbol and Maciolek (1978) list Maunawili Stream as being of Ecological Quality Status II, "limited consumptive. Moderate to high quality water or natural values: controlled use to prevent excessive modification". (For a thorough treatment of the status-use categories see Hawaii Dept. of Health 1977.) In my opinion, this ranking is too high. The streams in question were "well exploited, modified or degraded" (Status III) years ago, with additional modifications since.

POSSIBLE EFFECTS OF PROPOSED PROJECT

Currently the Maunawili ditch is a relatively inefficient system of water transport. Estimates of water loss exceed 1 mgd (Fukunaga and Assoc., Inc. 1983). Apparently this loss occurs primarily through seepage from the earthen ditches which make up much of the irrigation system. The proposed, more efficient irrigation system would eliminate substantially, the leaks and seepages now occuring.

Only small amounts of "lost" water appear to reenter the streams. Most, apparently, promotes thick vegetation near the point of loss. The possibility that improvements in the ditch will substantially lessen flow in the streams within the watershed seems remote, but this matter needs the attention of a professional hydrologist.

Even in the event of further reduction in stream flow, there would be little biological change in the 3 streams in question. The established introduced species are highly tolerant of poor water quality (Hathaway 1979). Often they are found in highly degraded environments (Norton 1978). Reduced flow and shallow pools would not inhibit these species' success in the streams. Of course, it will be important to insure strict adherence to erosion control procedures and the prevention of hydrocarbon loss into the streams during construction. This will maintain the current level of water quality in the streams.

Finally; if indeed lower stream flow would be a result of improvements to the irrigation ditch system, the effect on Kawainui Swamp, the ultimate receiving body for stream flow, would need to be evaluated. Furthering the already man-accelerated, natural process of eutrophication within the swamp environment should be avoided.

Literature Cited

Ford, J.I. 1975. Preliminary Biological Survey of Kawainui Marsh and the Maunawili-Kahanaiki Stream System. Prepared for the Water Resources Research Center, University of Hawaii, Honolulu. 11 pp.

Fukunaga and Associates, Inc. 1983. Preliminary Engineering Report for the Maunawili Ditch Improvements. Prepared for the State of Hawaii, Dept. of Land and Nat. Resources, Division of Water and Land Development. 69 pp.

Hathaway, C.B. 1978. Stream Channel Modification in Hawaii. Part C: Tolerance of Native Stream Species to Observed Levels of Environmental Variability. FWS/OBS-78/18. USFWS National Stream Alteration Team, Columbia, Missouri. 157 pp.

Hawaii Department of Health. 1977. An Ecological Approach to Water Quality Standards. Technical Committee on Water Quality Standards Report No. 1. Department of Health, Honolulu, HI. 165 pp.

Norton, S.E., A.S. Timbol, and J.D. Parrish. 1978. Stream Channel Modification in Hawaii. Part B: Effect of Channelization on the Distribution and Abundance of Fauna in Selected Streams. FWS/OBS-78/17. USFWS National Stream Alteration Team, Columbia, Missouri. 47 pp.

Timbol, A.S. and J.A. Maciolek. 1978. Stream Channel Modification in Hawaii. Part A: Statewide Inventory of Hawaiian Streams Including Survey of Habitat Factors and Associated Biota. FWS/OBS-78/16. USFWS National Stream Alteration Team, Columbia, Missouri. 171 pp.

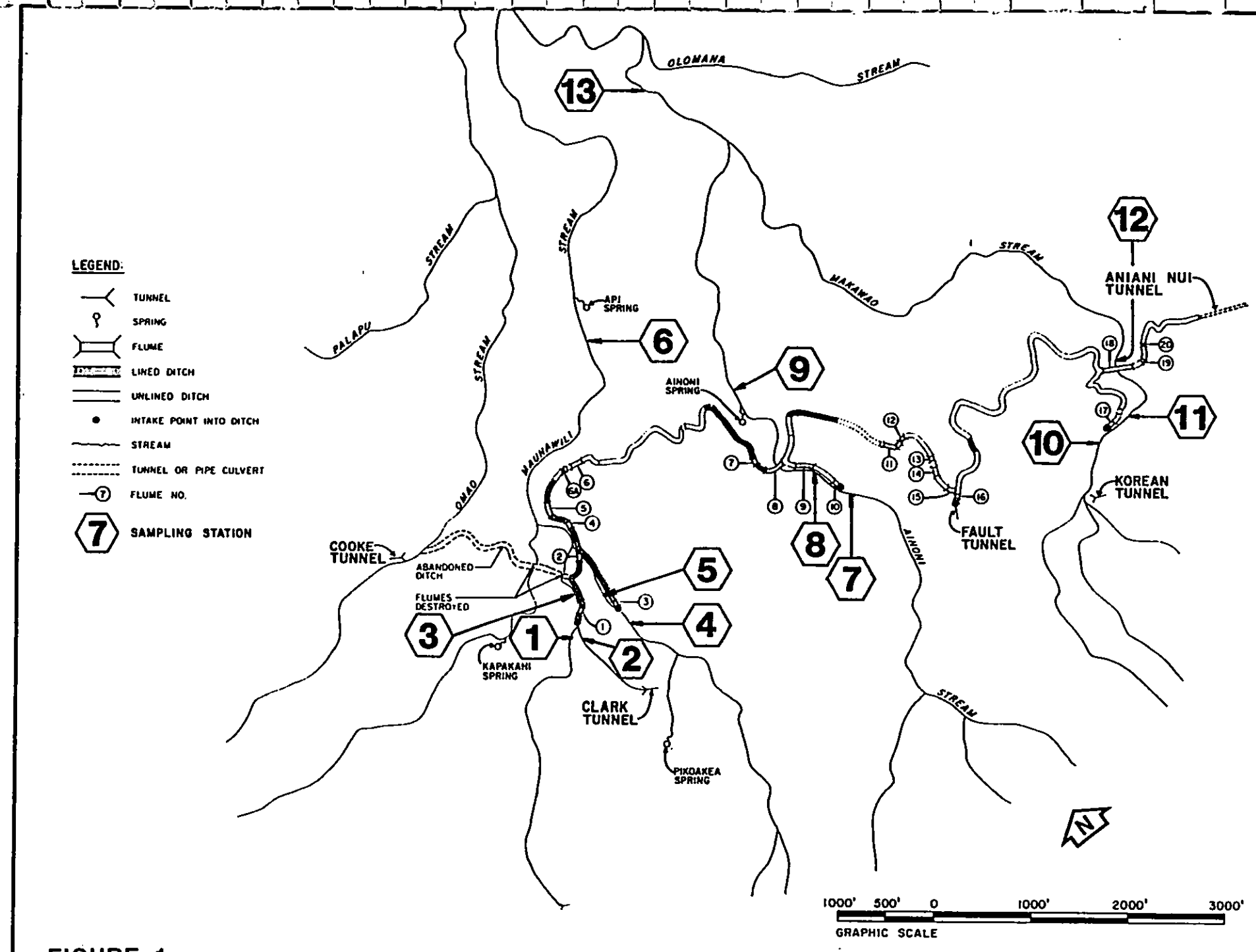

FIGURE 1.

Map of Maunawili watershed showing locations of 13 stations monitored during this study.

Table 1. Physical characteristics of the 13 stations monitored during this survey.

Station #	Elevation	Stream Width	Depth	Substrate[a]	Comments[b]
1	146 m	1-1.5 m	0.1-0.2 m	cobble/gravel	heavy canopy, low silt, slow flow
2	146	1	0.1-0.4	cobble/silt	open canopy, strong, silty flow
3	140	1-2	0.1-0.5	boulder/cobble silt	high canopy, small deep pools
4	153	<1	<0.1-0.2	cobble/silt	heavy canopy of hau thickets
5	140	1-3	<0.1-0.5	silt on bed-rock	series of large pools
6	85	1-2.5	0.1-0.6	cobble/silt/ sand	canopy ranged from open to heavy
7	153	1-1.5	<0.1	cobble/silt	very heavy hau canopy
8	140	<1-2	<0.1-0.4	cobble/silt/ boulder	high, thin canopy
9	109	1-3	0.1-0.4	cobble/boulder silt	open canopy
10	134	1-1.5	<0.1-0.3	cobble/silt/ boulder	heavy canopy, pool-riffle
11	128	<1	<0.1	cobble/gravel/ silt	heavy canopy, low flow
12	116	<1	<0.1	cobble/silt	no flow above flume # 18, minor below
13	43	1-3	0.1-0.3	cobble/boulder silt	substantial flow, high, thin canopy

---

[a] Wentworth particle scale where:
boulder = 250-1000 mm
cobble = 64-250 mm
gravel = 2-64 mm
sand = 1-2 mm
silt = <1 mm

[b] Canopy refers to vegetation which blocks solar insolation. Adjectives used:

high - upper story growth, tree branches and leaves, which generally allow some insolation.

heavy - very thick vegetation which does not allow light to penetrate to much of an extent.

open - little vegetation, canopy allows large amounts of light reach the stream itself.

Table 2. Stream fauna found to inhabit Maunawili, Ainoni and Makawao Streams during this survey.

SCIENTIFIC NAME	COMMON NAME	STATUS[a]
Crustaceans		
Atya bisulcata	mountain shrimp, opai	endemic[b]
Macrobrachium lar	Tahitian prawn	introduced[b]
Procambarus clarkii	crayfish	introduced
Fishes		
Poecilia mexicana	shortfin molly	introduced
Poecilia reticulata	guppy	introduced
Xiphophorus helleri	green swordtail	introduced
Molluscs		
Melania sp.	pond snail	indigenous

a

endemic-occurs naturally in Hawaii only.
indigenous-occurs naturally in Hawaii and also elsewhere.
introduced-purposefully or accidentally introduced to the streams, not native.

b

Both the introduced prawn, *M. lar*, and the endemic shrimp, *A. bisulcata*, are known to be diadromous, meaning they must travel between the sea and stream habitats as part of their life cycle. The atyid shrimp can possibly complete it's life cycle in the stream itself.

Table 3. Abundance of each species found at each of the 13 sampling stations during this survey.

	Station #												
SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13
Crustaceans													
Atya bisulcata	++	0	0	++	0	0	+++	0	0	++	0	0	0
Macrobrachium lar	+	0	0	+	++	0	+	+	0	+	0	0	0
Procambarus clarkii	0	++	++	0	++++	++++	++	+	++	0	++	++	+++
Fishes													
Poecilia mexicana	+++	++	++	++	+++	++++	+++	+	+++	++	+++	+	+++
Poecilia reticulata	+++	++	++	++	+++	++++	+++	++	+++	++	+++	+++	+++
Xiphophorus helleri	++	0	0	0	0	++	+	+	+	0	++	+	++
Molluscs													
Melanoia sp.	0	0	0	0	0	++	0	0	++++	+	++	0	++++

Abundances: 0 = absent

\+ = rare (1 to 3 per station)

++ = common (4 to 10 per station)

+++ = abundant (11-24 per station)

++++ = very abundant (25 and above per station)

APPENDIX B

HYDROLOGIC IMPACTS - KAWAINUI MARSH

A. GENERAL

Concern has been expressed that the proposed project would divert a significant amount of water from Kawainui Marsh--water that may be essential to maintain the viability of the marsh, especially to preserve and enhance the marsh as a wildlife habitat. The significance of anticipated hydrologic impacts can be effectively visualized by the development of generalized water budgets for the project study area under existing and proposed conditions.

B. WATER BUDGET

A water budget analysis was conducted to estimate the effect of the proposed improvements on the amount of water flowing into the marsh. A water budget is a model of the hydrologic elements of a given study area or watershed. The water budget can become extremely complex depending upon the number of hydrologic parameters considered. However, the model must usually be simplified (as in the case of this study) due to limited available data. The primary elements of a water budget are *inflow, outflow and storage.* (*See Figure* B-1).

Study Area

The area of study is the Maunawili Valley watershed, which includes the drainage areas of the Maunawili and Kahanaiki Streams as they enter the Kawainui Marsh at Kalanianaole Hwy. (shown in Figure B-2). The study area contains 4410 acres.

Inflow

For this study, rainfall is considered to be the only inflow into the study area. Mean annual rainfall data were used to estimate the total annual rainfall volume collected by the watershed and then converted into equivalent daily flow. Mean annual rainfall for the study area is about 80 inches per year.

Outflows

1. Streamflow - Streamflow estimates were obtained from previous studies done by the U. S. Geological Survey (Takasaki, et. al., 1969).

2. Ditchflow - The Maunawili Ditch Flow quantities were obtained from past records (U.S.G.S. and Waimanalo Plantation). Projected ditch flows were estimated for the proposed improvements.

3. Evapo-transpiration losses - Water loss into the

atmosphere from land areas through evapo-transpiration (evaporation & transpiration through plants and land surfaces) is dependent upon numerous variables and extremely difficult to estimate. However, it is generally agreed that pan evaporation measurements are indicative of the upper limit of evapo-transpiration losses for a given location. Typical estimates of annual losses from open reservoirs is 77% of the annual pan evaporation losses (ASCE 1949). Pan evaporation and reservoir evaporation rates are the result of unlimited availability of water, a condition not necessarily the case for land areas. Availability of water to plants and soil is the primary limiting factor affecting evapo-transpiration losses from land areas. annual pan evaporation for the study area is 44 inches per year. For this study, evapo-transpiration losses from the watershed are assumed to be 75% of the annual pan evaporation, or 33 inches per year.

Groundwater flow and storage

The balance of water remaining in the study area is assumed to leave the watershed as groundwater flow or remain in storage within the watershed. If long term storage is considered to be constant (since no significant withdrawals are made from the aquifiers and the fairly uniform, free-flowing springs and tunnels indicate overflow from full groundwater reservoirs), all of the excess water may be assumed to leave the watershed as groundwater flow.

GENERALIZED WATER BUDGET

EXISTING CONDITION

Total Area = 4410 acres

Average Annual Rainfall = 80 in.
Average Annual Rainfall Volume = 29,400 acre-ft. = 9579 MG
Equivalent Average Daily Flow = 26.2 MGD (100%)

Average Annual Pan Evaporation = 44 in.
Est. Evapo-Transpiration Loss = 33 in.
Eq. Ave. Daily Flow = 10.8 MGD (41%)

Average Streamflow out of study area into Kawainui Marsh
- Maunawili Stream = 5.8 MGD
- Kahanaiki Stream = 1.0 MGD
- Total = 6.8 MGD (26%)

Average Maunawili Ditchflow = 1.7 MGD (6%)

Est. Groundwater flow and/or storage = 6.9 MGD (27%)

PROPOSED CONDITION

Rainfall Eq. Daily Flow	=	26.2 MGD	(100%)
Projected Ditch Flow (Ave. Annual)	=	2.4 MGD	(9%)
Est. Evapo-transpiration Eq. Daily Flow	=	10.4 MGD	(39%)
Est. Total Streamflow into Kawainui Marsh	=	6.7 MGD	(26%)
Est. Groundwater Flow and/or Storage	=	6.7 MGD	(26%)

INCREASED YIELD FROM MAUNAWILI DITCH = ±0.7 MGD
This amounts to 3% of the total water budget for the watershed.

C. DISCUSSION

The preceeding water budget models are based on several assumptions, and thus, specific values are subject to debate. However, the models do show the relative impact of the project on the overall water budget for the watershed. The additional removal of 0.7 MGD from the watershed to Waimanalo appears to be insignificant, accounting for only 3% of the total water budget.

Minimal improvements are proposed at the five major intakes of the system. These intakes presently divert virtually all of the low stream flow originating from spring and tunnel flows above elevation 400 ft. MSL into the ditch system, and have done so since the original inception of the system in the early 1900's. (The average undisturbed streamflow to the Marsh is about three to four times the diverted flow.) Wet-weather (storm) flows will continue to be negligibly affected by the diversions at the system intakes. (It should be noted that wet-weather flows have a greater impact on water levels within Kawainui Marsh, as discussed later.)

Based on field observations and measurements, it is predicated that, by minimizing or possibly eliminating leakage losses from the existing transmission system, the required irrigation water flows necessary to support the Waimanalo Watershed Plan can be attained. (The U.S. Soil Conservation Service has developed the irrigation system based on a sustained dry-weather flow of 2.4 MGD. The total dry-weather inflow measured at the existing intakes is about 2.7 mgd. The measured average yield to Waimanalo is 1.7 mgd, indicating a loss of about 1.0 mgd through the Maunawili transmission system.)

The impact of the proposed improvements on the Kawainui Marsh is of great concern. The Marsh is of great ecological and cultural significance as documented in the "Resource Management Plan for Kawainui Marsh" (DPED 1983). Of specific concern is that the proposed improvements shall cause the Marsh to "dry-out". However, based on the above discussion, field observations, and consultation with water authorities, the proposed project will probably have negligible impact of the hydrology of the Marsh. Very little, if any, of the existing water leaking from the ditch system appears to re-enter the stream system. Instead, most of the lost water seems to support the lush vegetation in the areas adjacent to the ditch, and is eventually lost to the atmosphere via evapo-transpiration.

Water levels within the Marsh are dependent primarily on topographical conditions, i.e., flat land slopes, depressions or sumps, and drainage capacities of watercourses within the Marsh system. Drainage improvements installed in the 1960's by the U.S. Army Corps of Engineers reduced the flood hazards which had previously plagued the Kailua area. The Oneawa

drainage outlet channel from Kawainui Marsh was designed to carry 7350 cfs, or about 4750 mgd. This had the effect of removing the constricted outlet which had caused higher water levels within the Marsh and flooding of the Coconut Grove Subdivision in Kailua. It would be safe to say that the typical base flow out of Kawainui Marsh (probably less than 10 mgd) would easily pass unnoticed out of the channel. Storm flows in excess of the carrying capacity of water courses through the Marsh cause the backup of water within the Marsh, elevated water levels and ponding, thus maintaining the wetland environment.

D. OTHER CONSIDERATIONS

Diversion of water from the Maunawili-Kawainui Watershed has persisted since the 1880's. Water appeared to be readily available as evidenced by numerous springs and seeps in the area. Recent studies (Takasaki and Mink 1982) indicate that additional groundwater sources can still be developed within the watershed. The Maunawili Ditch improvements will not involve additional source development, but instead, minimize losses from the existing transmission system parts of which are well over 50 years old. The proposed yield from Maunawili is about 2.4 MGD during high demand periods, approximately 0.4 MGD more than is presently diverted during summer months. (Existing average ditch flow during the months of April thru October is 2.0 MGD. See Table B-1.) The increased amount is to be gained by reducing losses from the existing antiquated, inefficient transmission system.

Past records indicate that average summer months ditch flows in the 1920's thru 1940's, when the Waimanalo Sugar Plantation was in operation, were between 3 and 4 MGD. (See Exhibit A). In addition to the Maunawili Ditch flow, water was also pumped from Kawainui Marsh to Waimanalo. Average pumping rates were about 4 MGD. Records indicate that as much as 8 to 10 MGD was extracted from the Maunawili-Kawainui Watershed. The pumping of water from the Marsh did cause lowering of water levels during the high demand, summer months to as low as 5 feet below sea level. However, even with the high rates of extraction from the watershed, water levels in the Marsh recovered up to 3 to 4 feet above sea level when pumping was suspended during periods of lower demand. (See Exhibit B).

E. CONCLUSIONS

The effects of the proposed improvements on the hydrology of the Maunawili Watershed and Kawainui Marsh appear to be minimal.

1. The increased yield to Waimanalo as a result of the proposed improvements is projected to be about 2.4 MGD during high demand periods, an increase of between 0.4 and 0.7 MGD more than is presently withdrawn from

Maunawili. No additional water source development is proposed in this project. The increased yield will be the result of minimized losses through the existing transmission system. Based on field observations, it appears that most of the water currently leaking out of the system never re-enter the stream, but instead is consumed by the lush vegetation along the ditch system and is lost through evapo-transpiration. Therefore, no significant effects on streamflow are anticipated.

2. Historical records indicate that much more water was extracted from the Maunawili-Kawainui Watershed in the past when the Waimanalo Sugar Company was in operation. In addition to the 3 to 4 MGD diverted by the Maunawili Ditch System, up to 8 MGD was pumped directly out of Kawainui Swamp. Typical dry-weather irrigation flows to Waimanalo were between 8 and 10 MGD. Even at such high rates of fresh water removal from the watershed, when water levels dropped as much as 8 to 9 feet in the Marsh, the water levels rose to original levels during wet weather periods. This suggests that fresh water flow during dry weather period into the Marsh may not be a primary factor in the maintenance of the wetland environment.

3. The most effective way to preserve water levels (open water areas) in the Marsh would be to:

   a. dredge areas (create depressions, remove accumulated sediment material) so water can be retained;

   b. install outlet control (constricted outlet during low flows) so that the water doesn't pass through -

- Otherwise, the situation appears to be like trying to keep water in a bathtub by trickling in a few drops of water but leaving the drain wide open.

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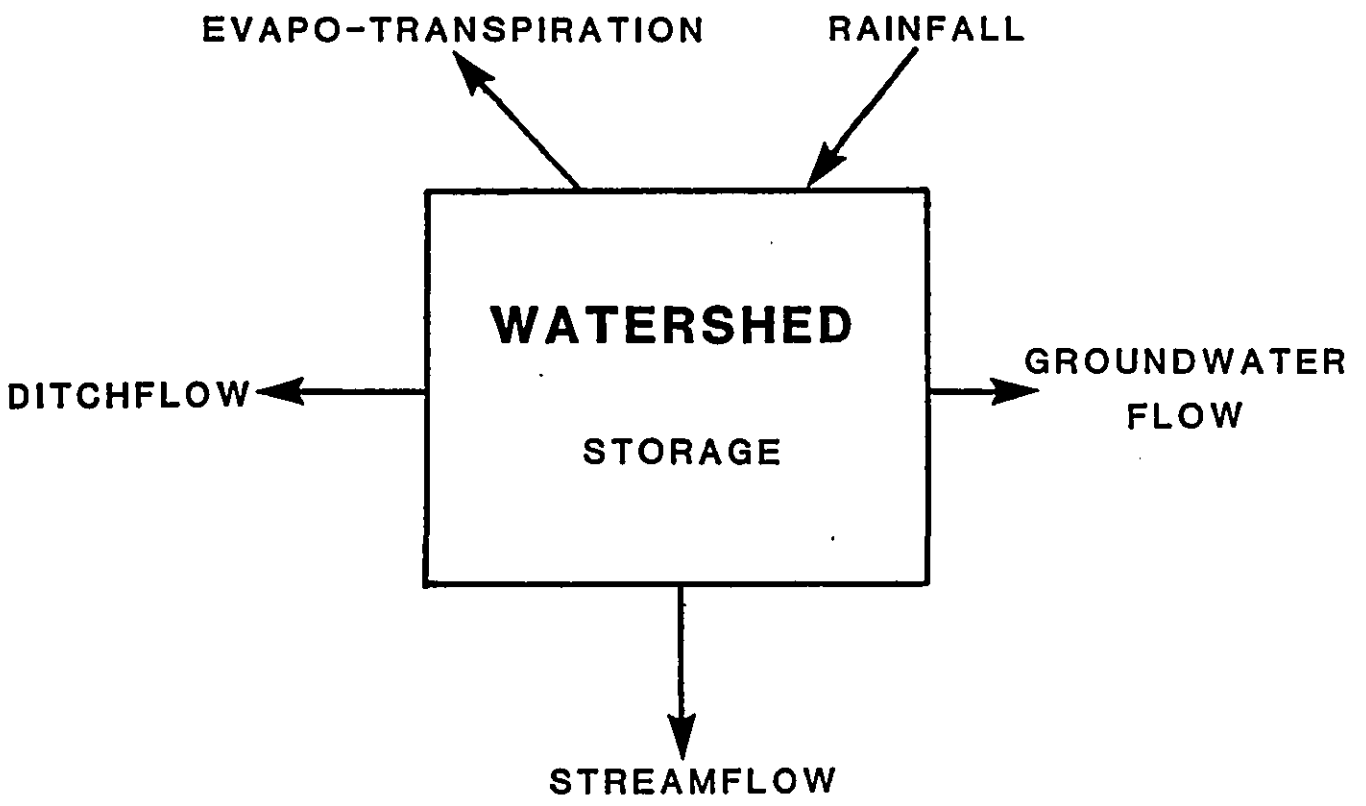
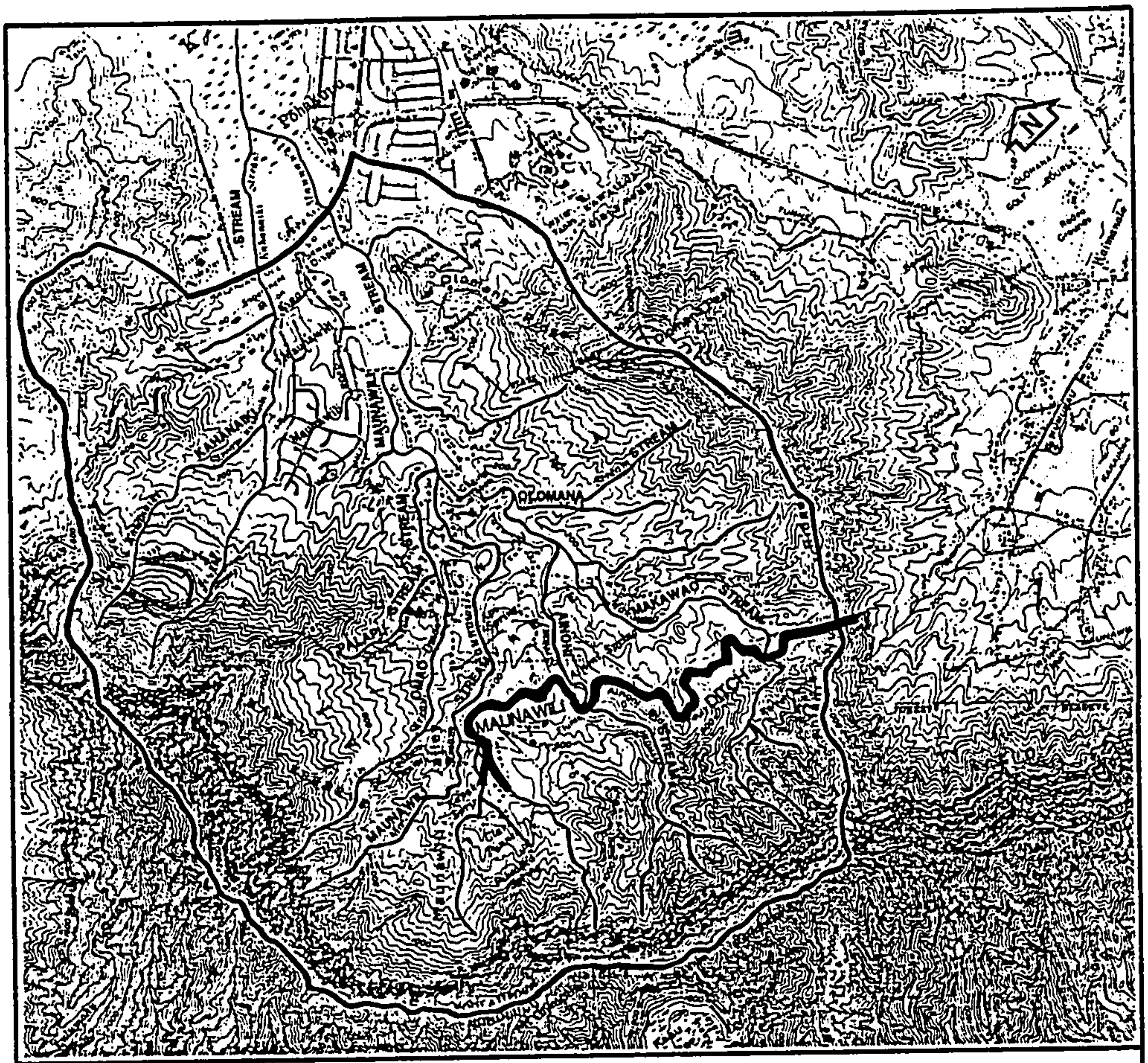


WATER BUDGET MODEL

FIGURE B-1



MAUNAWILI WATERSHED STUDY AREA

FIGURE B-2

TABLE B-1

MAUNAWILI DITCH USGS GAGING STATION NO. 16250000
MEAN DAILY FLOWS (MGD)

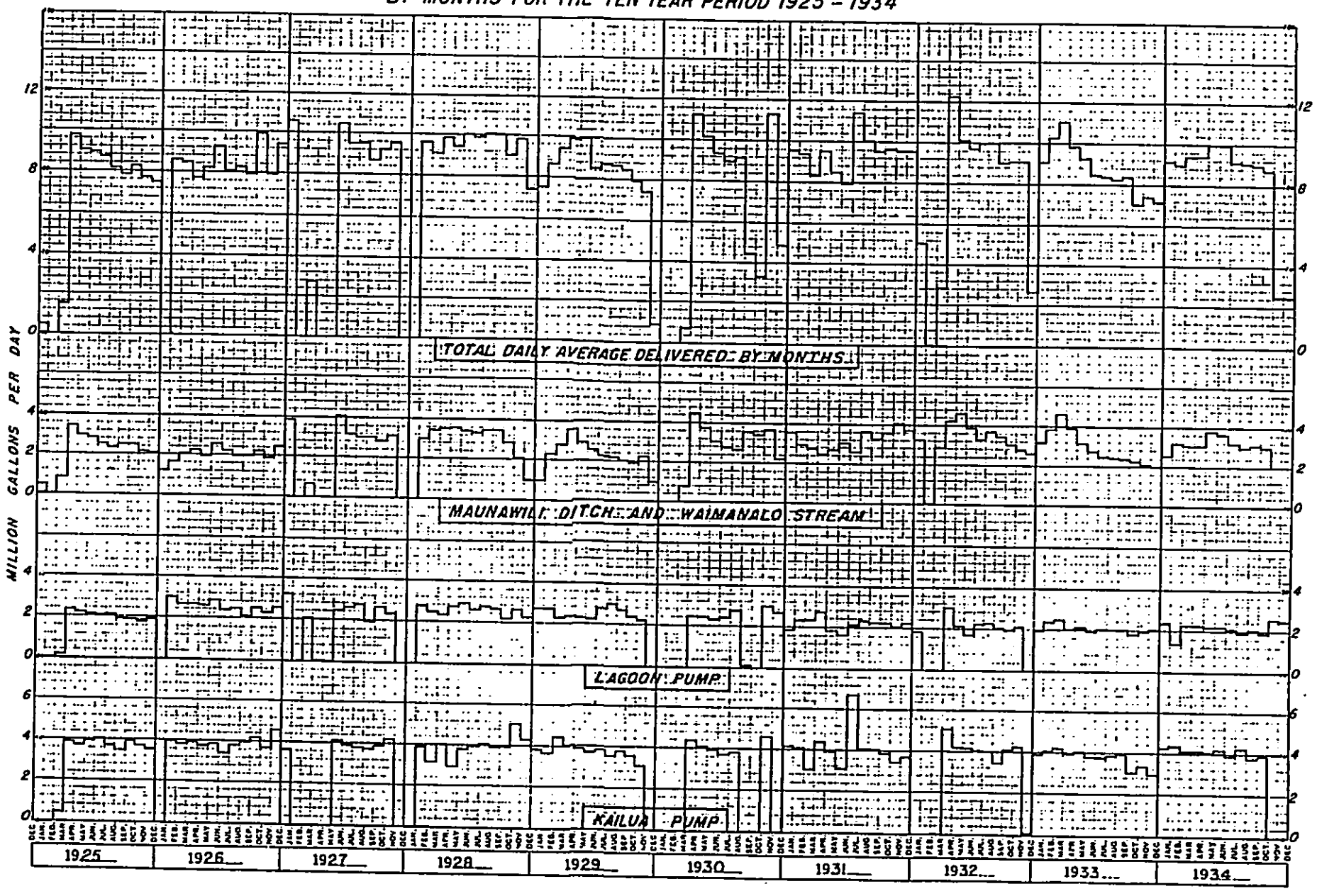
WATER YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AVE
1954	-	-	-	-	-	-	2.63	2.53	2.64	2.55	3.07	2.98	2.733
1955	2.82	2.51	.888	2.08	1.45	.852	1.9	3.16	2.92	2.59	2.63	2.8	2.217
1956	2.34	2.45	1.52	.662	1.31	2.52	1.84	2.1	2.49	2.24	2.07	2.33	1.989
1957	2.12	2.17	.676	1.05	1.73	1.8	1.94	2.1	1.95	2.23	1.99	2.02	1.815
1958	1.91	2.07	1.67	1.75	1.72	.916	1.9	2.63	2.15	2.33	2.05	2.22	1.943
1959	2.2	1.88	1.84	1.15	1.01	1.67	2.1	2.18	1.94	1.73	2.13	2.12	1.829
1960	2.02	2	1.72	1.39	1.09	.52	.89	2.28	2.55	2.15	2.16	2.01	1.732
1961	1.97	1.89	2.09	1.45	.81	1.45	1.56	1.85	1.91	1.73	1.77	2.04	1.71
1962	1.8	.65	.92	.89	.4	1.6	1.99	2.29	2.26	1.92	1.84	1.89	1.538
1963	1.73	1.58	1.53	1.83	.14	.17	.25	1.62	2.2	2.34	2.15	1.91	1.454
1964	1.87	1.75	1.26	1.53	1.27	1.44	1.45	1.67	1.69	1.54	1.02	1.49	1.498
1965	1.52	.6	.74	.57	.32	.45	.92	.77	1.78	2.53	2.57	2.11	1.24
1966	2.4	1.7	.113	.461	.896	1.8	2.62	2.21	2.51	-	-	-	1.634
1967	1.84	1.23	.37	.42	.98	1.52	1.97	1.75	1.84	1.6	1.82	1.52	1.405
1968	1.22	2.21	.02	-	-	.06	2.05	2.05	1.7	1.58	1.05	.39	1.233
AVE	1.983	1.764	1.097	1.172	1.010	1.198	1.734	2.079	2.169	2.076	2.023	1.988	

AVE DAILY FLOW = 1.731 MGD
AVE FLOW (APR - OCT) = 2.007 MGD

- INDICATES DATA NOT AVAILABLE

EXHIBIT A

WATER DELIVERED TO WAIMANALO SUGAR CO. IRRIGATION SYSTEM FROM ALL SOURCES
BY MONTHS FOR THE TEN YEAR PERIOD 1925 - 1934



SOURCE: H.A.R. AUSTIN (1953)

EXHIBIT B

KAWAINUI SWAMP

PUMPAGE DATA

SOURCE: HAWAII IRRIGATION AUTHORITY, T.H. 1956

B-13

PUMPAGE DATA
Kawaimui Swamp, Oahu
1924 to 1941

Year	Month	Days Either Pump Operated	WATER PUMPAGE (Million Gallons) Total for Month	Daily Mean for Month	Maximum Day	LEVEL OF WATER IN POND (Ft.) Maximum Height	Minimum Height	Height - Last Day of Month	SALINITY (Gr. per gal.) Maximum During Month	RAINFALL (Inches) Kawaimui Swamp Pump Total	Maximum Day
1924	Jan.	-	-	-	-	-	-	-	-	-	-
	Feb.	-	-	-	-	-	-	-	-	-	-
	Mar.	-	-	-	-	-	-	-	-	-	-
	Apr.	-	-	-	-	-	-	-	-	-	-
	May	-	-	-	-	-	-	-	7.1	0.70	0.25
	June	20	80.9	2.7	6.2	3.42	2.64	2.64	9.1	1.99	0.83
	July	29	152.9	4.9	7.3	2.65	1.62	1.62	9.6	1.09	0.31
	Aug.	31	186.3	6.0	8.1	1.60	-1.50	-1.50	15.4	0.95	0.58
	Sept.	30	89.6	3.0	5.2	-0.80	-3.50	-3.50	18.8	2.95	1.25
	Oct.	25	69.1	2.2	4.6	-0.60	-3.90	-0.69	17.8	2.27	0.70
	Nov.	11	32.0	1.1	4.3	0.58	-1.06	0.58	17.8	7.11	2.81
	Dec.	7	29.9	1.0	6.1	2.38	0.36	2.38	9.0	17.06	-
	Total	153	640.7	-	-	-	-	-	-	-	-
1925	Jan.	-	-	-	-	-	-	-	-	-	-
	Feb.	-	-	-	-	-	-	-	-	-	-
	Mar.	5	15.4	0.5	3.9	3.55	3.48	3.60	4.1	4.26	1.25
	Apr.	26	119.7	4.0	6.5	3.90	3.32	3.34	4.8	2.89	0.66
	May	31	133.7	4.3	6.0	3.36	2.71	2.71	5.1	1.74	0.60
	June	30	155.9	5.2	6.5	2.71	1.93	1.93	7.8	1.12	0.14
	July	31	165.0	5.3	7.1	1.89	0.40	0.40	8.2	1.70	0.30
	Aug.	31	130.1	4.2	6.2	0.30	-3.40	-2.95	18.1	0.80	0.28
	Sept.	20	66.2	2.2	6.1	-0.23	-4.90	-0.88	30.1	1.43	0.65
	Oct.	28	124.9	4.0	6.7	-0.80	-4.50	-0.82	21.9	2.28	0.52
	Nov.	3	7.5	0.2	3.8	1.37	-0.72	1.37	7.5	3.63	-
	Dec.	8	14.3	0.5	2.0	1.74	1.37	2.85	5.8	4.52	1.83
	Total	213	932.7	-	-	-	-	-	-	24.37	-
1926	Jan.	-	-	-	-	-	-	3.85	-	2.32	-
	Feb.	-	-	-	-	-	-	3.95	-	1.09	-
	Mar.	28	142.0	4.6	5.9	3.95	3.25	3.25	4.8	1.62	1.06
	Apr.	27	117.0	3.9	5.6	3.25	2.89	2.89	5.5	2.29	1.06
	May	31	179.5	5.8	7.3	2.82	1.70	1.70	7.5	0.63	0.13
	June	10	45.9	1.5	6.7	2.44	1.43	2.40	8.6	4.19	1.00
	July	29	168.5	5.4	6.8	2.35	1.08	1.08	6.5	0.99	0.27
	Aug.	31	191.1	6.2	7.6	1.05	-2.92	-2.45	16.8	1.44	0.50
	Sept.	29	79.9	2.7	4.3	-1.85	-3.67	-2.60	23.6	1.55	0.37
	Oct.	23	50.3	1.6	4.2	1.15	-4.46	1.15	16.1	3.43	1.34
	Nov.	3	7.5	0.2	3.8	1.75	1.15	1.73	-	2.11	1.37
	Dec.	13	36.7	1.2	4.1	1.94	1.65	1.94	5.1	1.84	1.00
	Total	224	1018.4	-	-	-	-	-	-	23.50	-

PUMPAGE DATA (Cont'd)
Kawainui Swamp, Oahu
1924 to 1941

Year	Month	Days Either Pump Operated	WATER PUMPAGE (Million Gallons) Total for Month	Daily Mean for Month	Maximum Day	LEVEL OF WATER IN POND (Ft.) Maximum Height	Minimum Height	Height - Last Day of Month	SALINITY (Gr. per gal.) Maximum During Month	RAINFALL (Inches) Kawainui Swamp Total	Pump Maximum Day
1927	Jan.	6	10.8	0.3	3.2	2.9	2.0	2.9	4.1	3.88	1.7
	Feb.	-	-	-	-	-	-	-	-	5.07	-
	Mar.	-	-	-	-	-	-	-	-	12.84	-
	Apr.	-	-	-	-	-	-	-	-	12.55	-
	May	-	-	-	-	-	-	-	-	4.66	-
	June	23	122.9	4.1	6.4	4.53	4.02	4.02	4.1	1.31	0.44
	July	30	177.4	5.7	7.6	4.01	3.32	3.32	5.8	1.87	0.33
	Aug.	31	208.6	6.7	7.5	3.25	2.33	2.33	6.8	1.37	0.29
	Sept.	30	178.1	5.9	6.9	2.28	1.70	1.84	7.5	4.69	3.00
	Oct.	31	153.2	4.9	6.4	1.85	1.04	1.04	6.5	1.96	0.80
	Nov.	4	16.7	0.6	5.6	4.17	0.94	4.17	6.2	9.22	3.00
	Dec.	-	-	-	-	-	-	-	-	-	-
	Total	155	867.7	-	-	-	-	-	-	59.42	-
1928	Jan.	-	-	-	-	-	-	3.75	-	1.34	-
	Feb.	11	19.3	0.7	2.2	3.97	3.35	3.74	5.5	1.99	1.13
	Mar.	27	124.7	4.0	7.8	3.62	2.15	2.57	5.5	1.35	0.44
	Apr.	11	28.0	0.9	5.0	2.86	2.44	2.65	5.1	5.43	2.50
	May	9	63.8	2.1	7.8	3.08	2.78	2.78	5.8	1.80	0.49
	June	30	225.1	7.5	7.8	2.75	1.34	1.34	6.8	1.16	0.59
	July	30	218.9	7.1	7.8	1.45	-0.09	-0.70	15.7	2.28	0.59
	Aug.	30	172.6	5.6	7.8	0.00	-2.98	-2.82	20.9	1.29	0.38
	Sept.	30	92.4	3.1	4.1	-2.36	-3.65	-2.97	38.7	0.51	0.08
	Oct.	31	67.4	2.2	2.8	-1.49	-3.70	-1.49	23.3	1.51	0.68
	Nov.	3	10.2	0.3	4.1	1.75	-1.56	1.75	7.5	3.35	0.95
	Dec.	8	16.9	0.5	3.4	1.32	-1.32	1.32	5.1	2.26	0.52
	Total	220	1039.3	-	-	-	-	-	-	24.27	-
1929	Jan.	16	72.9	2.4	7.6	1.39	1.18	2.30	4.1	4.94	2.76
	Feb.	3	7.3	0.3	3.9	2.54	2.52	2.82	3.4	3.39	0.79
	Mar.	13	39.6	1.3	4.4	3.18	2.92	2.92	3.4	1.22	0.26
	Apr.	30	192.6	6.4	7.9	2.85	1.82	1.82	5.1	1.04	0.31
	May	30	180.5	5.8	7.8	1.73	0.60	0.60	-	1.33	0.48
	June	29	163.5	5.5	7.9	0.57	-4.35	-2.38	29.1	0.49	0.06
	July	29	60.0	1.9	3.6	-2.58	-3.86	-2.76	43.1	0.82	0.22
	Aug.	30	46.2	1.5	2.5	-2.05	-3.53	-2.66	19.8	0.96	0.26
	Sept.	26	41.2	1.4	2.3	-2.75	-3.42	-2.90	6.5	1.00	0.29
	Oct.	27	43.0	1.4	1.8	-2.55	-3.21	-2.80	-	2.14	0.39
	Nov.	2	3.1	0.1	1.5	-1.52	-2.87	0.34	9.8	7.54	3.06
	Dec.	-	-	-	-	-	-	4.46	-	10.05	-
	Total	235	849.9	-	-	-	-	-	-	34.92	-

PUMPAGE DATA (Cont'd)
Kawaimui Swamp, Oahu
1924 to 1941

Year	Month	Days Either Pump Operated	WATER PUMPAGE (Million Gallons) Total for Month	Daily Mean for Month	Maximum Day	LEVEL OF WATER IN POND (Ft.) Maximum Height	Minimum Height	Height - Last Day of Month	SALINITY (Gr. per gal.) Maximum During Month	RAINFALL (Inches) Kawaimui Swamp Total	Pump Maximum Day
1930	Jan.	-	-	-	-	-	-	4.75	-	12.92	-
	Feb.	-	-	-	-	-	-	5.18	-	4.48	-
	Mar.	-	-	-	-	-	-	5.05	-	4.46	-
	Apr.	3	8.7	0.3	2.9	4.53	4.53	4.53	3.4	1.60	-
	May	30	222.5	7.2	8.0	4.54	3.77	3.77	4.8	0.55	0.16
	June	30	224.9	7.5	7.9	3.74	2.84	2.84	6.8	0.65	0.16
	July	31	206.6	6.7	7.8	2.82	1.79	1.79	7.5	0.82	0.17
	Aug.	29	217.2	7.0	7.8	1.75	0.54	1.14	8.6	3.61	2.11
	Sept.	-	-	-	-	-	-	3.10	-	5.98	-
	Oct.	-	-	-	-	-	-	3.60	-	5.61	-
	Nov.	6	13.7	0.5	2.5	-	-	4.20	3.4	5.58	1.88
	Dec.	-	-	-	-	-	-	3.05	-	1.58	-
	Total	129	893.6	-	-	-	-	-	-	47.84	-
1931	Jan.	30	123.7	4.0	6.0	3.14	2.94	2.94	4.5	0.83	0.24
	Feb.	27	186.7	6.7	7.9	2.94	2.21	2.21	6.8	0.76	0.13
	Mar.	23	129.0	4.2	7.8	2.24	1.65	1.25	5.8	1.52	0.55
	Apr.	10	39.4	1.3	6.1	1.82	1.68	1.77	6.8	1.94	0.84
	May	21	110.8	3.6	7.6	1.75	1.18	1.54	5.5	3.01	0.71
	June	28	158.9	5.3	6.6	1.54	0.04	0.04	-	0.43	0.11
	July	26	169.0	5.5	7.9	0.15	-1.12	-1.12	7.2	1.63	0.38
	Aug.	31	113.5	3.7	6.4	-0.55	-1.69	-0.74	10.9	3.06	0.52
	Sept.	20	76.8	2.6	7.7	0.79	-0.84	0.63	-	3.34	1.16
	Oct.	13	76.2	2.5	7.7	2.74	0.33	2.74	4.5	5.90	1.92
	Nov.	12	31.2	1.0	4.2	2.70	2.30	2.30	-	2.64	1.21
	Dec.	11	18.0	0.6	1.8	2.75	2.16	2.85	-	7.73	5.95
	Total	252	1233.2	-	-	-	-	-	-	32.79	-
1932	Jan.	-	-	-	-	-	-	3.80	-	5.10	-
	Feb.	-	-	-	-	-	-	5.85	-	16.86	-
	Mar.	-	-	-	-	-	-	-	-	2.03	-
	Apr.	24	182.8	-	8.3	3.62	3.41	3.54	8.9	2.00	0.63
	May	21	138.4	4.5	8.1	5.15	3.37	3.37	25.9	1.49	0.90
	June	30	221.0	7.4	7.9	3.36	2.63	2.63	13.7	0.98	0.57
	July	30	214.7	6.9	7.9	2.60	1.81	1.81	14.7	1.47	0.26
	Aug.	29	176.5	5.7	8.0	1.87	1.44	1.44	-	1.71	0.39
	Sept.	30	222.6	7.4	8.0	1.38	0.31	0.31	12.3	1.60	0.80
	Oct.	30	167.2	5.4	8.0	0.29	-1.34	-1.00	19.5	1.55	0.25
	Nov.	12	45.7	1.5	4.1	-	-	-	-	5.56	4.22
	Dec.	-	-	-	-	-	-	-	-	3.35	-
	Total	206	1368.9	-	-	-	-	-	-	43.70	-

PUMPAGE DATA (Cont'd)
Kawaimui Swamp, Oahu
1924 to 1941

Year	Month	Days Either Pump Operated	WATER PUMPAGE (Million Gallons) Total for Month	Daily Mean for Month	Maximum Day	LEVEL OF WATER IN POND (Ft.) Maximum Height	Minimum Height	Height - Last Day of Month	SALINITY (Gr. per gal.) Maximum During Month	RAINFALL (Inches) Kawaimui Swamp Pump Total	Maximum Day
1933	Jan.	4	15.6	0.5	5.5	2.80	2.79	2.80	-	3.45	1.38
	Feb.	7	44.7	1.6	8.0	3.65	2.85	3.65	29.1	8.47	2.21
	Mar.	4	24.8	0.8	8.0	3.45	3.40	3.43	17.1	12.30	6.98
	Apr.	30	209.3	7.0	8.0	3.42	2.95	2.95	9.9	1.25	0.47
	May	31	220.1	7.1	8.0	2.92	2.11	2.11	11.6	0.93	0.39
	June	30	219.2	7.3	7.6	2.05	0.71	0.71	12.3	1.05	0.26
	July	31	204.0	6.6	7.4	0.69	-1.82	-1.82	15.1	1.48	0.24
	Aug.	31	83.8	2.7	4.3	-1.86	-3.05	-3.00	17.1	1.04	0.41
	Sept.	30	51.8	1.7	2.0	-2.97	-3.40	-3.40	17.8	0.63	0.15
	Oct.	31	36.5	1.2	1.4	-3.25	-3.45	-3.26	-	0.38	0.08
	Nov.	24	36.7	1.2	2.5	-2.20	-3.50	-3.45	23.6	1.23	0.44
	Dec.	21	28.3	0.9	1.7	0.47	-3.46	0.47	18.8	7.77	-
	Total	274	1174.8	-	-	-	-	-	-	39.98	-
1934	Jan.	7	25.5	0.8	6.8	1.39	0.50	1.39	18.5	3.18	1.03
	Feb.	2	1.8	0.1	1.7	2.52	1.48	2.46	-	3.73	1.00
	Mar.	28	185.1	6.0	8.4	2.57	2.16	2.16	27.0	2.19	0.70
	Apr.	30	205.5	6.8	8.3	2.11	1.62	1.87	20.5	2.47	0.71
	May	28	204.3	6.6	8.1	1.84	1.57	1.59	18.5	2.21	1.21
	June	25	165.5	5.5	8.1	1.89	1.25	1.25	16.4	1.59	0.92
	July	30	218.8	7.1	7.8	1.20	0.04	0.04	24.3	1.00	0.29
	Aug.	29	176.7	5.7	7.4	-0.03	-0.78	-0.73	28.7	1.89	0.68
	Sept.	15	71.3	2.4	7.4	1.20	-1.50	1.19	23.9	7.38	5.76
	Oct.	16	100.8	3.3	7.6	1.59	0.80	1.59	18.1	3.94	0.90
	Nov.	-	-	-	-	-	-	2.69	-	2.71	-
	Dec.	-	-	-	-	-	-	2.70	-	1.92	-
	Total	210	1355.3	-	-	-	-	-	-	34.21	-

PUMPAGE DATA (Cont'd)
Kawainui Swamp, Oahu
1924 to 1941

Month	KAWAINUI SWAMP PUMPAGE IN MILLION GALLONS													
	1935		1936		1937		1938		1939		1940		1941	
	Total for Month	Daily Mean for Month	Total for Month	Daily Mean for Month	Total for Month	Daily Mean for Month	Total for Month	Daily Mean for Month	Total for Month	Daily Mean for Month	Total for Month	Daily Mean for Month	Total for Month	Daily Mean for Month
Jan.	-	-	6.1	0.2	76.2	2.5	-	-	-	-	-	-	-	-
Feb.	-	-	-	-	-	-	-	-	6.2	0.2	-	-	44.8	1.6
Mar.	-	-	4.1	0.1	-	-	10.0	0.3	19.8	0.6	31.6	1.0	74.4	2.4
Apr.	-	-	20.0	0.7	108.4	3.6	48.7	1.6	14.9	0.5	35.0	1.2	183.8	6.1
May	-	-	116.1	3.7	43.7	1.4	108.2	3.5	91.7	3.0	27.0	0.9	160.7	5.2
June	-	-	220.6	7.4	248.6	8.3	178.7	6.0	217.8	7.3	184.0	6.1	98.3	3.3
July	173.2	5.6	258.2	8.3	208.7	6.7	235.5	7.6	202.6	6.5	221.7	7.2	-	-
Aug.	246.3	7.9	244.2	7.9	186.5	6.0	31.3	1.0	214.0	6.9	185.7	6.0	-	-
Sept.	231.9	7.7	220.0	7.3	191.0	6.4	204.5	6.8	115.8	3.9	168.6	5.6	-	-
Oct.	44.2	1.4	114.3	3.7	101.9	3.3	117.5	3.8	69.0	2.2	57.7	1.9	-	-
Nov.	-	-	-	-	11.0	0.4	13.2	0.4	-	-	2.3	0.1	-	-
Dec.	-	-	-	-	42.1	1.4	109.3	3.5	-	-	-	-	-	-
Total	695.6	-	1203.6	-	1218.1	-	1056.9	-	951.8	-	913.6	-	562.0	-

NOTE: Data not available when not listed.

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