REVISED FINAL
ENVIRONMENTAL IMPACT STATEMENT

for the

UPPER MAKALEHA SPRINGS WATER RESOURCE DEVELOPMENT
Kapaa, Kauai, Hawaii

JANUARY 1994

State of Hawaii
Department of Land and Natural Resources
Division of Water and Land Development

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

This Environmental Document is Submitted
Pursuant to Chapter 343, HRS

REVISED FINAL ENVIRONMENTAL IMPACT STATEMENT
UPPER MAKALEHA SPRINGS
WATER RESOURCE DEVELOPMENT
Kapaa, Kauai, Hawaii

PROPOSING AGENCY:

Division of Water and Land Development
Department of Land and Natural Resources
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Honolulu, Hawaii 96809

ACCEPTING AGENCY:

Governor, State of Hawaii

Keith W. Ahue
Chairperson
Board of Land and Natural Resources

January 6, 1994
Date of Signature

Prepared by:

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Please take note that,

The **DIVISION OF WATER RESOURCE MANAGEMENT** was reorganized in March 1992. Under the reorganization, the Division was abolished and its personnel were divided into the Commission on Water Resource Management and the newly created **DIVISION OF WATER AND LAND DEVELOPMENT.**

THE DIVISION OF WATER RESOURCE MANAGEMENT in the document means **THE DIVISION OF WATER AND LAND DEVELOPMENT.**

REVISED DRAFT ENVIRONMENTAL IMPACT STATEMENT
UPPER MAKALEHA SPRINGS WATER RESOURCE DEVELOPMENT PROJECT
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The Hawaii Division of Water Resource Management, in cooperation with the Kauai County, Department of Water, proposes to tap natural springs on State land in the Makaleha Mountains of East Kauai, and to pipe the water to Kapaa for domestic uses. The project involves the construction of a concrete intake basin and approximately 4000 feet of iron pipe. The proposed project will fulfill the primary purpose of the Kealia Forest Reserve which is to serve as a source of water supply.

Other project alternatives considered included the "no project" option, drilling a new well on Akulikuli Ridge, enlarging existing water tunnels, the construction of a surface impoundment, and water conservation within the Wailua-Kapaa system.

The proposed project will help alleviate existing water shortages in the Kapaa-Wailua area by increasing the existing water supply capacity approximately 18 percent. Adverse environmental impacts include a degradation of native fish and shrimp habitats and surface water quality, especially during construction. In addition, the project will also include the diversion of about 1.0 mgd of surface water now being used by Lihue Plantation Company (LPC) for irrigation purposes. These impacts will be mitigated by: 1) the use of cement rubble masonry for the intake and pipeline pedestal construction; 2) limitation of vegetation removal and replanting of exposed riparian areas with indigenous vegetation; 3) the restriction of land vehicles past the mauka end of Kahuna Road; 4) the use of silt fences and fabric material to reduce potential sedimentation; 5) the scheduling of excavation work during the drier months of May through September; 6) a commitment by Kauai County to not capture water from the Springs if LPC irrigation requirements are unmet; 7) periodic monitoring of the aquatic habitat of Upper Makaleha Stream by the Kauai district office of the State Division of Aquatic Resources; 8) the reduction of water capture by the Kauai County Department of Water if State monitoring detects significant adverse impacts upon aquatic habitat due to increased dewatering; and 9) a successful negotiation between the State of Hawaii and Lihue Plantation Company that results in a reduced diversion of Upper Makaleha Stream flows to Makaleha Ditch in light of reduced requirements for irrigation water in Kealia.

The project is consistent with the Kauai County General Plan and the Hawaii State Plan.

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CHAPTER ONE

INTRODUCTION

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INTRODUCTION

1.1 PURPOSE OF THE PROJECT

This environmental impact statement has been prepared to:

1. Identify and analyze reasonable project alternatives for obtaining an increased potable water supply for the Island of Kauai's Wailua-Kapaa area;

2. Evaluate selected characteristics and trends of the Upper Makaleha Spring Catchment site, the Kapaa Homesteads area, and surrounding Wailua-Kapaa area;

3. Determine and analyze significant environmental consequences which are expected to result from implementation of the selected project alternative; and

4. Identify practical mitigative measures which can reduce the consequences of the proposed water resource development.

1.2 METHODOLOGY

This EIS document contains a combination of quantitative and qualitative analyses which were made to meet the information objectives outlined in section 1.1. These objectives reflect the EIS content requirements outlined in Title 11, Chapter 200 of the Hawaii Revised Statutes.

Analyses relied primarily upon available information and consultation with selected representatives from various public agencies and private organizations in Hawaii (see section 1.3). Available information and agency consultations were supplemented with onsite field surveys and related evaluations by several environmental specialists.

An archaeological reconnaissance was conducted along Makaleha Stream in October, 1986. The reconnaissance survey and subsequent evaluations were made by Cultural Surveys Hawaii under the direction of Hallett Hammatt, Ph.D.

In December, 1986, a botanical survey was performed by Char & Associates near the county water storage tank along Kapaa Road to Makaleha Stream, as well as along some 4,000 feet of Makaleha Stream to the proposed water development site. A flora survey report documenting field observations was subsequently made by Char & Associates and is incorporated within the EIS.

A survey of the faunal resources in Makaleha valley was made by Phillip Bruner in December, 1986 to determine which, if any, birds and feral mammals inhabit or frequent the project area. Subsequently, evaluations were made to document field survey results and to determine whether or not 1) endangered species are inhabiting or frequenting the project area; and 2) endangered species would be adversely impacted by the proposed development project. In light of comments

received during public agency consultation, a later reconnaissance survey of the project site was made by Mr. Michael Kido, environmental consultant, in April, 1990 to assess whether or not an established breeding population of Koloa (Hawaiian Duck) is present within the project area.

An aquatic biological reconnaissance of Makaleha Stream was made in late 1986 to identify the composition and abundance of macrofauna in Makaleha stream. The initial reconnaissance study was expanded in April, 1990 to address the concerns raised by the State Office of Environmental Quality Control. The April, 1990 study gave greater attention to the physiochemical conditions of existing biota and the impact of changes in stream flow conditions.

1.3 AGENCY AND PUBLIC CONSULTATION

Consultation with representatives of various private and public agencies was made during preparation of the original draft EIS submitted by the State Division of Water Resource Management in 1987 (formerly known as the State Division of Water and Land Development). The agency representatives consulted, their related affiliation, and their provision of written or verbal information are summarized in Table 1-1. Documented information obtained from these agencies is presented in Appendix A.

Following preparation and circulation of the original draft EIS, several public agencies in Hawaii provided documented comments concerning the proposed project. These comments and the related responses from Portugal & Associates, Inc., are presented in Appendix B.

The scope of comments made by various agencies in 1987-1988 prompted the State Division of Water Resource Management and its consultant, Portugal and Associates, to revise the scope of the original project. Incorporating these modifications, a final EIS was completed and submitted to the State Office of Environmental Quality Control (OEQC) in December, 1990 and circulated to appropriate governmental agencies, special interest groups, private corporate interests, and other community organizations.

The final EIS submitted in December, 1990 contained additional information about the affected environment and included significant changes to the scope of the selected project alternative. Following the receipt of correspondence from several public agencies (Appendix C), the State Division of Water Resource Management held an informal meeting with representatives of the State Department of Hawaiian Homes Lands, the University of Hawaii Environmental Center, and the Kauai County Department of Water on August 2, 1991. Issues raised during this meeting, and related concerns and recommendations of the State OEQC, prompted the State Division of Water Resource Management to withdraw its revised final EIS of December, 1990. More recently, the final EIS was revised in April, 1992 and is now being recirculated as a revised draft EIS in order to afford agency and public review of more recent project information, an additional project alternative, and a revision to the selected project alternative.

Initial consultation, made by Portugal and Associates, Inc. during preparation of the original draft EIS (Table 1-1), was expanded during completion of this revised draft EIS. This consultation involved informal discussions between James Pedersen, Planning Consultant, and the agencies and organizations summarized in Table 1-2.

TABLE 1-1
SUMMARY OF CONSULTATION
WITH SELECTED PUBLIC AND PRIVATE AGENCIES
DURING PREPARATION OF ORIGINAL EIS

Agency	Representative	Type of Response
United States Government		
Soil Conservation Service	Laurie K. Ho	written
Fish & Wildlife Service	Ernest Kosaka	written
Army Corps of Engineers	Everette A. Flanders	written
State of Hawaii		
Dept. of Health	John C. Lewin, M.D.	written
Dept. of Health	Theodore Inouye	written
Division of Forestry & Wildlife	Ralph E. Daehler	written
Division of State Parks	Ralston H. Nagata	written
County of Kauai		
Department of Planning	Avery H. Youn	written
Department of Water	Raymond H. Sato	verbal
Private & Community Organizations		
Lihue Plantation Company	Lefty H. Kawazoe	written
Office of Hawaiian Affairs	Earl Neller	written
Kauai Outdoor Circle	Nina Magoun	verbal
Kauai Sierra Club	Bert Lyon	none
Kauai Audubon Society	David Boynton	none
Conservation Council for Hawaii	Mike Kido	none

TABLE 1-2
SUMMARY OF EXPANDED CONSULTATION WITH SELECTED PUBLIC AND PRIVATE AGENCIES DURING PREPARATION OF THE REVISED DRAFT EIS

Agency	Representative	Type
United States Government		
U.S. Geological Survey	Roy Taogoshi	Informal mtg.
State of Hawaii		
Department of Hawaiian Home Lands	Charles Ice	Informal mtg.
U.H. Environmental Center	John Harrison	Informal mtg.
Division of Aquatic Resources	Don Heacock	Telephone
County of Kauai		
Department of Water	Raymond H. Sato	Informal mtg.
	Greg Fujikawa	Informal mtg.
Private Corporations		
Lihue Plantation Company	Mike Furukawa	Informal mtg.
	Irven Contrades	Informal mtg.
AMFAC	Mike Burke	Informal mtg.

1.4 RESPONSIBILITY FOR EIS PREPARATION

This environmental impact statement was prepared by Portugal and Associates, Inc., consulting engineers and land surveyors, in consultation with James Pedersen, Planning Consultant. Portugal and Associates, Inc. was retained by the State of Hawaii, Department of Land and Natural Resources, Division of Water Resource Management, to prepare the environmental impact statement, engineering design plans, and related design specifications, for the construction of the Upper Makaleha Springs Water Source Development Project.

CHAPTER TWO

PROJECT ALTERNATIVES

CHAPTER TWO
PROJECT ALTERNATIVES

2.1 SIGNIFICANT FACTORS INFLUENCING WATER RESOURCE DEVELOPMENT

2.1.1 Existing Potable Water Demands

The Kapaa-Wailua water system presently serves approximately 4,460 metered consumers (Yamase, 1990). During FY 1989, potable water consumption in the Kapaa-Wailua area was slightly more than one billion gallons, or about 25 percent of the Kauai's total consumption (Kauai Office of Economic Development, 1989). Average daily demand for the Kapaa-Wailua water system is roughly 2.49 million gallons per day (Yamase, 1990).

Unfortunately, water consumption in the Kapaa-Wailua area has severely strained and/or exceeded available water supply since 1982. The 1.0 mgd storage tank serving the upper Kapaa Homesteads, for example, has been depleted of its supply on several occasions during the past five years. The lack of available supply has prompted Kauai County officials to impose 1) a moratorium on the development of residential subdivisions containing more than 15 lots; 2) voluntary water use restrictions, during the summer months, by larger agricultural consumers; and 3) occasional voluntary water use restrictions upon other domestic and commercial consumers.

Development of the existing Makaleha well, completed in FY 1988, has provided some temporary relief to local water shortage problems. The development permitted Kauai County officials to lift its former moratorium on the development of residential subdivisions containing more than 15 residential lots. In addition, it allowed the County to approve development of some 500 additional residential units in the Kapaa-Wailua service area. Despite the presence of additional potable water supply, County Department of Water representatives continue to view the Kapaa-Wailua system as deficient in light of present consumption and growing pressures for land development. A number of land use development projects have already been curtailed because of the lack of any additional water supply in the Kapaa-Wailua system (Fujikawa, 1990).

2.1.2 Future Potable Water Demands in the Kapaa-Wailua Area

The Kauai Water Use and Development Plan, published by R.M. Towill Corporation in 1990, indicates that present average day demand will increase from 2.49 mgd in 1988 to 3.65 mgd by the year 2010. A second "long range" forecast, provided in the Towill plan, relates to the potential urbanization of the Kapaa-Wailua area during the next 20 years. The second Towill forecast suggests that the average daily demand in the Kapaa-Wailua area will increase to roughly 5.63 mgd if: 1) the Kapaa-Wailua area is fully developed as outlined in the Kauai County General Plan and existing zoning densities; and 2) the resident population increases to the levels predicted by the State Department of Business and Economic Development.

2.1.3 Relationship to County Department of Water Standards to Future Water Demands and Existing Source Capacity

Future water needs in the Wailua-Kapaa area must also be viewed in the context of other system requirements and related criteria. Kauai County Department of Water standards require that system capacity must reflect maximum day demand (average day demand x 1.5), pending water requirements for proposed projects, and the capacity of groundwater wells assuming a 16-hour per day operation and full-time availability. Maximum day demand is used to incorporate requirements for fire flow while a 16-hour pumping duration is used to prolong the life of the pumps and ensure greater operational reliability.

The correlation of these County water standards with future potable water demands and existing water source capacity (Table 2-1) indicates a present shortage in source capacity. This shortage will intensify with increasing water demands generated by a growing residential and visitor populations and the related urbanization of the Wailua-Kapaa area. Consequently, there is a clear need for the development of additional water source capacity for the Kauai County's Wailua-Kapaa water system.

2.2 METHOD OF ALTERNATIVE EVALUATION AND COMPARISON

Three project alternatives are presented in Sections 2.3 through 2.5. Each alternative is identified in terms of general scope, location, and significant project consequences. Subsequently, each development option is further evaluated on a comparative basis.

Arbitrary numerical rankings and related comparisons were made by Portugal and Associates to better assess the desirability and undesirability of those potential impacts which 1) may be significant, and/or 2) are of concern to public agencies consulted during preparation of the original and revised versions of the environmental impact statement. Project evaluation criteria used for the comparison of alternatives included a combination of both short-term, long-term, and cumulative impacts. Those issues considered in the evaluation included the following:

Conserves aquatic resources of Makaleha and Kapaa Streams;
Conserves surface water quality of Makaleha and Kapaa Streams;
Increases available water supply capacity of Wailua-Kapaa system;
Conserves the wildlife habitat of the Makaleha and Kapaa watersheds;
Maintains the surface water supply for Lihue Plantation Company;
Makes cost-effective use of State funds for County water source development;
Makes cost-effective use of County funds for system operation/maintenance; and
Conserves non-renewable energy resources used for electrical power production.

The numerical ranking of alternatives was made by assigning weighted values to each of the evaluation criteria and subsequently rating the potential impact of each alternative on each of the established evaluation criteria.

TABLE 2-1

AVAILABLE WATER SOURCE CAPACITY
KAUAI COUNTY WAILUA-KAPAA WATER SYSTEM
1991, 2010, AND LONG RANGE FORECAST

Year	Max.Day Demand (mgd)	Pending Development (mgd)	System Requirement (mgd)	Existing Well Capacity (mgd)	Available Capacity (mgd)
1991	3.74	0.85	4.59	4.01	-0.58
2010	5.48	0.85	6.33	4.01	-2.32
LR	8.45	0.85	9.30	4.01	-5.29

Assumptions:

1. Average day demand forecasts from 1990 Kauai Water Use and Development Plan were used to calculate maximum day demand.
2. Pending development requirement, estimated by Kauai County Department of Water, reflects existing demands based upon pending development projects.
3. Existing well capacities assume full-time availability (no stand-by capacity) from existing six groundwater wells, as well as use of a daily pumpage of not more than 16 hours.
4. LR represents a longer range time period when existing County General Plan designations are fully developed to existing zoning densities.

Source: Kauai County, Department of Water, 1991; James Pedersen, Planning Consultant, 1991

Weighted values, assigned to each evaluation criteria, ranged from 0.1 to 1.0. Higher weighted values indicated issues believed to be of greater importance to public agencies and the general public. The rating of individual criteria for each alternative involved the determination of numerical scores ranging from 1 to 10. Lower scores, e.g. 0 to 3, indicated a potential adverse impact which is not expected to benefit the community or the local resource affected. A score of 5 or 6 suggests that the implementation of the given alternative will not influence, or adversely affect, the criteria/resource being considered. Scores ranging from 7 to 10 represent potential impacts which are expected to benefit the community and/or the local resource in question. The alternative receiving the highest cumulative score represents the most desirable overall alternative.

While subjective and arbitrary, this analytical method, combined with other analyses made in Chapter Two, is useful for alternative comparison. This approach provides the reviewer with the information necessary to identify and evaluate the rationale used for alternative selection.

2.3 PROJECT ALTERNATIVE A: THE NO PROJECT OPTION

Under Alternative A, no project would be undertaken to provide additional water supply for the Kapaa-Wailua area. Continued water conservation efforts would be encouraged and carried out by the Kauai County Department of Water to sustain existing land use development and support the existing resident and visitor population. The development of vacant property and/or the rezoning of developed lands to higher densities would be discouraged or not permitted due to the unavailability of additional water supply.

2.4 PROJECT ALTERNATIVE B: DRILL A NEW WELL AT AKULIKULI RIDGE

This development option would involve the drilling of a groundwater well in the ridge next to the existing Akulikuli tunnel (Figure 2-1), at approximately 360 feet above mean sea level (MSL). This well location would ***"....provide access to the aquifers within the Waimea volcanic series at a minimum lift"*** (Island Resources, 1981).

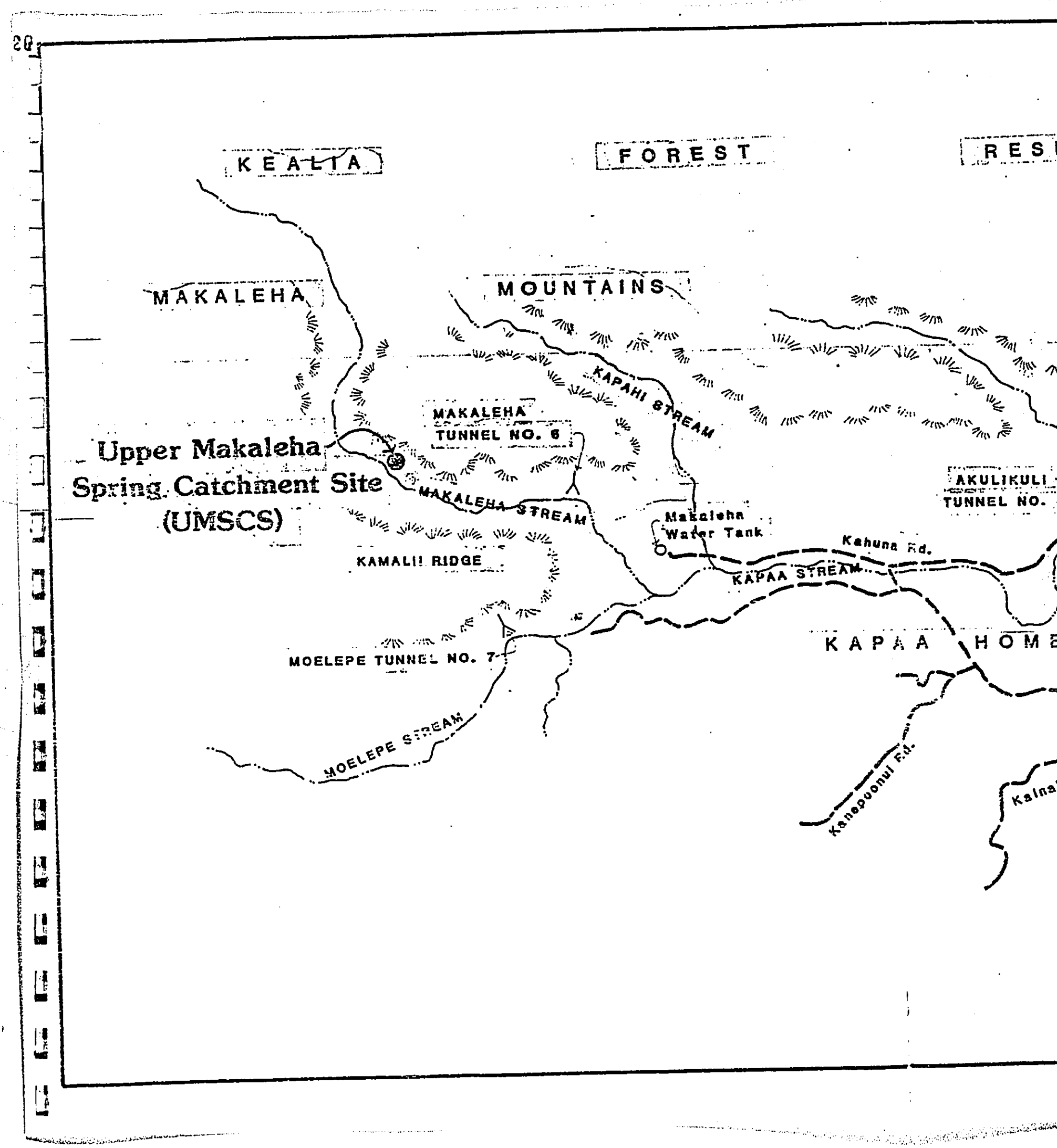
Installation of two pumps and a water transmission pipe from the tunnel to the County's water storage tank would also be required.

2.5 PROJECT ALTERNATIVE C: ENLARGE EXISTING TUNNELS

The Moelepe, Makaleha, and Akulikuli tunnels (Figure 2-1) presently supply roughly 40 percent of the potable water consumed in the Kapaa-Wailua service area.

"Small additional quantities of perched groundwater might be diverted into Moelepe and Makaleha tunnels by drilling small diameter holes (5 to 10 feet in length) into the ceilings at selected locations" (Island Resources, 1981).

Existing intakes and pipe from the Moelepe, Makaleha and Akulikuli tunnels already discharge water from these tunnels to Makaleha or Kapaa Stream.


KEALIA
FOREST
RES
MAKALEHA
MOUNTAINS
KAPAHI STREAM
MAKALEHA
TUNNEL NO. 6
Upper Makaleha
Spring Catchment Site
(UMSCS)
MAKALEHA STREAM
AKULIKULI
TUNNEL NO.
Makaleha
Water Tank
Kahuna Rd.
KAMALII RIDGE
KAPAA STREAM
KAPAA HOME
MOELEPE TUNNEL NO. 7
MOELEPE STREAM
Kanepuonui Rd.
Kalna

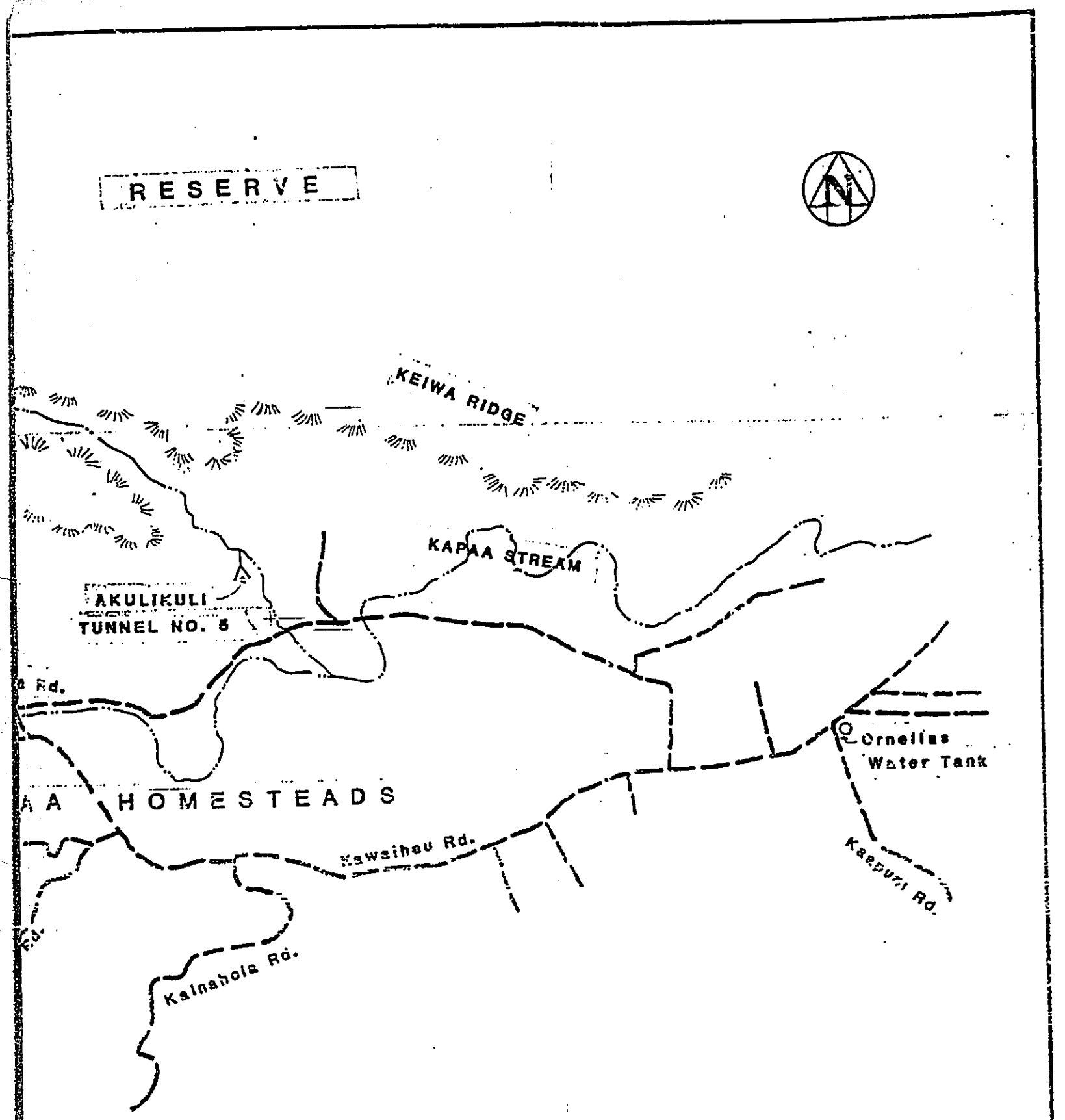


FIGURE 2-1

LOCATION OF PROJECT AREA AND PROJECT ALTERNATIVES

2.6 PROJECT ALTERNATIVE D: IMPOUNDMENT OF A SURFACE WATER SUPPLY

This alternate development approach would involve the diversion of roughly 1.0 mgd from Upper Makaleha Stream and the development of a related surface impoundment in the upper Kapaa Homestead area. This approach would enable the capture and storage of increased stream discharges during the "wet season" months.

This alternative would require the diversion of roughly 1.0 mgd of surface flow from Makaleha Stream, as well as the construction of, at least, a one-acre surface impoundment in the vicinity of the County water storage tank along Kapaa Stream (Figure 2-1). The depth of the surface impoundment would be approximately 10 feet.

Related facility development would include the construction of a related water treatment facility and the installation of a water transmission line from the surface impoundment to the County storage tank and/or existing water transmission system. Two water pumps may also be required; however, this requirement is dependent upon the selected location of the impoundment, as well as the elevation difference between the County storage tank and the water treatment facility.

2.7 PROJECT ALTERNATIVE E: TAP NATURAL SPRINGS IN THE MAKALEHA MOUNTAINS

This project alternative would tap the natural springs in the Makaleha Mountains and transmit spring water, via gravity flow, to an existing County water storage tank in the upper Kapaa Homestead area (Figure 2-2A through Figure 2-2F). This option would generally involve the construction of an underground cut-off trench, a small intake structure, and an 8-inch pipe along the north side of the existing Makaleha valley. The new source would supply a flow ranging from 500 to 700 gallons per minute (gpm) to the Kapaa-Wailua water system.

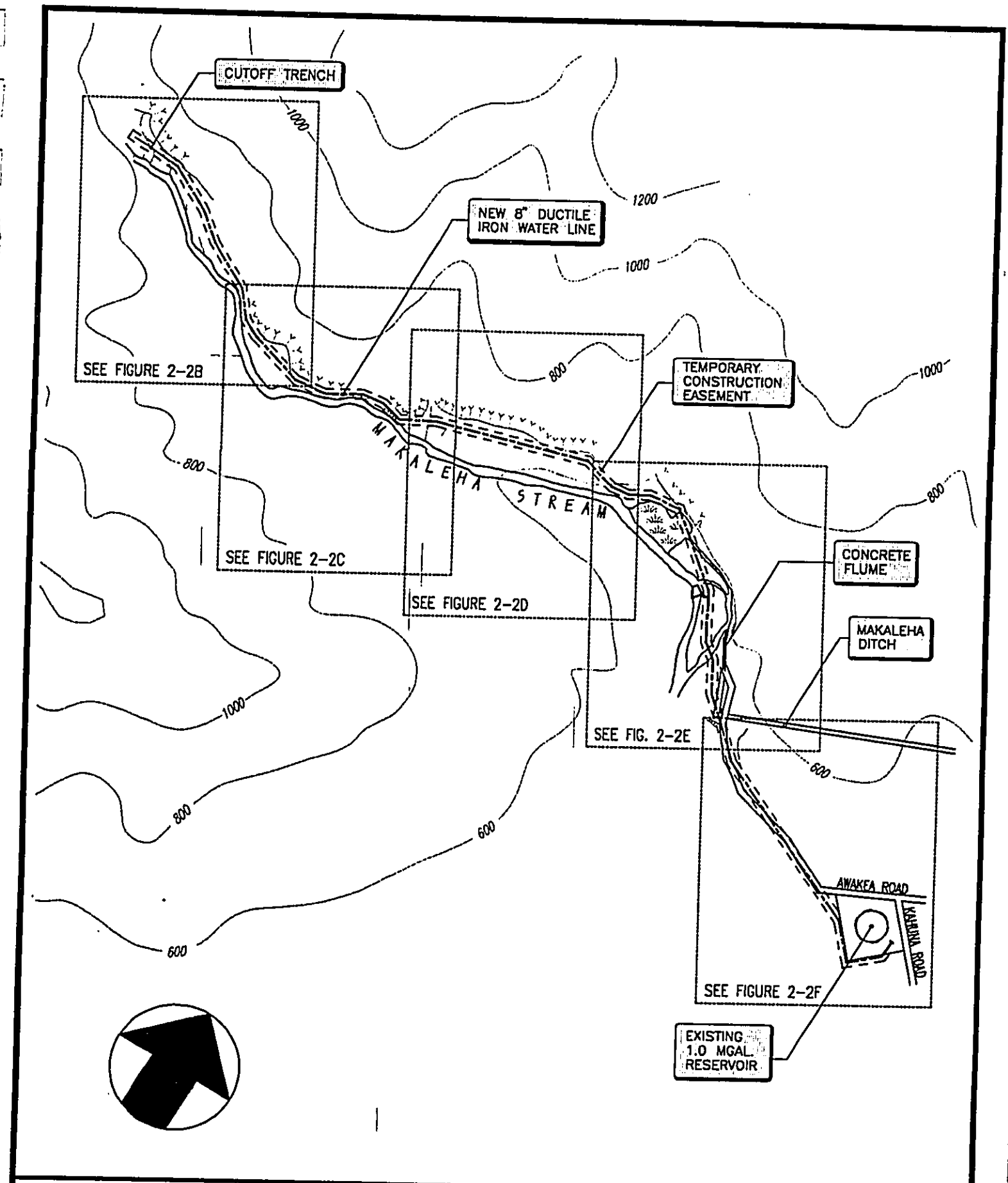
2.8 PROJECT ALTERNATIVE F: WATER CONSERVATION IN THE WAILUA-KAPAA AREA

Water conservation would involve the County of Kauai, Department of Water, implementing programs to minimize system losses and encourage reduced water consumption by residential and commercial consumers.

System conservation efforts would include the monitoring of leak detection in the transmission and distribution systems. As leaks are determined, pipe replacements and repair can be identified and carried out by the Kauai County Department of Water.

Reduced consumption by residential and commercial consumers would be achieved through one or more of the following methods:

* the implementation of community education programs.
* the establishment of inverted water rate schedules that would discourage increased consumption by, at least, residential customers. Available technologies



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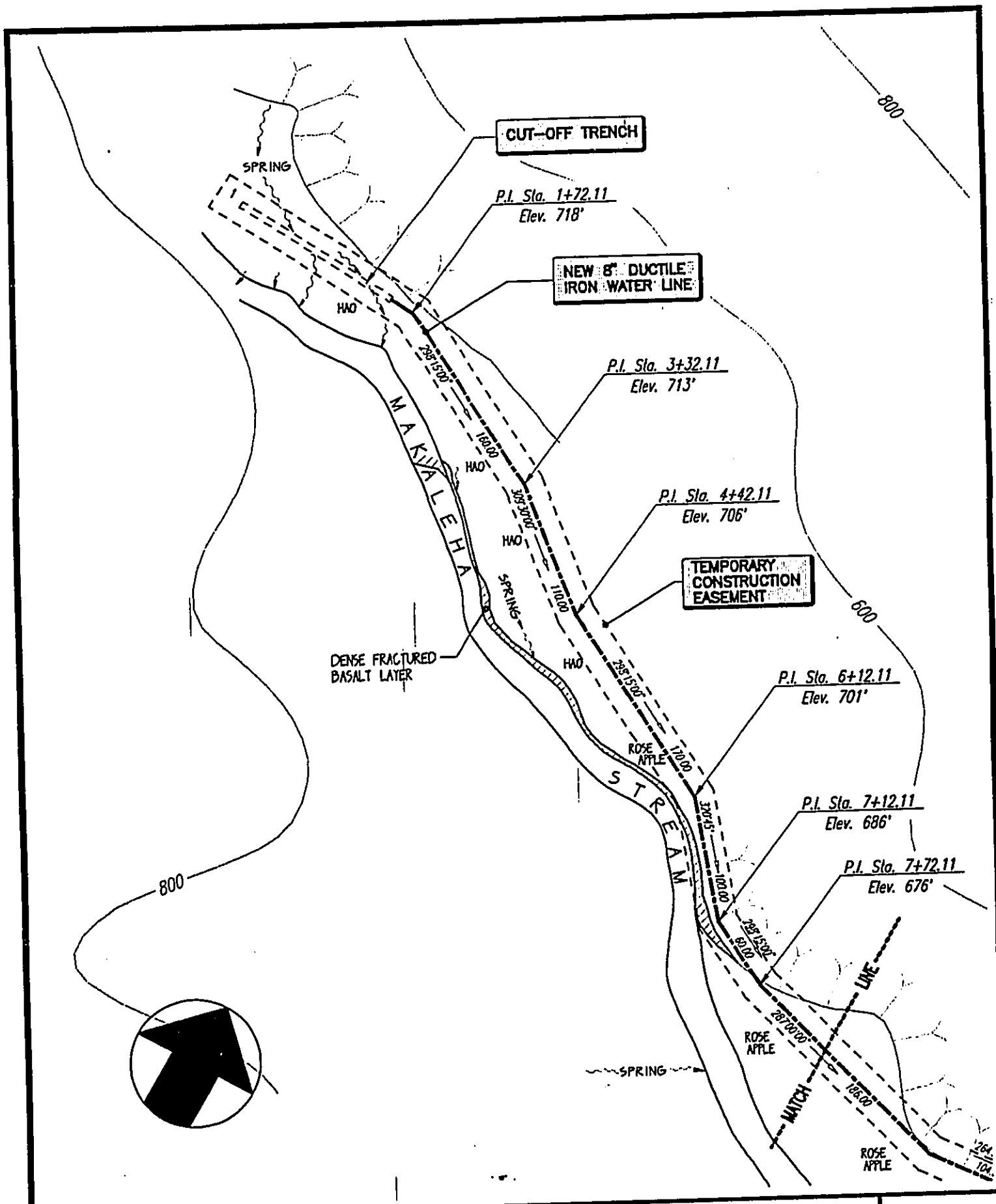
PROJECT ALTERNATIVE E

SCALE: 1" = 400'

April 22, 1992

FIGURE 2-2A



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PROJECT ALTERNATIVE E

SCALE: 1" = 100'

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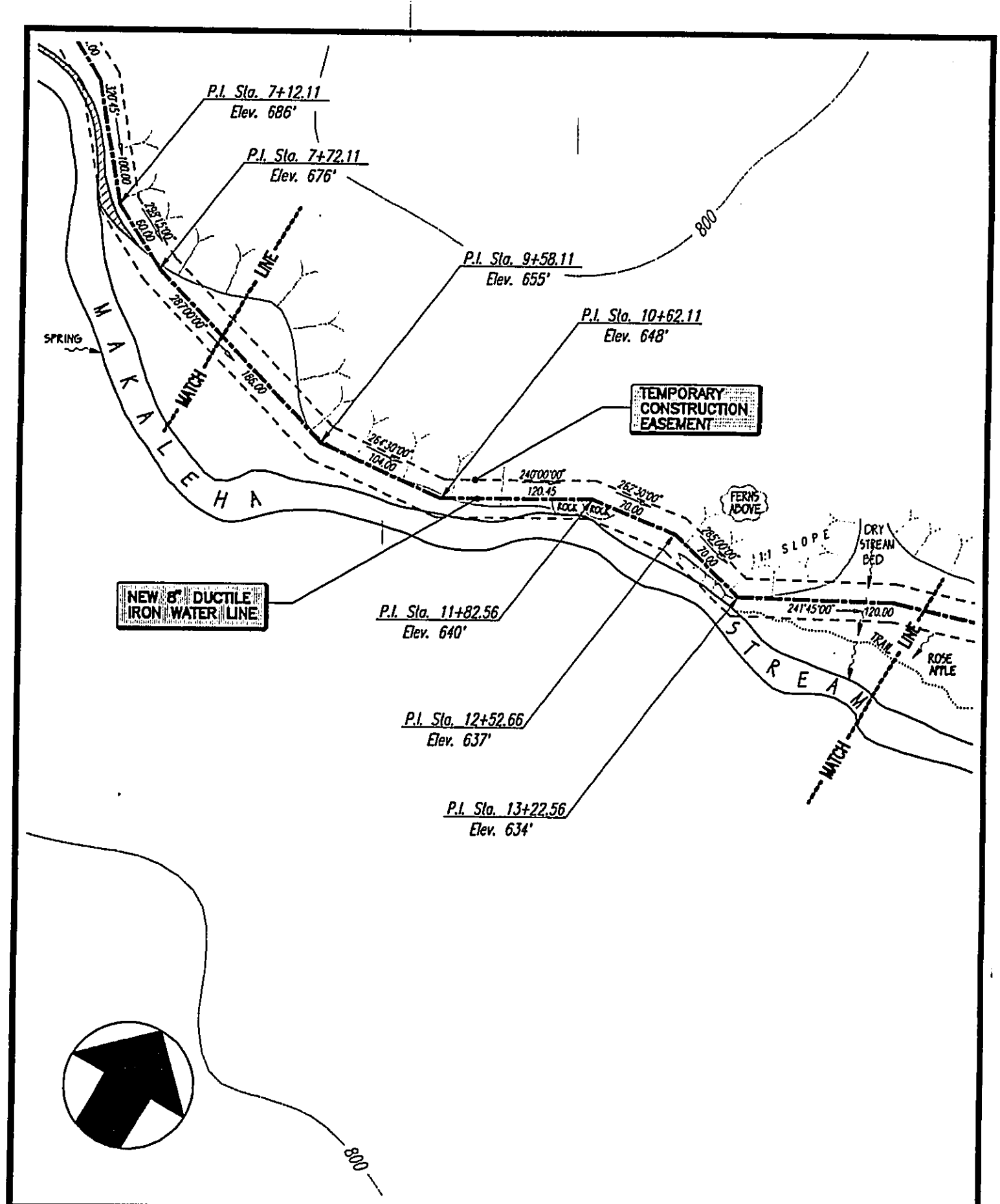
FIGURE
2-2B



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PROJECT ALTERNATIVE E

SCALE: 1" = 100'

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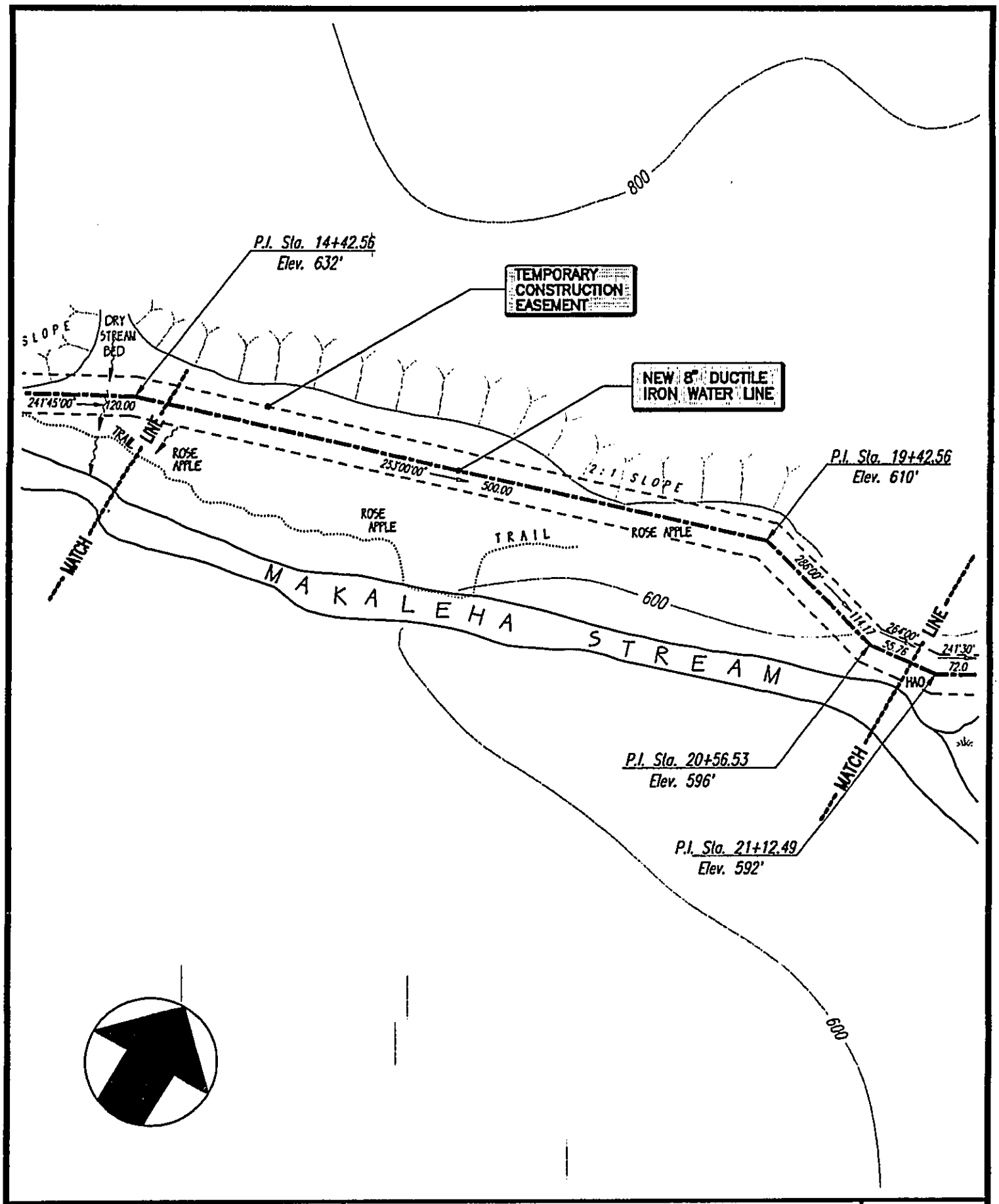
FIGURE
2-2C



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PROJECT ALTERNATIVE E

SCALE: 1" = 100'

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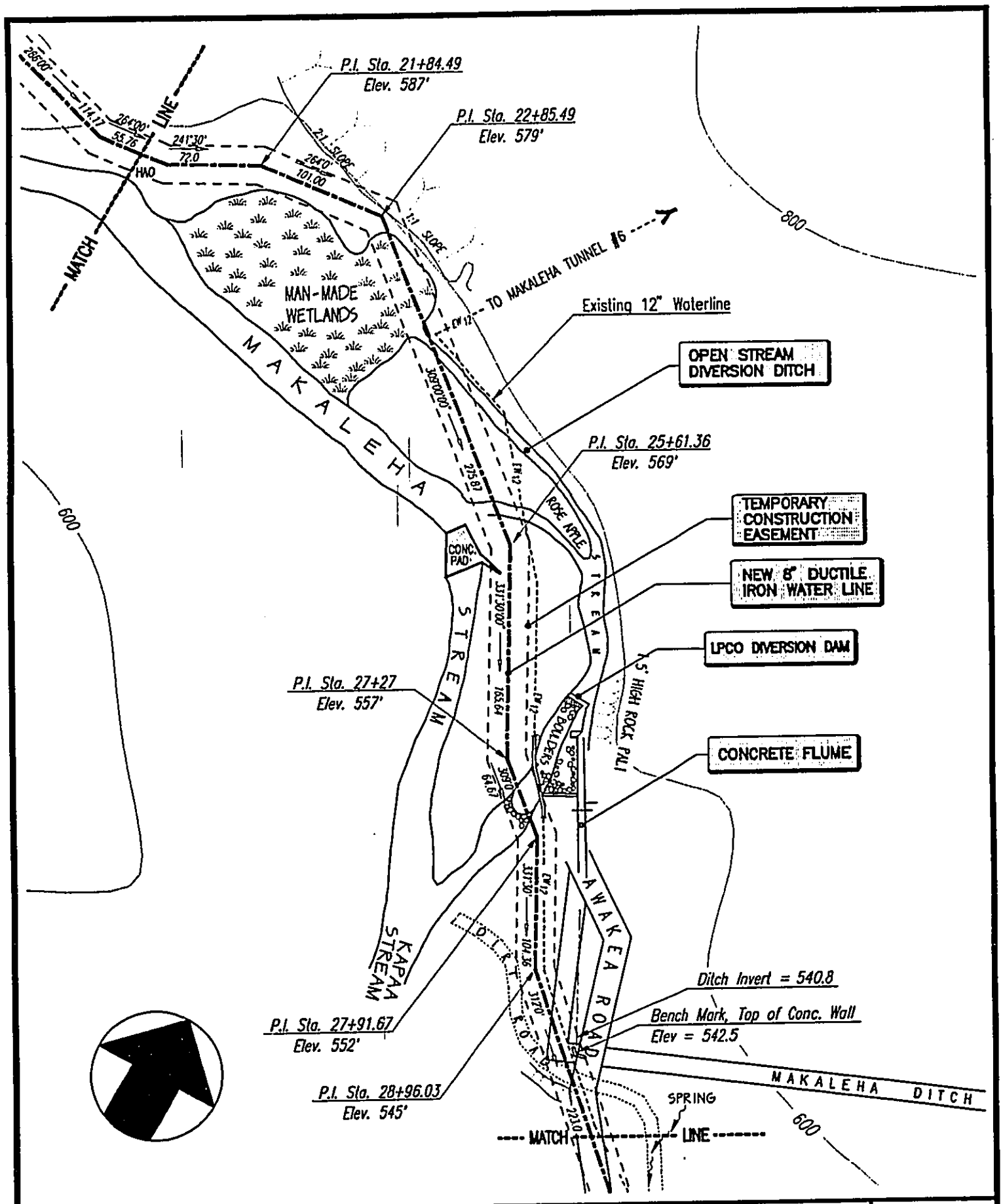
FIGURE
2-2D



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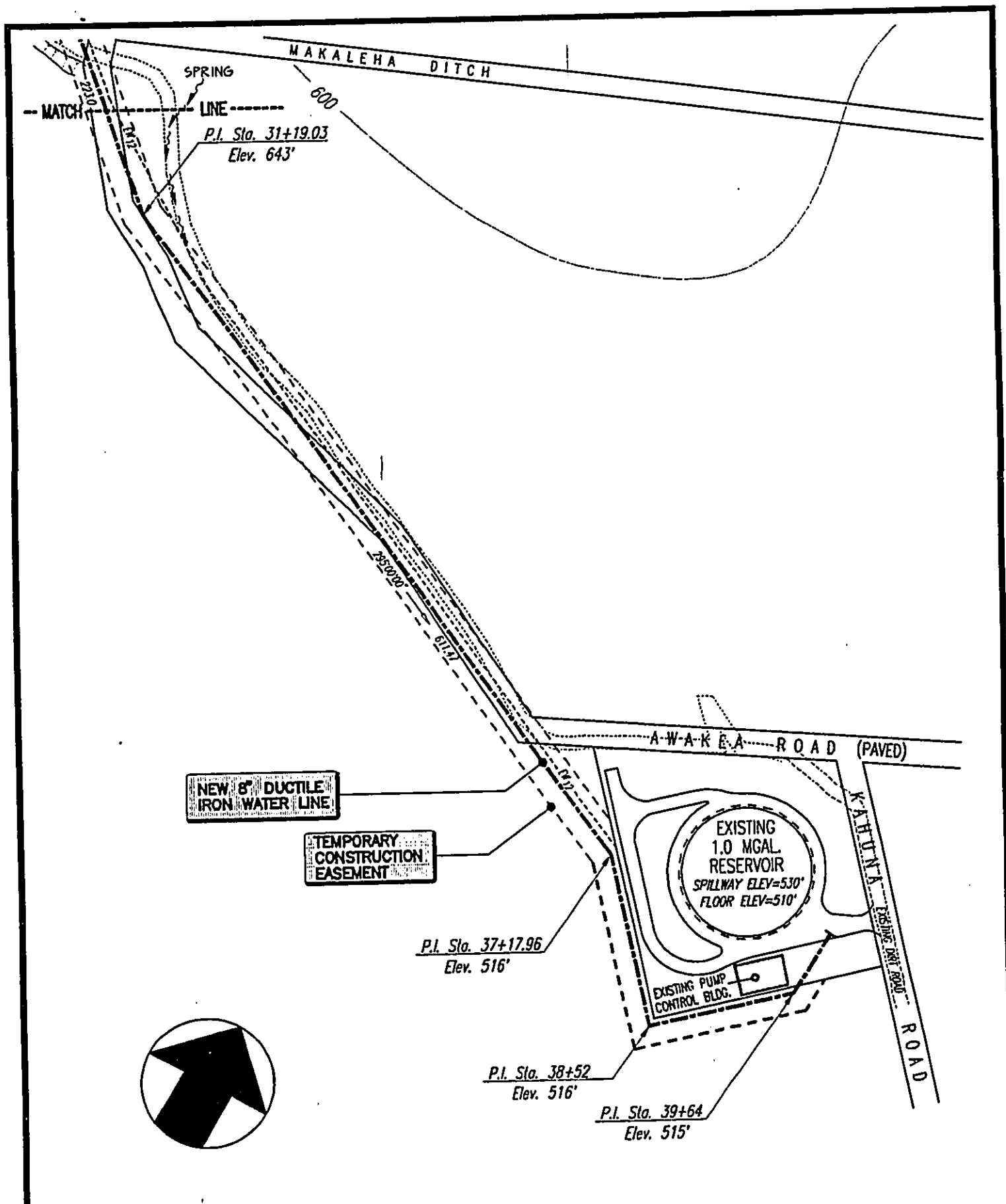
PROJECT ALTERNATIVE E

SCALE: 1" = 100'

April 22, 1992

FIGURE
2-2E



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PROJECT ALTERNATIVE E

SCALE: 1" = 100'

April 22, 1992

FIGURE
2-2F

for water fixtures within the home and some most commercial facilities suggest that water consumption could achieve a water savings up to 50 percent (Table 2-1a); and/or,

* The incorporation of local amendments to the National Plumbing Code and other Kauai County building codes that would require the use of low-flow fixtures for building renovations and new construction.

The installation of available water-saving fixtures in existing households and businesses could reduce up to half of the potable water used by residential and commercial customers. Potential water savings in residential water consumption are demonstrated in Table 2-1a. Similar fixtures could be used in most commercial retail and service facilities.

While water-saving fixtures could generate up to a 50 percent savings in water consumption for a given residence or commercial establishment, the potential level of water savings in the overall Wailua-Kapaa area is dependent upon the level of potential community participation. For example, a 100 percent participation by all residential consumers and commercial businesses would probably generate a 50 percent reduction in present average by consumption (Table 2-1a), or about 1.2 million gallons per day. It is believed, however, that one or more of these conservation efforts would likely produce somewhat less participation and that total water savings would probably range between 20 and 40 percent, or a savings of 240,000 to 480,000 gallons per day.

The establishment of an intensive consumer education program would require the assignment of, at least, one person full-time to implement the education program. In addition, various educational material would need to be prepared and published for public circulation and/or community meetings.

2.9 COMPARISON OF PROJECT ALTERNATIVES

2.9.1 Conservation of Aquatic Habitat and Surface Water Quality

One of State water resource management objectives is to conserve the quality of local streams for existing and potential aquatic life. Streams located in the upper reaches of Kauai's inland watersheds generally contain little diversity, but primarily contain species endemic to the Island. For example, the primary native fish specie, found in the higher inland stream environments, are gobiids (Timbol, 1990).

In generally, native fish, crustaceans and mollusks can be influenced by significant variations in water temperature, available oxygen, and general water quality. Such variations may occur as a result of factors generating changes such as reduced stream discharges, the reduction or elimination of riparian vegetation, the introduction of greater sedimentation, or other conditions that might impede upstream and downstream migration of diadromous species.

Alternatives A and F would have no direct impact upon local streams, e.g. Makaleha Stream, in the upper Kapaa Homestead area. Similarly, Alternative B is not expected to generate any effects upon local stream since high-level, dike-confined ground water is expected to contain little, if any, native aquatic life.

TABLE 2-1a
HOUSEHOLD WATER CONSUMPTION AND WATER CONSERVATION OPPORTUNITIES
(GALLONS PER DAY)

Household Use	Frequency	# of Uses Per Day	Water Volume Use	Total Hsehol d Water Use	Water Use w/ Conser-vation	Water Conservation
Lavatory faucets	4 persons 6 x day	24	2	48	32	faucet aerators
Shower	4 persons 1 x day	4	25	100	50	1.5 gpm showerheads
Kitchen food prep/ maintenance/disposal	2 persons 1 x day	4	2	8	5	aerators/ discontinue use of garbage disposals
Dishwashing	1 person 1 x day	1	15	15	10	faucet aerators
Toilet	4 persons 5 x day	20	5	100	30	1.5 gallon toilet
Laundry	1 person 1 x day	1	40	40	32	washers w/suds savers; adjust size of washload
Utility sink/ Miscellaneou uses	1 person 2 x day	2	5	10	7	faucet aerator
TOTALS				320	166	

Notes:
[1] Assumes an average household size of 4 persons.
[2] Miscellaneous uses might include cleaning of selected materials or guest toilet/lavatory use.

Sources: Sierra Club Books, 1975; Metcalf and Eddy, 1979; James Pedersen, Planning Consultant, 1991.

The enlargement of existing tunnels (Alternative C) represents the option having the greatest potential to generate impacts upon Makaleha and Kapaa streams. Such construction could cause increased sedimentation in Makaleha and Kapaa Streams due to the potential collapse of a portion of the existing tunnels during, or following, the enlargement of the tunnels. Pipe installations along the steep slopes of the Makaleha and Kapaa watersheds also could generate considerable sedimentation during construction without the use of practical mitigation measures.

If a suitable site could be located, development of a surface impoundment (Alternative D) would not be expected to disturb native aquatic life unless construction of the impoundment would alter local groundwater or surface flows to a nearby stream, e.g. Kapaa Stream, in the project area. However, the related diversion of 1.0 mgd of flow from Makaleha Stream would, similar to Alternative E, somewhat reduce the surface discharge of the Stream. The dewatering of some stream areas would threaten the survival of some native aquatic fauna.

Alternative E would somewhat reduce the surface discharge of the Makaleha Stream. Intermittent stream measurements conducted during the past nine years indicate that Makaleha Spring contributes roughly 8 percent of the total stream discharge. Dewatering of the would threaten the survival of some native aquatic fauna. The existing stream gradient (29 percent) would help maintain adequate oxygen levels in the Stream. Limited clearing of streamside vegetation, and a 7.5 to 15 percent loss in surface discharge, may result in a slight elevation of stream temperature. Considerable sedimentation of Makaleha Stream could occur during construction without the use of practical guidelines for the construction of the proposed intake and the installation of pipe along the north side of the stream.

2.9.2 Contribution to Potable Water Demands and Related Development Costs

The no project option would not provide any additional water supply to the Kapaa-Wailua service area. As a result, this option would not incur any public funds within the short term. Ultimately, local demands for future land use development would likely encourage the potential development of additional sources of water supply during the next decade. If this occurs, the extended delay, or future recommitment to water source development in the Makaleha area, would significantly increase the cost of such development as land values continue to increase.

The development of a well at Akulikuli Ridge is not expected to generate a significant yield as studies conducted by Island Resources ***"....revealed that [a] high-level dike confined water at or near the land surface does not exist"*** (Island Resources, Ltd., 1981). Project alternatives C through E would each provide an additional supply ranging between 500 to 700 gallons per minute to the Kapaa-Wailua water system. Development costs for these alternatives would range from roughly $1.5 million for Alternatives B and E, $2.0 million for Alternative C, and roughly $3.0 million for development of a surface impoundment (Alternative D).

Alternative F, which would encourage reduced system and household water consumption in the Wailua-Kapaa system, could provide additional water supply to the Wailua-Kapaa water system. As stated earlier, leak detection monitoring of existing transmission and distribution lines, as well as the use of readily-available water-saving fixtures, might generate water savings of up to 40 percent of average day demands with 100 percent consumer participation. However, it is believed

that participation and actual water savings would more realistically range from 10 to 20 percent. It is estimated that the cost of labor and other direct costs associated with education material production and distribution would be approximately $100,000 per year. Initial leak detection monitoring costs would probably cost in the range of $100,000. Given the cost and volume of anticipated water savings, this option is not believed to be a cost-effective approach for addressing water development in the Wailua-Kapaa system that is already is a deficit water capacity condition. However, water conservation is clearly a desirable program that could help reduce future water demands in Wailua-Kapaa and the extent of future potable well production.

2.9.3 Statistical Comparison Results

The statistical rating and comparison of project alternatives (Tables 2-2 and 2-3), described in section 2.2, suggest the following preference in order of desirability:

Alternative E -	TAP NATURAL SPRINGS IN THE MAKALEHA MOUNTAINS
Alternative F -	WATER CONSERVATION IN THE WAILUA-KAPAA AREA
Alternative C -	ENLARGE EXISTING TUNNELS
Alternative D -	IMPOUNDMENT OF A SURFACE WATER SUPPLY
Alternative B -	DRILL A NEW WELL AT AKULIKULI RIDGE
Alternative A -	THE NO PROJECT OPTION

Alternative E was rated the most desirable alternative because of its more cost effective development approach. This option also will also generate a lower operational and maintenance cost since no pumping operations will be required to withdraw or transport captured flows. Since no pumping operations will be required, Alternative E will also help conserve non-renewable resources, e.g. oil and gas, that otherwise would be required to provide additional electrical power production. The County of Kauai, Department of Water, indicates that the gravity supply delivery system ensures energy conservation by eliminating electrical power costs which have totaled $40,000 to $50,000 (estimated $60,000 with escalation) per year for comparable water systems in Kauai (Sato, 1992). While this alternative may threaten the survival of some native aquatic fauna, e.g., L. concolor, and somewhat degrades the wildlife resources of Makaleha Stream, the proposed project is not expected to generate any significant degradation to the surface water quality, aquatic habitat, or wildlife habitat in the project area.

Alternative F was rated second in desirability because of this option would somewhat increase the potable water supply of the Wailua-Kapaa area without disturbing the water quality and aquatic habitat of the Upper Makaleha Stream environment. At the same time, the cost effectiveness of this option is limited since the potential water savings via water conservation would be limited to roughly 0.240 mgd to 0.480 mgd for a cost of roughly $100,000 for public education while system conservation efforts might require 0.5 million to conduct required leak detection monitoring.

Alternative C was rated third in desirability because of its cost-effective approach for increasing the supply of potable to the Wailua-Kapaa system. In addition, it does not adversely affect the supply of irrigation water to Lihue Plantation Company. However, this option is rated somewhat less than Alternatives E and F because of the potential for considerably greater adverse impacts upon the water quality and aquatic habitat of Makaleha and Kapaa Streams.

TABLE 2-2

COMPARATIVE RAW SCORING OF PROJECT ALTERNATIVES MAKALEHA SPRINGS WATER RESOURCE DEVELOPMENT

Evaluation Criteria	Weighted Value (0.1 to 1.0)	Alternatives A	B	C	D	E	F
1. Conserves surface water quality of Makaleha and Kapaa Streams	0.9	5	4	2	5	5	5
2. Conserves aquatic habitats of Makaleha and Kapaa Streams	0.9	5	4	2	4	4	5
3. Increases potable water supply to the Kapaa-Wailua service area.	1.0	0	6	8	8	8	6
4. Conserves wildlife habitat in the Makaleha and Kapaa watersheds.	0.7	5	4	4	2	4	5
5. Maintains the surface water supply for Lihue Plantation Co. and DHHL	0.8	5	3	3	5	4	6
6. Makes cost-effective use of State funds for County water source development.	0.7	5	7	6	4	8	4
7. Makes cost-effective use of County funds for water system operations and maintenance.	0.7	5	4	8	4	8	5
8. Conserves non-renewable energy resources used for electrical power generation.	0.8	5	4	8	4	8	8

Note: Section 2.2 of the report summarizes the significance of weighted values and scoring ranges used in this matrix evaluation.

TABLE 2-3

COMPARISON OF FIVE PROJECT ALTERNATIVES
MAKALEHA SPRINGS WATER RESOURCE DEVELOPMENT
TOTAL WEIGHTED ALTERNATIVE SCORES

Evaluation Criteria	Weighted Value (0.1 to 1.0)	Alternatives A	B	C	D	E	F
1. Conserves surface water quality of Makaleha and Kapaa Streams.	0.9	4.5	3.6	1.8	4.5	4.5	4.5
2. Conserves aquatic habitats of Makaleha and Kapaa Streams.	0.9	4.5	3.6	1.8	3.6	3.6	4.5
3. Increases potable water supply to the Kapaa-Wailua service area.	1.0	0.0	6.0	8.0	8.0	6.0	6.0
4. Conserves wildlife habitat in the Makaleha and Kapaa watersheds.	0.7	3.5	2.8	2.8	1.4	2.8	3.5
5. Maintains the surface water supply for Lihue Plantation Co. and DHHL	0.8	4.0	2.4	2.4	4.0	3.2	4.8
6. Makes cost-effective use of State funds for County water source development.	0.7	3.5	4.9	4.2	2.8	4.9	2.8
7. Makes cost-effective use of County funds for water system operation and maintenance.	0.7	3.5	2.8	5.6	2.8	5.6	3.5
8. Conserves non-renewable energy resources used for electrical power generation.	0.8	4.0	3.2	6.4	3.2	6.4	6.4
TOTAL SCORES		**27.5**	**29.3**	**33.0**	**30.3**	**37.0**	**36.0**

Note: Total weighted score for each criteria was calculated by multiplying the comparative raw scores summarized in Table 2-1 by the weighted value for each criteria.

Alternative D was rated fourth in desirability because of its potential impact upon native aquatic fauna in Makaleha Stream. While no specific site has been under consideration for a surface impoundment, the development of, at least, a one-acre impoundment would also likely impose a significant adverse impact upon local wildlife resources with the clearing of existing vegetation.

The rating of Alternative B was comparable in overall desirability to Alternative A. While this development option represents a cost-effective approach for water source development, Alternative B would generate considerably greater energy costs to operate the well.

The "no project" option was considered to be the least desirable project alternative primarily because it does not address the increasing demand for potable water in the Kapaa-Wailua service area. Long term costs for the development of an additional water supply will be considerably higher as property values and development costs continue to rise. The only project benefit afforded by this development option is the maintenance of a continued supply to Lihue Plantation Company. Aquatic and wildlife resources would not be impacted.

2.10 PROJECT DESCRIPTION OF SELECTED PROJECT ALTERNATIVE E

2.10.1 Project Objectives

The primary objective of the proposed water source development project is to expose the source of the Upper Makaleha Springs, capture the water in an underground basin, and transport the water supply to the 1.0 mgd County water storage tank at the mauka end of Kahuna Road. A secondary objective of the project is to ensure that the existing water rights of Lihue Plantation Company in the drainage basins of North Wailua and Kapaa are not adversely affected. A third important objective is to minimize the disruption and impacts to the water quality and aquatic habitat of Makaleha Stream.

2.10.2 Phase One

An underground cut-off trench (Figure 2-3) will initially be constructed at the Upper Makaleha Spring Catchment site. The trench will be long and narrow, and nestled against the base of Makaleha Valley's north wall. The size and configuration of the trench basin is somewhat dependent upon what is discovered upon exposure of the spring source. As presently designed, the intake structure will be roughly 5 feet wide, 3 feet deep, and 150 feet long.

The cut-off trench basin will be cut into the existing rock formations and constructed with a concrete rubble masonry with a reinforced concrete slab. A manhole-type structure will provide access to the cut-off trench.

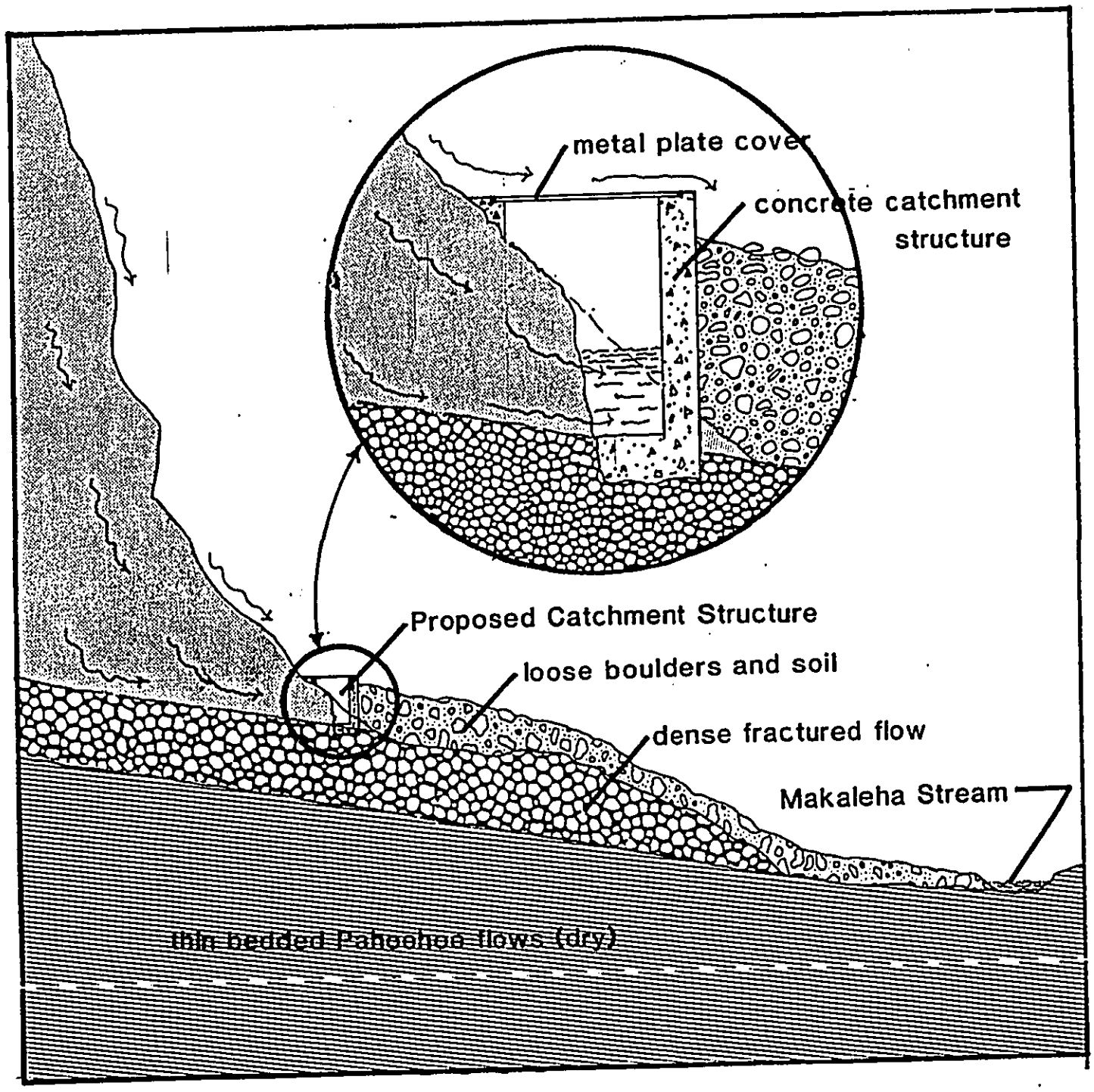


FIGURE 2-3

PROPOSED UPPER MAKALEHA SPRINGS INTAKE STRUCTURE

Construction of the inlet will be accomplished via manual labor and some mechanized heavy equipment, e.g., backhoe, that will be mobilized to the project site to help facilitate the relocation of rock material adjacent to Makaleha Stream. Suitable rocks, excavated during the construction of the trench, will be used for the concrete masonry work to eliminate the cost and impact of mobilizing fill material to the project site. In order to reduce the impact of construction equipment and activities upon the water quality of Makaleha Stream, the selected contractor will be required to accomplish all work within a defined construction easement along the north side of Makaleha Stream (Figures 2-2A through 2-2F).

Construction of the intake structure will be scheduled during lower flow conditions, i.e., May through September, to improve work efficiency and minimize potential sedimentation to Makaleha Stream. Following construction of the intake, laborers will revegetate all exposed areas with indigenous plants.

Prior to beginning Phase Two work, a hydrogeologist will be assigned to monitor spring flows to the intake structure. Such testing will be done to verify the anticipated capture capacity of, at least, 500 gpm.

Phase One work is expected to be completed over a 4 to 9 month period. Construction work will be accomplished by a daily labor force ranging between 5 to 10 tradesmen and laborers.

Upon completion of Phase One work, the County of Kauai will also ensure that its diversion of surface water to its Wailua-Kapaa system will not interfere with irrigation uses of Lihue Plantation Company. To accomplish this objective, the Kauai County Department of Water will not divert water to the Wailua-Kapaa system if Makaleha Stream discharges are insufficient to meet irrigation water requirements of the Plantation and the Department of Hawaiian Home Lands.

2.10.3 Phase Two

A valve will be installed at the outlet end of the intake device to control the amount of water entering a proposed pipeline. While the Kauai County Department of Water will operate this valve, it will coordinate its use of water with the Kauai district office of the State Division of Aquatic Resources. The Division of Aquatic Resources will carry out periodic monitoring of native aquatic fauna between the Spring and the Makaleha Stream/Kapaa Stream confluence in order to provide continued information concerning the potential impact of stream dewatering, as well as specific and timely recommendations concerning the extent of future water capture from Upper Makaleha Spring.

An 8-inch ductile iron pipeline will be built to transport water, about 4,000 feet along the north side of Makaleha valley, to the County 1.0 mgd water storage tank.

In order to reduce the visual impact of the waterline, the pipe will be installed underground in areas where practical. The rugged terrain of the valley will require that roughly half or more of the waterline will be mounted above-ground on concrete pedestals not more than three-feet above ground elevation (Figure 2-4). For example, the lowest 1,500 feet of pipeline will generally parallel the existing 12-inch diameter iron pipe that presently carries water from the existing Makaleha Tunnel to the County water storage tank (Figure 2-2A through 2-2F).

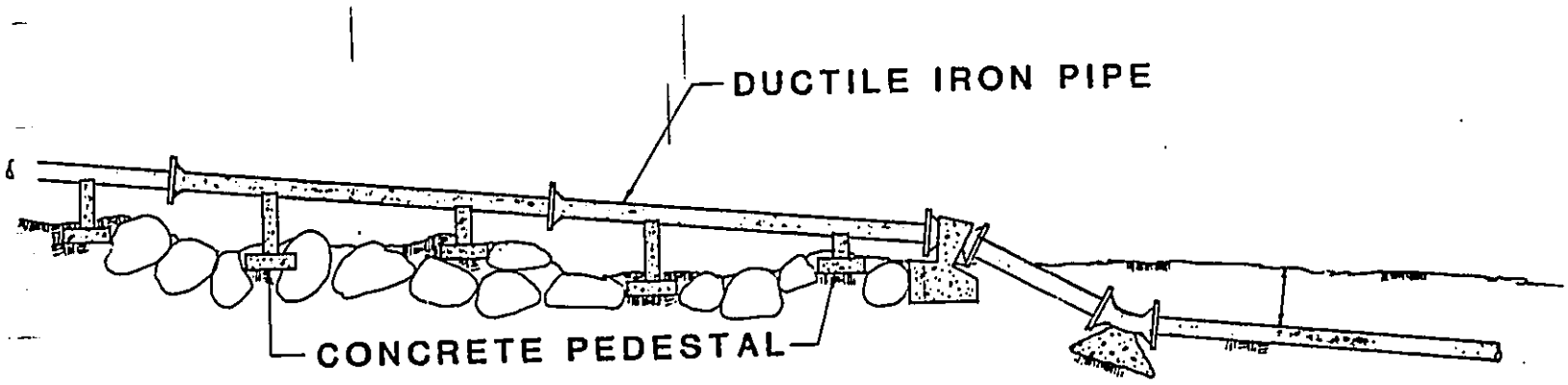
Phase Two construction of the pipeline will again be accomplished by manual labor and the related use of some smaller equipment. Suitable rock material will be used by laborers in conjunction with the construction of the concrete pedestals.

Labor crews will also establish temporary diversion swales, and make use of selected fabric material, e.g. Mirafi, to reduce the amount of potential silt-laden runoff entering Makaleha Stream. As construction of the pipeline progresses, exposed areas will be revegetated with indigenous plant species.

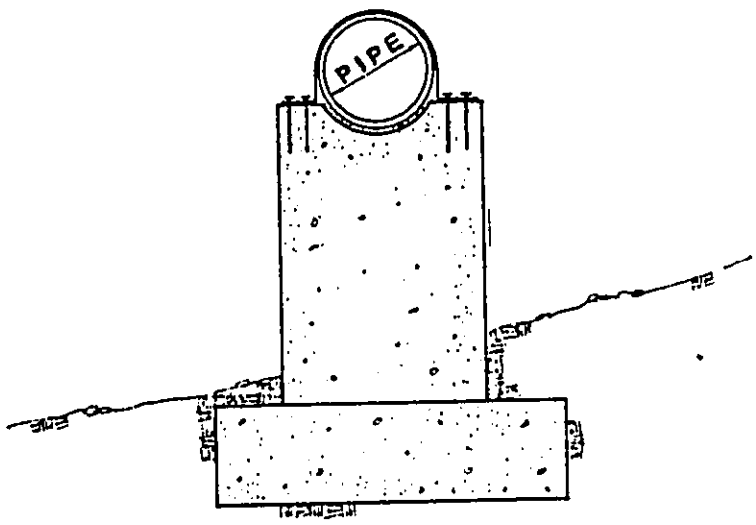
A daily labor force, consisting of 10 to 20 tradesman and laborers, will carry out the pipeline installation over a 9-month construction period.

2.10.4 Cost of Construction

The cost of constructing the entire Upper Makaleha Springs Water Resource Development Project is estimated to be $950,000.00. The planning and design of the project is being performed by the State Division of Water Resource Management. The construction of the project will be financed via a combination of State and Kauai County funds.



TYPICAL PIPE SECTION
INSTALLED ABOVE GROUND



TYPICAL CONCRETE PEDESTAL
WITH STEEL STRAPS

FIGURE 2-4

ABOVE-GROUND PIPELINE INSTALLATION
TYPICAL CONCRETE PEDESTAL FOUNDATION

CHAPTER THREE

ENVIRONMENTAL SETTING

CHAPTER THREE
ENVIRONMENTAL SETTING

3.1 PHYSICAL ENVIRONMENT

3.1.1 Project Location

The project site is situated on a 2,335-acre parcel of land owned by the State of Hawaii (TMK: 4-6-01:1). This parcel encompasses the southeast quadrant of the Makaleha Mountains and the watershed of Makaleha Stream downslope to the Lihue Plantation Company diversion dam (Figure 2-2A).

3.1.2 Geology and Soils

Generalized geological maps for the project area, as well as general onsite observations, indicate that the upper slopes of Makaleha valley are characterized by highly weathered lavas of the Waimea volcanic series known as the Napili Formation (MacDonald and Abbott, 1970).

The base, and possibly the lower slopes, of the valley are believed to be dominated by rock from the Koloa series. Rock from the Koloa series is younger than the rock of the weathered lavas of the Waimea volcanic series. The structure of the rock is considerably more complex because of its variable composition of basalts, cinder ash bed layers that are frequently interspersed with permeable and fractured gravel materials.

Soils such as Kolokolo extremely stony clay loam and Kapaa silty clay overlay the rock of the Koloa series (U.S. Soil Conservation Service, 1972).

3.1.3 Climate

The climate of east Kauai is generally warm throughout the year with ambient temperatures ranging from 70 to almost 80 degrees Fahrenheit.

While temperatures are generally consistent throughout the year, rainfall (Table 3-1) and surface wind characteristics in the Kapaa-Wailua area suggest a 5-month "summer" season and a 7-month "winter" season. The summer season, from May through September, is a higher sun period that is characterized by both warmer temperatures and more steady tradewind conditions. In contrast, the winter season typically includes somewhat cooler temperatures, greater storm-generated rainfall, and less frequent tradewinds (Giambelluca, Nullet, and Schroeder, 1986).

The headwaters of Makaleha Stream area situated at elevations considerably higher where existing rainfall records are available. General rainfall distribution information for the Island of Kauai indicates that the project area receives between 150-200 inches of rainfall per year (Figure 3-1). With the exception of the amount of rainfall, it is believed that seasonal precipitation patterns, at lower elevations, are consistent with rainfall occurrence at higher elevations.

TABLE 3-1

SEASONAL MEDIAN RAINFALL CHARACTERISTICS
KAPAA-WAILUA SERVICE AREA
(MILLIMETERS)

January	150
February	100
March	100
April	100
May	75
June	50
July	75
August	50
September	50
October	100
November	150
December	150

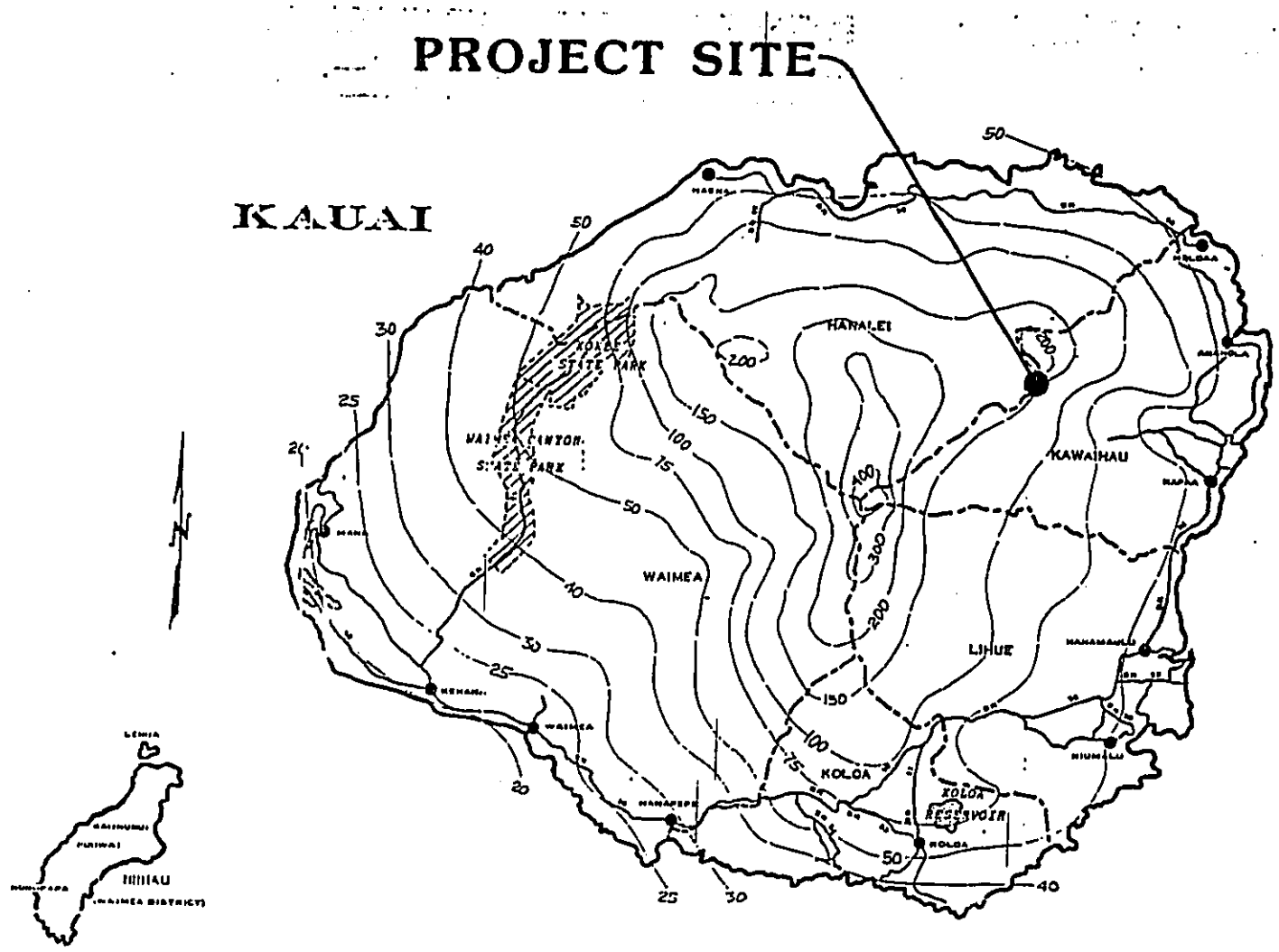


FIGURE 3-1

ANNUAL RAINFALL DISTRIBUTION
ISLAND OF KAUAI

3.1.4 Topography

Makaleha Valley is a steep-sloped drainage area about 2.4 miles long. The headwaters of the valley begin at about 1,800 feet above mean sea level (MSL). Downstream of the headwaters, the Upper Makaleha Springs area is situated at about 800 feet above mean sea level (Figure 2-2A). Elevations within the valley's descend at an average slope of 14 percent between the valley headwaters and the confluence of Makaleha and Kapaa Streams. The County's 1.0 mgd storage tank, situated near the confluence of Makaleha and Kapaa Streams, is located at about the 440-foot elevation.

In the vicinity of Makaleha Springs, Makaleha Stream is relatively narrow water body during medium flow conditions with its width ranging from 5 to 10 feet; the width of the Stream generally increases downstream with the maximum width being 25 to 30 feet under medium flow conditions. Field observations, under variable flow conditions, indicate that the width, depth and velocity of the Stream doubles during high flow conditions.

The Valley floor is very rocky with large boulders, some in excess of ten feet in diameter. Larger fractured basalt boulders are especially evident in the stream bed area immediately downstream of Makaleha Springs.

3.1.5 Hydrology

3.1.5.1 General Hydrological Characteristics

Percolating rainfall is perched by dense lava characterizing the steep slopes of Makaleha Valley (Figure 3-2). The Upper Makaleha Springs emerge where steeper sloping rock boulders begin to thin out. Upon discharge, the water flows along defined channels which empty into Makaleha Stream (Figure 3-3) at about the 800-foot elevation. As Makaleha Stream progresses downstream, small waterfalls, natural drainage channels, and seepages within the overall drainage basin provide additional surface flow to the Stream.

3.1.5.2 Estimated Stream Discharges from Makaleha Spring and Upper Makaleha Stream

Various observations and estimates of the Makaleha Spring discharge have been made since 1981 (Table 3-2). The more recent field observations, made by Amadeo Timbol, Ph.D., in March, 1990, indicate that water emerging from Makaleha Springs contributes approximately 700 gallons per minute to the surface discharge of Makaleha Stream.

The volume of stream discharge from Upper Makaleha Stream is, at first glance, somewhat uncertain because an existing U.S. Geological Survey gaging station (Makaleha Ditch near Kealia) along the Stream records only the amount of flow being diverted to Makaleha Ditch. The Ditch is situated at a point approximately 400 feet downstream Makaleha Tunnel No. 6 (Figure 2-1). However, discussions with Mr. Irwen Contrades, Irrigation Supervisor for Lihue Plantation Company, in late 1991 indicate that diverted flows to Makaleha Ditch represent virtually all of the total streamflow from Upper Makaleha Stream.

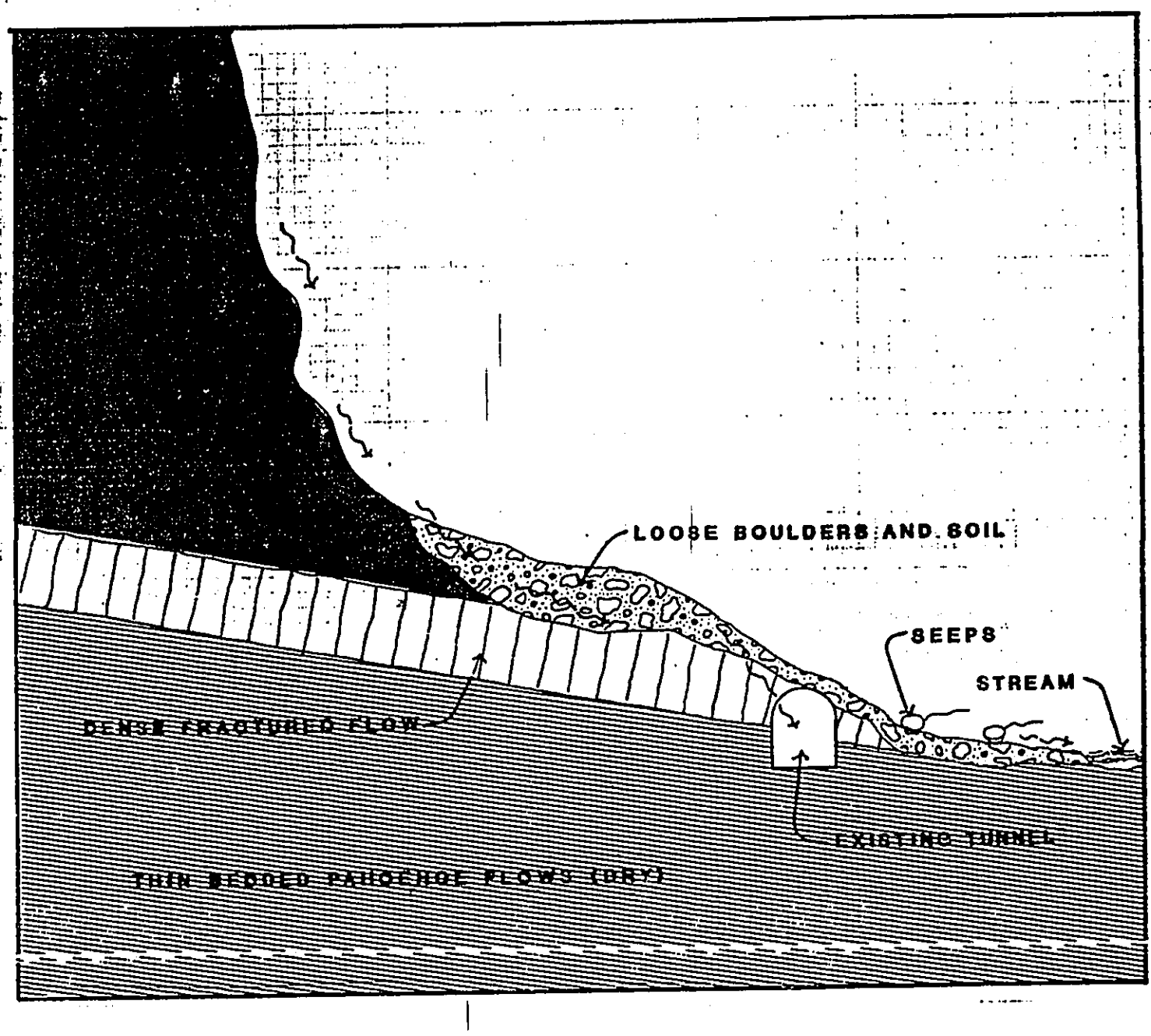


FIGURE 3-2

TYPICAL PERCHED GROUNDWATER OCCURRENCE AT MOELEPE TUNNEL, MAKALEHA TUNNEL, AND UPPER MAKALEHA SPRINGS (not to scale)

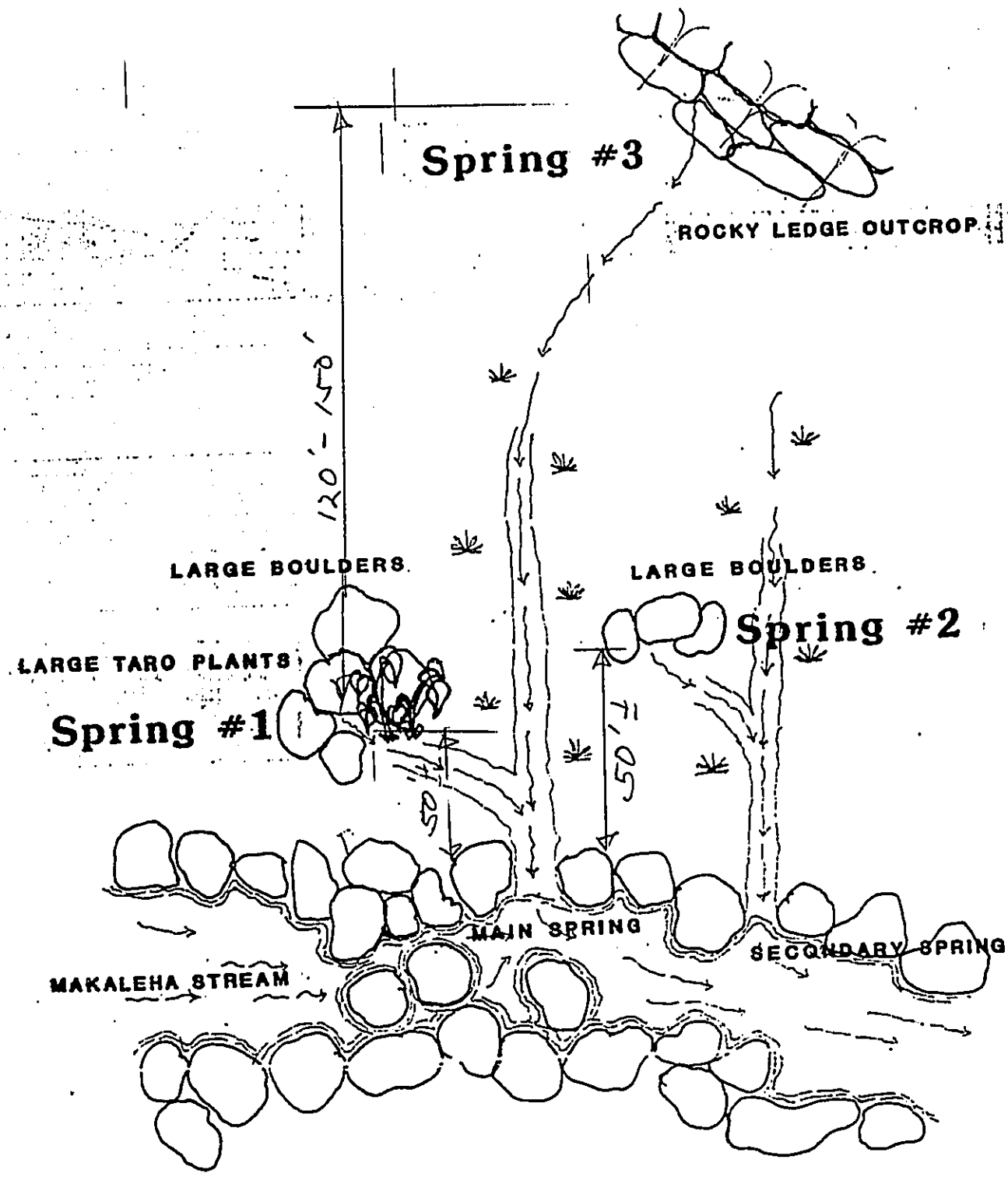


FIGURE 3-3

SKETCH OF UPPER MAKALEHA SPRINGS
(not to scale)

TABLE 3-2

SUMMARY OF SPRING DISCHARGE OBSERVATIONS
MAKALEHA SPRINGS
1981 - 1990

Observation Period	Estimated Spring Discharge (gpm)	Method of Measurement	Observer(s)
June 25-26, 1981	500	visual	Bowles
May 18, 1984	1,500	rough cross section critical depth method	Fujikawa
July 13, 1984	430	3-inch Parshall Flume	Kojiri
December 6, 1986	1,070	Pygmy Propeller & Parshall Flume	Mills
March 29-30, 1990	709	Reid equation & Swoffer flow meter	Timbol

Sources: Bowles, 1981; Portugal & Associates, 1987; and Timbol, 1990.

Lihue Plantation Company diverted flows from Upper Makaleha Stream to Makaleha Ditch since, at least, December, 1936 for the purpose of irrigating some 1,800 acres of sugar cane fields in nearby Kealia. Mr. Irven Contrades, Irrigation Supervisor for Lihue Plantation Company, estimates that the amount of streamflow used for irrigation represented about 50 percent of the total streamflow during the months of October through March. During the drier months of April through September, the Plantation diverted virtually all of the Upper Makaleha Stream flow for irrigation. With the recent closure of sugar cane cultivation in the adjoining Kealia area, Lihue Plantation Company has discontinued its use of Makaleha Spring water in April, 1991. While no longer used for irrigation, the actual diversion of water from Makaleha Stream to Makaleha Ditch continues.

A review of long-term streamflow records (since 1936) from the Makaleha Ditch gaging station indicates the average annual diverted streamflow is approximately 6.8 cubic feet per second (3,052 gallons per minute), or about 4.4 million gallons per day. Streamflow records from the same gaging station for the CY 1978-1988 period indicate an average annual flow of roughly 5.1 mgd with higher streamflows particularly evident during the months of February and March (Table 3-3). Using most recent measurements of 700 gpm from the Upper Makaleha Spring, the Spring is believed to contribute approximately 20 to 23 percent of the Makaleha Springs stream discharge.

3.1.5.3 Existing Water Rights

State General lease S-3827 provides East Kauai Water Company, a subsidiary of Lihue Plantation, with the right to divert 50 million gallons per day from the drainage basins of the North Wailua, Kapaa, Anahola and Hanalei Rivers. The State of Hawaii reserves the right to provide surface water resources to other parties as long as the diversion is not less than 50 mgd during the drier months of June, July and August.

The terms and conditions of its existing lease (GL S-3827), which expires on May 10, 1994, also stipulates that the State of Hawaii has the right to divert 1.0 mgd from the four drainage areas for domestic purposes. However, the State lessee, Lihue Plantation Company, must receive not less than two years advance notice. The State of Hawaii has already advised Lihue Plantation Company, Ltd. of its intention to use a portion of the Makaleha Stream flows as a domestic supply for the Kapaa-Wailua area.

3.2 BIOLOGICAL RESOURCES

3.2.1 Aquatic Resources of Makaleha Stream

3.2.1.1 Introduction

The aquatic resources of Makaleha Stream were surveyed by Amadeo Timbol, Ph.D, aquatic biologist, in August, 1986 and March-April, 1990. Analyses made in conjunction with this fieldwork are summarized in Appendix D.

TABLE 3-3

AVERAGE MONTHLY VOLUME OF DIVERTED STREAMFLOW FROM UPPER MAKALEHA STREAM TO MAKALEHA DITCH FROM CY 1978 THROUGH 1988 (MILLION GALLONS PER DAY)

Month	Avg Volume
January	3.53
February	7.76
March	13.00
April	5.38
May	5.72
June	5.22
July	5.92
August	5.98
September	5.08
October	6.09
November	5.00
December	3.74
Average	5.12

Source: Lihue Plantation Company, 1991.

Following its review of a draft EIS for the project, the State Division of Aquatic Resources re-surveyed the Upper Makaleha Springs area near the end of October, 1992. This survey was performed in the aftermath of Hurricane Iniki. It also followed the discontinuation of sugar cane cultivation in Kealia at the end of 1991; however, the diversion of surface water to Kealia probably continued during the survey.

While performed by different scientists, it is important to recognize that the cumulative survey results represent conditions at different times of the year. The months of June, August and September historically represent the drier months of the year. Moderate rainfall occurs during the months of April, May, and October.

The results of these surveys suggest considerable seasonal variation in the aquatic habitat and resources of Upper Makaleha Stream. Selected data and conclusions from the Timbol surveys and more recent Division of Aquatic Resources study are segregated to highlight the significantly different conclusions that were drawn from the three survey periods.

3.2.1.2 Timbol Survey Results and Related Conclusions

Dr. Timbol's survey and evaluation of Makaleha Stream indicates the presence of three species of fish, 8 insects, one crustacea, one amphibia, and one annelida. The aquatic fauna of Makaleha Stream contains little diversity in composition, but most species are endemic to Hawaiian aquatic environments. Of the fourteen species observed in the Stream, 11 species are endemic to Hawaii.

Two of the more unique fauna found in Makaleha Stream include native fishes known as A. stamineus (o'opu-nakea) and Lentipes concolor (o'opu-alamo'o). Both of these fish, which are eventually restricted to fresh water as adults, are diadromous.

"Adult gobies spawn over a period of months in freshwater, mostly in the lower reaches of streams. Hatchlings are carried out to sea by stream current where they spend a marine existence as plankton. These then metamorphose into post-larvae (hinana) near the mouths of streams, settle on appropriate substrata, and migrate upstream to their places of permanent residences" (Timbol, 1990).

Given this life cycle, the native fish found in Makaleha Stream require a suitable environment throughout the Stream to support their upstream and downstream migrations.

During Dr. Timbol's survey, o'opu-nakea found in Makaleha Stream included various sizes which indicates that the post-larvae (hinana) are capable of upstream migration despite various environmental obstacles. In contrast, the absence of post-larvae, juvenile o'opu-alamo'o suggest that this fish may represent a captive adult population; existing environmental conditions within and/or downstream of Makaleha Stream may inhibit the migration of juvenile o'opu-nakea.

The primary stress upon native fish in Makaleha Stream is the present diversion of Stream discharges to Makaleha Ditch. The downstream migration of native fish to the ocean via Kapaa Stream, is presently hampered by the long-term diversion of Makaleha Stream discharges to Makaleha Ditch by Lihue Plantation Company (LPCO). Sugarcane cultivation in the adjacent Kealia area was discontinued at the end of 1991. However, the diversion continues as LPCO has

a long-term State lease to use this surface water for agricultural irrigation. In the short term, it is expected that LPCO will require some irrigation water; however, short-term demands for irrigation water in Kealia area should be significantly less with the discontinuation of sugarcane production and the start-up of other less water-consuming agricultural activities.

Despite the present dewatering to Makaleha Ditch, Makaleha Stream supports endemic fish upstream and downstream of LPCO's Makaleha Ditch diversion. The existing diversion to Makaleha Ditch may be a contributing cause of the lack of migration by the o'opu-alamo'o. However, it is important to recognize that the upper reaches of Kapaa Stream (situated downstream of Makaleha Stream) are also fed by surface runoff from various other streams and that other nearby stream diversions (Figure 2-1) also reduce the amount of fresh water contribution to Kapaa Stream. In addition, there are numerous other environmental factors that influence the migration and survivability of the native fish species.

3.2.1.3 State Division of Aquatic Resources Survey and Related Conclusions

The State Division of Aquatic Resources (DAR) survey was performed over a 5-hour period by a survey team that comprised three biologists. The survey team used a standardized sampling technique that involved 49 randomized point counts. Clumps of fish and shrimp were observed outside of the defined sampling boundaries.

In contrast to the Timbol surveys, the State DAR observed very different conditions near the end of October 1992. In a memorandum dated April 23, 1993, Mr. Henry Sakuda, Administrator of the State Division of Aquatic Resources, indicated that the following native inland fish species were identified along with native opae.

Hawaiian Name	Scientific Name	Density (no./ft2)
'O'opu nakea	Awaous guamensis	0.08
'O'opu nopili	Sicyopterus stimpsoni	0.01
'O'opu hi'ukole	Lentipes concolor	0.03
Opae kala'ole	Atyoida bisulcata	0.08

"All three 'o'opu species were widely distributed and common in Makaleha Stream....Only one exotic fish species, Poecilia reticulata, was found in the stream" (Sakuda, 1993). With the abundant presence of the 'o'opu, the State Division of Aquatic Resources concluded that downstream Kapa'a Stream flows are sufficiently continuous to permit the obligatory life cycle migrations to the sea.

The State Division of Aquatic Resources also indicated that Upper Makaleha Stream has outstanding biological resource value. DAR concluded from its field investigations that the Stream is not degraded; further, the Stream is important because the downstream portions of Kapa'a Stream have already been impacted by agricultural and urban development.

3.2.1.4 Aquatic Insect Biota

"Bishop Museum scientists have described the aquatic and surrounding native insect biota as among the most diverse in Hawaii. Up to 5 species of the endemic, biologically important damselfly (Megalagrion) inhabit the area. One and possibly two species of native lymnaid snails previously unknown to science have recently been found in Makaleha and have as yet not been described and named" (Sakuda, 1993).

Makaleha Springs and Stream is also a prime candidate for the existence of hyporheic ecosystems in Hawaii (Sakuda, 1993). These ecosystems represent distinct communities of aquatic organisms that live within the flooded spaces beneath rivers. Little scientific research has been devoted to the study of hyporheic habitats in Hawaii, but there is strong evidence that native hyporheic species exist (Howarth, 1993).

3.2.2 Vegetation

A botanical survey was made along Kapaa Road from the County water storage tank to the confluence of Makaleha and Kapaa Streams, as well as along the stream banks of Makaleha to the Makaleha Springs site. This survey was conducted in December, 1986 by George Linney and Winona Char of Char & Associates. Appendix E presents a summary of field results and an assessment of the proposed project upon the floral resources of the project area.

The field survey reported a total of 123 plant species which included 26 ferns and 97 flowering plants. These plants were located in three general types of habitats: open field, stream banks, and closed forest.

Most of the species identified are exotic. None of the plants reported included species that have been identified or proposed by federal or State agencies for "rare", "threatened" or "endangered" status.

3.2.3 Wildlife Resources

The wildlife resources of Makaleha valley were observed during a one-day survey of Makaleha Valley on December 23, 1986 by Phil Bruner, wildlife biology consultant. This survey was supplemented by a second bird survey in March-April, 1990 that was performed by Michael Kido, environmental consultant. The second survey consisted of 12 different observation periods that focused solely upon the sighting and evaluation of Koloa, the Hawaiian duck, and its potential habitat. Analyses made in conjunction with both surveys are presented in Appendix F..

Wildlife in Makaleha Valley consists of, at least, feral pigs and dogs, as well as various species of exotic and native birds. Resident birds included the White-tailed Tropicbird, 'Amakihi, and the Hawaiian Duck. A total of six exotic birds were also observed; the Japanese White-eye was the most common bird sighted during related field surveys.

Analyses made by Michael Kido conclude that the Koloa is probably not a permanent resident of Makaleha Valley even though potential habitat is present in the upper portions of the valley. The dense growth of hau has formed a low, closed canopy of vegetation which is believed to be unattractive to the lower-flying Koloa. In addition, increased human disturbance by hikers and hunters also presents another factor that reduces the suitability of Makaleha Stream for the Koloa (Kido, 1990).

3.3 CULTURAL RESOURCES

3.3.1 Archaeological Resources

An archaeological reconnaissance was made of the Makaleha Stream area by Hallett Hammatt, Ph.D., of Cultural Surveys Hawaii on October 1, 1986. The results of this reconnaissance are summarized in Appendix G.

Selected valley slope areas were examined during the survey to locate potential terracing areas and other archaeological features. However, no features were discovered. The Cultural Surveys Hawaii archaeologist concluded that the valley slopes are too steep and narrow to practically support the development of agricultural terracing. Further, any other past features have clearly been destroyed during past higher flow stream conditions.

3.3.2 Population and General Land Development Trends

3.3.2.1 Island of Kauai

During the past two decades, the Island of Kauai has emerged from a sugar cane plantation community of roughly 29,800 residents in 1970 to a community of approximately 51,000 persons in April, 1990 (U.S. Census, 1990) that is principally based upon the visitor industry. The shift in emphasis from sugar production to the visitor industry was marked by the gradual increase in visitor arrivals that grew from roughly 410,000 visitors in 1970 to 1,177,000 visitors in 1989 (State Department of Business and Economic Development, 1982 and 1989). This increase in visitor arrivals represents an average annual growth rate of 10 percent since 1970.

The growth of the visitor industry during the past decades has fueled additional private investments and the related construction of hotels, resort condominiums, commercial retail centers, as well as residential apartments and single family residential subdivisions. By the year 2000, it is estimated that an additional 2,634 hotel, condominium, and apartment units (available as visitor accommodations) will be constructed on Kauai to supplement an existing inventory of 7,563 hotel, condominium, apartment-hotel, and cottage units (Kauai County Office of Economic Development, 1989). Roughly one-third of this development is expected to occur in the Wailua-Kapaa area.

The continued growth of the visitor industry and related secondary services in the local Kauai economy is expected to sustain continued growth in resident and visitor populations. The State Department of Business and Economic Development estimates that Kauai's future resident population will increase to roughly 61,100 persons in 1995 and approximately 68,200 persons by the year 2000. Westbound visitor arrivals during the same period are expected to increase to almost 1,473,000 in 1995 and to approximately 1,657,000 in 1998 (Kauai County Office of Economic Development, 1989).

3.3.2.2 Kapaa-Wailua Area

Kauai's Kapaa-Wailua area has generally paralleled the growth of the rest of the island during the past 20 years. More recent U.S. Census estimates for the Wailua, Wailua Homesteads and Kapaa areas indicate a resident population of roughly 13,627 persons in 1990.

The Kapaa-Wailua area is part of the larger Kawaihau district which includes the residential communities of Wailua, Waipouli, Kapaa, and Anahola. Since 1980, the Kawaihau district has grown at the rate of roughly 3.8 percent per year, or almost double the average population growth rate of most American communities. In 1970, the resident population of Kawaihau district included 5,173 persons. By 1980, the district population increased to 5,846 residents.

Approximately 2,800 hotel, condominium, and apartment-hotel units are situated in the Kapaa-Wailua area. By the year 2000, the existing number of hotel, condominium, and apartment-hotel units in this area is expected to be approximately 3,723 units (Kauai County Office of Economic Development, 1989). Consequently, the Kapaa-Wailua area will continue to be Kauai's primary location for visitor accommodations.

3.3.3 Recreation in the Makaleha Springs Area

Recreation occurring with the Makaleha Springs area include some limited fresh-water fishing, pig hunting, and hiking. Public recreational access to the area is reaffirmed by the State of Hawaii in its general lease agreement with Lihue Plantation Company.

3.4 BUILT ENVIRONMENT

3.4.1 Existing Water System Serving the Kapaa-Wailua Area

3.4.1.1 Location and Size

The Kapaa-Wailua Water System is the largest water system on the Island of Kauai. As stated earlier, the average daily demand generated by this service area is already 2.49 mgd.

The Kapaa-Wailua water system service area extends from Kauai Hilton and Beach Villas to Kealia and encompasses Wailua Homesteads, Wailua Houselots, Kapaa Town and Kapaa Homesteads. The service area comprises three major sub-systems: Akulikuli, Moelepe, and Makaleha.

3.4.1.2 Existing Water Sources and General Water Distribution

Akulikuli Tunnel 5, Moelepe Tunnel 7 and Makaleha Tunnel (Figure 2-1) are the existing water sources serving the three respective sub-systems. Water is distributed initially to the higher elevation areas and subsequently distributed to lower elevation customers via a series of storage tanks and pressure-reducing facilities.

Water obtained from the Moelepe Tunnel is presently diverted to the Wailua Homesteads area and booster pumped to the Puu Pilo storage tank. The Makaleha and Akulikuli tunnels supply the Kapaa Homesteads and Kapaa Town. The Wailua Houselots and Wailua Town areas are served by basal ground water obtained from deep well pumps located on the eastern slopes of the Nonou Mountain Range.

3.4.1.3 Makaleha Sub-System

The water supply from Makaleha tunnel, the source of supply for this sub-system, is stored in the 1.0 mgd County water storage tank at the end of Kahuna Road. A 12-inch cast iron transmission line connects the storage facility to its source. Distribution is made through a combination of 8-inch, 10-inch, and 12-inch mains along Kawaihau Road to service Kauai County's customers in Kapahi, Kawaihau, and the upper portions of Kaapuni Road.

The Makaleha sub-system is inter-connected to the Akulikuli sub-system and can assist in replenishing the supply in the 0.2 million gallon Ornellas storage tank (Figure 2-1) at the Kawaihau-Kaapuni intersection. The Makaleha sub-system is also inter-connected to the Moelepe sub-system through a six-inch cast iron main along Kanepoonui Road. While the latter inter-connection provides the County of Kauai with the capability to transfer water between the Makaleha and Moelepe sub-systems, this interconnection is left closed under normal operating conditions.

Presently, the combined 1.5 mgd capacity of the Makaleha and Akulikuli tunnels represents the Kapaa area's primary source of potable water. Unfortunately, present average day demands have been estimated to be 2.49 mgd. As stated earlier in Chapter Two, average demands exceed the present well source capacity in the context of design and operational criteria used by the County of Kauai, Department of Water. For this reason, the Nonou wells, which are also operating at capacity, are temporarily being used to supplement Kapaa's maximum day demands until additional water sources can be developed. Consequently, the development of additional source(s) of water is a primary concern of the Kauai County Department of Water (Fujikawa, 1990).

3.5 PLANS, POLICIES AND CONTROLS

3.5.1 Kealia Forest Reserve

Makaleha Springs and Stream are situated with the Kealia Forest Reserve. The Reserve was established in 1906 to conserve the watershed of Makaleha Mountains for water supply purposes. Under General Lease S-3827, East Kauai Water Company (Lihue Plantation Company) continues the long-standing practice of diverting surface runoff from the Makaleha Mountains to irrigate sugarcane fields in the nearby Kealia area. The lease reserves the right for the State of Hawaii

to withdraw up to 1.0 mgd of water from the lease area for domestic water supply purposes. Consequently, the proposal to develop additional domestic water supply is consistent with the purpose of the Kealia Forest Reserve.

A related objective of the Reserve is to conserve the natural environment of the mountains for recreational fishing and hunting, as well as wildlife enhancement.

3.5.2 Hawaii State Plan, Hawaii Revised Statutes, Chapter 226

The Hawaii State Plan was enacted into law in 1978. The Plan provides a guide for the short and long-term development of Hawaii. These guidelines are presented in the context of regional goals, objectives, policies, general strategies and priorities concerning Hawaii's population, economy, environment, infrastructure, and social services (Office of the Governor, Office of State Planning, 1991). In the following paragraphs, the guidelines considered relevant to the Upper Makaleha Springs Water Resource Development Project are identified.

Physical Environment — Land-based, Shoreline, and Marine Resources: Section 226-11

The primary focus of the objectives outlined in Section 226-11 is to bring a balance between land-based or water-based activities and natural resources. The planning phase of project development is emphasized in these objectives. Planning with watershed areas should include consideration of multiple uses, provided that such uses do not adversely affect water quality and groundwater recharge.

Facility Systems — Water: Section 226-16

The objectives and policies in Section 226-16 are directed toward the State's intention to provide adequate water supplies that support domestic, agricultural, commercial, industrial, recreational, and other community needs within the capacity of existing resources. A recommended approach for developing water supply systems and facilities is also addressed. This section outlines policies which include 1) developing adequate water supplies in advance of anticipated needs; 2) supporting water supply services to areas experiencing critical water problems; and 3) coordinating water development efforts with anticipated land use activities.

3.5.3 State Land Use Designations

Makaleha Springs is presently situated with an area designated for "conservation" uses. Conservation uses are administered by the State Department of Land and Natural Resources.

Downstream of the project site, the Office of State Planning has recommended in its five-year land use boundary review that Kapaa Stream be included in the State conservation district. The intent of OSP is to establish a 100-foot conservation corridor on both sides of Kapaa Stream because of its outstanding aquatic resources.

3.5.4 Hawaii Coastal Zone Management Act, Chapter 205A, Hawaii Revised Statutes

Chapter 205A outlines, in part, the State of Hawaii's coastal zone management objectives, policies and guidelines. While the project area has not been designated as a special management area by the Kauai County Planning Commission, the broadly written State law has resulted in a CZM review of all lands in the State except forest reserves and federal land. The project area is situated in the Kealia Forest Reserve.

Despite the question in applicability of this statute to the proposed project, a review of the State CZM objectives policies and guidelines indicates that the only relevant objectives concern scenic and open space resources. The general intention of the State for these resources is the general objective of encouraging non-coastal dependent activities to inland areas of the island.

3.5.5 State Department of Health

Chapter 20, Title 11, Section 11-20-29, of the State Administrative Rules, requires the State Department of Health (DOH) to approve all new water sources that serve public water systems. Such approval is based upon the submission of an engineering report that satisfactorily addresses all of the issues identified in the State administrative rules. Consultation with State Department of Health representatives indicate that such issues include, at least, the following:

1. Nature of the soil and substrata overlaying the water source;
2. Nature, distance, direction of flow and time of travel of contaminants from present and anticipated domestic, industrial, and agricultural sources of pollution.
3. The probability and potential effect of surface drainage, or contaminated underground water entering the proposed water source; and
4. Water quality and flow data during variable environmental conditions (Lewin, 1990).

Section 30 of the DOH Administrative Rules, Chapter 11-20, also requires that construction plans for any water system under the jurisdiction of the County of Kauai must be approved by the County of Kauai's Department of Water.

3.5.6 Interim Instream Flow Standard for Kauai, Chapter 13-169, Hawaii Administrative Rules

The State commission on water resource management adopted an interim instream flow standard for all streams on the Island of Kauai on June 15, 1988. This standard recognizes that stream flows vary throughout the year due to changing rainfall patters; however, the standard does not permit new or expanded diversions beyond June 15, 1988 unless there is a compelling public need.

3.5.7 State Department of Hawaiian Home Lands: Anahola-Kamalomalo and Moloaa Development Plan

This plan is a land use development plan for Hawaiian home lands in the Anahola area which includes future land use proposals for residential, agricultural, public facilities, and resource management areas in the Anahola-Kamalomalo and Moloaa areas. While this area is situated considerably north and east of the project area, future plans of the State Department of Hawaiian Home Lands (DHHL) assume the use of some of the surface water that is presently discharged into Makaleha Ditch. Ultimately, Makaleha Ditch flows connect to Mimino and Kawano Ditches. A portion of the Kawano Ditch is situated within Hawaiian Home lands and could be used to support future agriculture uses. Until April, 1991, Lihue Plantation Company used Makaleha Ditch to divert Makaleha Stream discharges for the irrigation of sugarcane fields in Kealia.

Under the terms and conditions of the State of Hawaii's general lease S-3827 with East Kauai Water Company (Lihue Plantation Company), Lihue Plantation Company can divert up to 50 mgd from the drainage basins of the North Wailua, Kapaa, Anahola, and Hanalei Rivers. However, the lease also stipulates that surface water must also be made available to Kuleana lands for domestic and irrigation uses. The Hawaiian Homes Act of 1920 set aside roughly 5,000 acres of the ahupuaa of Anahola-Kamalomalo (Belt Collins and Associates, 1987).

Future water supply requirements necessary to support the proposed DHHL land uses in the Anahola-Kamalomalo and Moloaa areas are estimated in the plan to be about 5.5 million gallons. This supply would support both domestic and agricultural irrigation demands. Related consultation with the State Department of Hawaiian Home Lands representatives and the Native Hawaiian Advisory Council indicate a continuing concern that adequate water supplies are available to support future land uses in the area.

3.5.8 Kauai County General Plan

The Kauai General Plan calls, in part, for the development of additional water sources in upper Kapaa to meet the anticipated increase in potable water demand. The development and use of Upper Makaleha Springs is specifically proposed to help address this issue and plan objective.

3.5.9 Kauai Water Use and Development Plan

In addition to the forecast of anticipated potable water demands to the year 2010, the plan summarizes proposed water source development projects for the Kauai County Department of Water. Proposed projects for the Wailua-Kapaa system include the following:

Type of Project	Capacity	Cost
One well	1,000 gpm	$ 3,736,800
3 wells	700 gpm	7,847,280
2 wells	600 gpm	4,484,160
7 reservoirs	1.0 mg	11,816,000
12,000 lineal feet of pipe	12-inch	900,000
TOTAL		$ 28,784,280

3.5.10 Flood Hazard Designations

The U.S. Army Corps of Engineers has designated the Upper Makaleha Springs area as a Zone X flood hazard area. The Federal Emergency Management Agency has further defined this zone to be those areas that are outside the 500-year flood plain.

3.5.11 State Agricultural Park in Kealia

Consultation with the State Department of Agriculture (DOA) indicates that the State DOA has recently been evaluating State-owned lands in Kealia for the potential development of a State agricultural park. DOA indicates that such a project would require a source of irrigation water for approximately 1.5 millions gallon per day. The DOA has also expressed concern that the proposed water resource development project at Makaleha Springs would adversely affect the potential use of agricultural lands in Kealia (Kitagawa, 1992).

3.5.12 Hawaii Stream Assessment

"Makaleha Stream is tributary to Kapaa Stream, which is listed as perennial stream in the Hawaii Stream Assessment conducted by the State Commission of Water Resource Management and the National Park Service. The Hawaii Stream Assessment ranks Kapaa Stream as Outstanding in aquatic resources, as well as in recreational resources, and Substantial in riparian and cultural resources" (Masumoto, 1992).

CHAPTER FOUR

ANTICIPATED ENVIRONMENTAL CONSEQUENCES AND PROPOSED MITIGATIVE MEASURES

CHAPTER FOUR
ANTICIPATED ENVIRONMENTAL CONSEQUENCES AND PROPOSED MITIGATIVE MEASURES

4.1 PHYSICAL IMPACTS

4.1.1 Diversion of Flows from Makaleha Stream to Makaleha Ditch

One impact relating to diversion of flows from the Upper Makaleha Springs would be a reduction of 1.0 mgd in surface water supply to Lihue Plantation Company. As described in Chapter Three, Makaleha Stream discharges about 4.4 to 5.1 mgd of surface flow. The Plantation presently diverts virtually all of the stream discharge to Makaleha Ditch.

Until April, 1991, the Plantation was, on an annual basis, diverting approximately 4.4 mgd of flow to the Makaleha Ditch for the irrigation of some 1,800 acres of sugar cane. Virtually all of the diverted flow from Makaleha Stream was used for irrigation during the drier months of April through September. From October through March, the Plantation formerly used roughly 50 percent of the total stream discharge for irrigation purposes.

In November, 1991, representatives of LPC indicated that the Plantation will discontinue its sugar cane cultivation of 1,800 acres of sugarcane in the Kealia area (Contrades, 1991) by the end of 1991. However, the diversion of Makaleha Stream discharges to Makaleha Ditch continues even though the irrigation requirements of LPC have, for the short-term, been eliminated. Lihue Plantation's water rights to the drainage areas of North Wailua, Kapaa, Anahola, and Hanalei Rivers are in effect until May 10, 1994.

LPC's future diversion of Makaleha Stream discharges may also continue once short and longer-term development plans for the Kealia area are determined by American Factors Company (AMFAC) and Lihue Plantation representatives. Discussions with Lihue Plantation Company representatives indicate that short-term land uses will probably include an agriculture use such as cattle or horse pasture in order that the Company can maintain its agricultural tax status on the land (Furukawa, 1991). No estimates have been developed by Lihue Plantation Company for future irrigation of pasture lands; however, this land use can be expected to generate significantly smaller requirements for irrigation water. Consequently, it is not believed that the proposed Upper Makaleha Springs Water Resource Development project will adversely affect the short-term uses of the Kealia area through 1994. In addition, the Kauai County, Department of Water, has stated that it will not divert water to its 1.0 mgd storage tank if irrigation needs of LPC are not met, e.g. during lower flow stream periods.

Beyond 1994, the potential impact of domestic water use by Kauai County, Department of Water, cannot be made until a more definitive indication is made for the future development of the Kealia area. Potential land use scenarios may include the long-term leasing of these lands to smaller agricultural companies pursuing the production of diversified agricultural crops. However, the potential return-on-investment from the development of these lands for residential,

commercial and/or resort uses strongly suggest that AMFAC will elect to gradually develop the Kealia area for residential, commercial, resort, and/or golf course development.

It is also possible that Lihue Plantation Company will no longer divert Makaleha Stream discharges beyond May, 1994. An extension of its present water rights would require review by the State Water Commission. Land use proposals other than agriculture may not provide an adequate rationale for Water Commission approval of future water diversions from Makaleha Stream.

4.1.2 Temporary Sedimentation of Makaleha Stream

Construction labor activity and related equipment operations associated with the development of the proposed intake structure and 8-inch transmission line will generate some temporary sedimentation of the Stream. Such impacts could be significant unless proper mitigation efforts are exercised by the contractor responsible for construction. For this reason, the State of Hawaii, Division of Water Resource Management, is committed to implementing the following guidelines for construction:

1. Temporary access by construction labor and heavy equipment to the project site along the north side of Makaleha Stream will occur within a defined construction easement. This easement is depicted in Figure 2-2A through 2-2F. No permanent or improved easement will be provided to support long-term operation and maintenance of the water supply facilities.

2. Excavation work required to build the proposed intake structure along the north side of the valley will be scheduled and accomplished during the drier months of May through September.

3. Excavated rock and soil material (if any) will be stockpiled adjacent to the Stream prior to reuse in the construction of the intake structure or concrete pedestals. Rock material not reused will remain in riparian areas adjacent to the Stream, rather than within the active Stream waters.

4. Temporary silt fences and fabric material will be used by the contractor to reduce the potential impact of sedimentation during construction of the intake structure, installation of the pipeline, and related heavy equipment mobilization.

5. The contractor will temporarily halt construction efforts during unexpected higher intensity rainfall conditions.

4.1.3 Temporary Stream Crossings During Construction

The 30-foot wide temporary construction easement depicted in Figure 2-2A through 2-2F will cross over a man-made artificial wetland area and one downstream segment of the Makaleha Ditch which were constructed by Lihue Plantation Company to divert water to downstream intake structures associated with the Makaleha Ditch. In addition, portions of the construction easement also includes selected stream bank areas.

In order to avoid significant sedimentation of these Stream areas, metal plates will be used to temporarily cover and protect selected stream segments and streambank areas. Where necessary, the plates will be supported by existing rock material in riparian areas outside of the Stream to support the mobilization of limited heavy equipment and construction labor movement.

The temporary covering of selected stream segments will also avoid impacts upon the streamflow through stream and channel diversions to Makaleha Ditch. Consequently, the supply of irrigation water will also not be affected during the course of construction.

4.2 BIOLOGICAL AND WATER QUALITY IMPACTS

4.2.1 General

The water quality, aquatic habitat, and wildlife habitat of Makaleha Stream will be affected by the proposed project. In a cumulative sense, it is not believed that these impacts will generate any significant impacts upon the Stream biota. However, significant impacts are likely if the mitigation efforts identified in sections 4.1, 4.2, and 4.3 are not carried out prior to and during the course of construction.

The basis for these conclusions are generally summarized in the following paragraphs. In essence, they summarize the primary conclusions of more detailed evaluations of aquatic, botanical and wildlife resources which are presented in Appendices D, E, and F.

Analyses of the aquatic resources of Makaleha Stream were made by Amadeo Timbol, Ph.D. in May, 1990 and August, 1986. The more recent analyses reflects an expansion of the 1986 report based upon additional fieldwork in March and April, 1990, as well as agency and public concerns concerning the potential effects of the project upon endemic fish.

The survey and evaluation of botanical resources was accomplished by Char & Associates in December, 1986. An assessment of wildlife resources was made by Mr. Phil Bruner in December, 1986; the wildlife assessment by Bruner was supplemented by a reconnaissance study of the Hawaiian Duck that addressed the question of whether on not a Hawaiian Duck population exists in the Upper Makaleha Stream area.

4.2.2 Aquatic Resources

4.2.2.1 Existing Resources

Field sampling was conducted in Makaleha Stream by Dr. Timbol in August, 1986, as well as March and April, 1990 at three selected stations. These surveys indicate the presence of 14 animal species that include eight insects, three fish, one crustacea, one amphibia, and one annelida. Aquatic fauna in the stream are characterized by low diversity; however, eleven of the fourteen species are endemic to Hawaii. The one crustacea found by Dr. Timbol, Atyoida bisculata, in the upper reaches of Makaleha Stream is believed to have been imported to the Stream as the upstream migration of this specie to Makaleha Stream is considered highly unlikely (Timbol, 1990).

4.2.2.2 Dewatering of Makaleha Stream

The primary impact upon these aquatic resources will be generated by the dewatering of Makaleha Stream between the springs and the Makaleha/Kapaa Stream confluence. Native fishes supported by Makaleha Stream, i.e., Awaous stamineus (o'opu-nakea) and Lentipes concolor (o'opu-alamo'o) are the primary concern. These native fish species typically migrate between fresh and salt water.

"Adult gobies spawn over a period of months in freshwater, mostly in the lower reaches of streams. Hatchlings are carried out to sea by stream current where they spend a marine existence as plankton. Then these metamorphose into post-larvae (hinana) near the mouths of stream, settle on appropriate substrata, and migrate upstream to the places of permanent residences" (Ego, 1956; Tomihama, 1972; Maciolek, 1977; Timbol, et al, 1980; and Kinzie and Ford, 1982).

For this reason, the native fish found in Makaleha Stream require a suitable environment throughout the Stream to support their upstream and downstream migrations. In this context, the primary aquatic resource concern is the potential survivability of these native species (Timbol, 1990). It should also be noted that the U.S. Fish and Wildlife Service is in the final stages of processing an opinion regarding the o'opu-alamo'o; various scientific publications have also listed the o'opu-nakea as "threatened" in various scientific publications (Choy, 1991).

The primary stress upon native fish in Makaleha Stream is the present diversion of Stream discharges to Makaleha Ditch. The downstream migration of native fish to the ocean via Kapaa Stream, is presently hampered by the long-term diversion of Makaleha Stream discharges to Makaleha Ditch by Lihue Plantation Company (LPCO). Sugarcane cultivation in the adjacent Kealia area was discontinued at the end of 1991. However, the diversion continues as LPCO has a long-term State lease to use this surface water for agricultural irrigation. In the short term, it is expected that LPCO will require some irrigation water; however, short-term demands for irrigation water in Kealia area should be significantly less with the discontinuation of sugarcane production and the start-up of other less water-consuming agricultural activities.

Despite the present dewatering to Makaleha Ditch, Makaleha Stream supports endemic fish upstream and downstream of LPCO's Makaleha Ditch diversion. During Dr. Timbol's survey, o'opu-nakea found in Makaleha Stream included various sizes which indicates that the post-larvae (hinana) are capable of upstream migration despite environmental obstacles, e.g., dewatering. In contrast, the absence of post-larvae, juvenile o'opu-alamo'o suggest that this fish may represent a captive adult population; existing environmental conditions may inhibit the migration of juvenile o'opu-nakea.

The existing diversion to Makaleha Ditch may be a contributing cause of this potential lack of migration. However, it is important to recognize that the upper reaches of Kapaa Stream (situated downstream of Makaleha Stream) are also fed by surface runoff from various other streams and that other nearby stream diversions (Figure 2-1) also reduce the amount of fresh water contribution to Kapaa Stream. In addition, there are numerous other environmental factors that influence the migration and survivability of the native fish species.

The captive o'opu-alamo'o, which live upstream of the proposed stream capture site, will survive since that portion of the Upper Makaleha Stream will not be affected by the proposed development. The o'opu-nakea is expected to survive since this species is frequently found in degraded fresh-water habitats such as Kauai's Huleia River. However, the survival of the o'opu-alamo'o downstream of the Springs is more tentative and is dependent upon the extent of dewatering (Timbol, 1990).

4.2.2.3 Recommendation for Long-Term Monitoring of Native Fish Population

Local aquatic biologists based on Kauai indicate that there is limited scientific knowledge concerning the ecology of native aquatic fauna in Hawaiian Stream environments (Timbol, 1991 and Heacock, 1987). This lack of information, in itself, results in an uncertainty concerning potential impacts of the proposed project. For this reason, it is recommended that periodic monitoring is made of the Upper Makaleha Stream area during and following proposed construction activities. Such monitoring would be appropriately conducted by the Kauai district office of the State Division of Aquatic Resources who are familiar with conditions in other similar aquatic environments on Kauai. The focus of this longer-term mitigative measure would be to: 1) assess the impact of dewatering on native aquatic fauna; and 2) when necessary, advise the Kauai County Department of Water of required reductions in water capture.

4.2.3 Physiochemical Characteristics of Makaleha Stream

The proposed capture of water from Upper Makaleha Springs will also somewhat degrade the physiochemical characteristics of Makaleha Stream. The extent of potential degradation of Makaleha Stream physiochemical characteristics cannot be quantified in great detail. However, potential impacts can be qualitatively discussed in the context of the following water quality factors and recommended mitigative measures that will influence the quality of the aquatic environment supporting the native fish population.

4.2.3.1 Stream Oxygen Levels

Since the upper slopes of Makaleha Stream contain a relatively steep gradient of approximately 14 percent, it is believed that a lowered flow rate will continue to maintain a flow rate which will adequately aerate future surface flows in the stream (Timbol, 1990).
Dissolved oxygen levels recorded during field surveys, made during moderate flow conditions, ranged from 95 to 99 percent saturation in the vicinity of Makaleha Springs and two downstream stations.

With the impending closure of sugar cultivation in Kealia, a significant opportunity exists for enhancing DO and temperature levels in Makaleha Stream, between the Makaleha Ditch diversion and the Kapaa Stream confluence. Given the reduced irrigation requirement in the Kealia area, it is recommended that the State Board of Land and Natural Resources negotiate a reduction in the volume of surface flow diversion from Makaleha Stream to Makaleha Ditch with East Kauai Water Company, Ltd. (Lihue Plantation Company). Increased streamflow, downstream of the Makaleha Ditch diversion, would: 1) enhance the quality of aquatic habitat in the lower portions of Makaleha Stream; and 2) significantly reduce any potential risks of the proposed project upon the habitat of the o'opu-alamo'o in this portion of the Stream. Should efforts to negotiate with

Lihue Plantation fail, a remaining option would be for the State Board of Land and Natural Resources to not renew any application by the Plantation for renewal of its existing water rights.

4.2.3.2 Stream Temperature

The removal of streamside vegetation within the proposed construction easement may increase exposure of the sun upon Makaleha Stream. Elevated stream temperatures and excessive evaporation could be expected as a consequence of a significant increase in sun exposure. However, this potential impact could be significantly reduced through the use and implementation of the following mitigation measures by the construction contractor:

1. The removal of streamside vegetation will be limited to areas which obstruct the construction of the proposed intake structure and installation of the proposed pipeline.

2. Areas that are cleared by the contractor will be replaced with indigenous plants that are approved by the State construction inspector.

4.2.3.3 Potable Water Quality

Limited sampling and related analyses of the spring waters indicate that the potential water supply is very acceptable for domestic use. It is believed that the proposed intake structure will afford effective protection against potential surface contamination. Because of its proposed setback from the stream, its location will also reduce the likelihood of potential flood inundation during higher stream flow periods.

The design of the proposed intake structure is based on the premise that the perched groundwater, percolating down within the mauka slope of Makaleha Valley, would follow the "dense fracture flow" depicted in Figure 2-3. The impervious rock layer will cause the perched water to travel along the top layer until it reaches the proposed inlet structure. Excavations along the base of the valley wall will be made until the area of "dense fractured flow" is reached. The construction of a cutoff wall type structure is intended to detain and collect the ground water before it reaches the "loose boulders and soil (Figure 2-3).

For security and maintenance purposes, a steel plate cover will be provided on the top of the intake structure. A washout line will also be installed to facilitate periodic flushing of the inlet structure. These design features will also contribute to the maintenance of an acceptable potable water quality.

4.2.4 Wildlife Resources

The proposed project is expected to temporarily reduce available habitat for several exotic and native birds frequenting the Makaleha Stream area. However, this impact is expected to be limited in area and duration if the proposed mitigation measures in sections 4.1 and 4.2 are implemented by the construction contractor. The replacement of removed flora with indigenous plant species will be especially beneficial in terms of providing adequate cover and habitat for the local bird population.

It should be noted that the permanent road development discussed in Appendix F is no longer part of the proposed project scope. This decision was made in light of the potential impacts that could occur from such a development. Unpaved vehicular access to the proposed catchment area will occur only during construction.

4.2.5 Botanical Resources

Use of the temporary construction easement will require the removal of selected vegetation which restricts equipment mobilization to the proposed cut-off trench and the installation of the 8-inch waterline. The removal will include the removal of exotic trees and shrubs such as the hau bush, rose apple, banana, and yellow guava.

While the removal of streamside vegetation will have some impact upon stream temperatures, the hau bush has overgrown much of the stream. In some areas, the removal of the hau bush may represent a benefit to the aquatic environment as dense root mats of the hau bush may be blocking the upstream migration of native diadromous fish (Timbol, 1990).

It should also be noted that all streamside vegetation in Makaleha Valley is periodically exposed to higher flood conditions. These conditions generate a significant change in the composition and location of existing botanical resources. This conclusion is confirmed by the presence of more hardy species such as yellow guava Psidium guajava) and other exotic tree-like plants that dominate Makaleha's stream banks (Timbol, 1990).

As stated in section 4.2.3.2, it is recommended that plants removed from the construction easement be replaced by indigenous plants. Such mitigation will help reduce potential sedimentation impacts and provide a vegetative canopy that will not pose any stress to the upstream migration of native fish.

4.3 BUILT ENVIRONMENT

4.3.1 Increased Domestic Water Supply to the Kapaa-Wailua Service Area

A proposed flow of 500 gpm would provide an additional supply of approximately 0.72 mgd to the County of Kauai's Kapaa-Wailua service area. Assuming a consumption rate of roughly 100 gallons per person per day, the proposed water source development project would create an additional domestic water supply that would be sufficient to support the daily consumption of roughly 7,200 Kauai residents. In the context of Kauai County Department of Water standards, the added surface supply would provide an additional 18 percent of water supply capacity to the Wailua-Kapaa water system that would, for the short term, eliminate the present deficit in available water supply.

4.4 UNRESOLVED ISSUES

On the basis of the environmental analyses and consultations made for this environmental impact statement, the following unresolved issues have been identified.

4.4.1 Potential Discharges from Makaleha Spring

While a number of flow measurements have been made at the proposed Makaleha Spring site since 1986, the actual quantity of water that will be available from the Upper Makaleha Springs catchment system will not be realized until completion of the first phase of the project. However, this risk is common to most all groundwater development projects.

4.4.2 Future Development of the Kealia Area

Future lands uses in the Kealia Area are uncertain due to the changing interests of the Lihue Plantation Company and its parent company, AMFAC. Future water diversion of Makaleha Stream discharges for other types of irrigation are also in question since the existing water rights of Lihue Plantation extend only to May, 1994. Consequently, the longer-term effect of a reduced surface discharge upon Lihue Plantation Company operations is difficult to assess without some clearer idea of future land uses, related water requirements, and whether Lihue Plantation Company and AMFAC will be granted future water rights to the use of Makaleha Stream waters.

4.4.3 Potential Impacts Upon Native Fish Population

The extent of potential impacts upon the native fish population, due to Stream dewatering, will remain unclear without the implementation of longer-term monitoring. Existing aquatic resource studies indicate that the greatest potential impact may be upon the o'opu-alamo'o. Younger post-larvae juveniles apparently are presently unable to migrate upstream. The existing adult population is possibly a captive fish population. Despite the potential impact, it is believed that implementation of proposed mitigative measures will greatly reduce the potential impacts and risk upon the o'opu-alamo'o.

APPENDIX A

DOCUMENTED INFORMATION OBTAINED DURING EIS CONSULTATION

APPENDIX A

DOCUMENTED INFORMATION OBTAINED DURING EIS CONSULTATION

APPENDIX A

SUMMARY OF CONSULTATION WITH SELECTED PUBLIC AND PRIVATE AGENCIES DURING PREPARATION OF ORIGINAL EIS

Agency	Representative	Type of Response	Date of Letter
United States Government			
Soil Conservation Service	Laurie K. Ho	written	December 2, 1986
Fish & Wildlife Service	Ernest Kosaka	written	December 2, 1986
Army Corps of Engineers	Everette A. Flanders	written	February 6, 1986
State of Hawaii			
Dept. of Health	John C. Lewin, M.D.	written	February 24, 1987
Dept. of Health	Theodore Inouye	written	January 20, 1986
Division of Forestry & Wildlife	Ralph E. Daehler	written	December 10, 1986
Division of State Parks	Ralston H. Nagata	written	January 14, 1987
County of Kauai			
Department of Planning	Avery H. Youn	written	November 26, 1986
Department of Water	Raymond H. Sato	verbal	
Private & Community Organizations			
Lihue Plantation Company	Lefty H. Kawazoe	written	February 18, 1987
Office of Hawaiian Affairs	Earl Neller	written	February 13, 1987
Kauai Outdoor Circle	Nina Magoun	verbal	
Kauai Sierra Club	Bert Lyon	none	
Kauai Audubon Society	David Boynton	none	
Conservation Council for Hawaii	Mike Kido	none	

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UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
4334 RICE ST.
ROOM 104
LIHUE, HI 96766

RECEIVED
DEC - 8 1986
By

to: C.C.

December 2, 1986

Mr. Glenn Y. Yamamoto
Portugal and Associates, Inc.
4334 Rice St., Suite 204
Lihue, HI 96766

Dear Sir,

The Hawaii DLNR, Division of Water and Land Development's (DOWALD's) proposed site to tap natural springs in the Makaleha mountains is located on soils called Rough Mountainous Land(rRT). These soils occur in mountainous areas on all islands. They consist of very steep land broken by numerous intermittent drainage channels. Over much of the area, the soil is very thin. It ranges from 1 inch to 10 inches of thickness over saprolite material.(weathered bedrock) In most places the saprolite is relatively soft and permeable to water. Rock land, rock outcrop, soil slips, and eroded spots make up 20 to 40 percent of the acreage. This land type is used for water supply, wildlife habitat, and recreation.

There are no engineering interpretations or estimated properties for Rough Mountainous Land but the soil material is similar to that of the Amalu and Olokui soil series.

Features of Each Soil as Taken from the 1972 Soil Survey of Kaua'i

Amalu Soil Series

a) poor source of topsoil because it is always wet
b) soil is a peat and clay mixture
c) poorly drained
d) for foundations of low buildings this soil has high compressibility
e) shrink-swell potential is moderate to low
f) corrosivity is high for both uncoated steel and on concrete

Olokui Soil Series

a) poor source of topsoil because too wet
b) poor compaction characteristics therefore unsuited for road fill
c) low shear strength because of wetness
d) subject to seepage
e) shrink-swell potential is moderate to low
f) corrosivity is high for both uncoated steel and on concrete

In conclusion, because these soils are very steep and wet, care needs to be taken during construction of the concrete basin. Due to limitations of the soils, time of construction needs to be

bal
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considered to avoid times of heavy rain. Exposed areas of soil need to be revegetated to reduce the hazard of erosion.

Sincerely,

Laurie K. Ho

Laurie K. Ho
Soil Conservationit

attach.

United States Department of the Interior

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

ES
Room 6307

DEC 2 1986

DEC -3 1986

Mr. Glenn Y. Yamamoto
Portugal and Associates, Inc.
4334 Rice Street
Suite 204
Lihue, Kauai 96766

Re: Proposed Upper Makaleha Spring Catchment Site, Kauai

Dear Mr. Yamamoto:

We have reviewed your November 17, 1986 letter regarding the proposed project and offer the following comments for your consideration.

Our primary concern with the proposed project is the potential reduction of stream flow in Makaleha Stream and the associated loss of aquatic habitat for native diadromous species such as 'o'opu, 'opae, and hihiwai, endangered koloa (Hawaiian duck), and native insects.

The environmental assessment (EA) should include information on the hydrology of Makaleha Springs and its contribution to discharge in Makaleha Stream. The tapping of the spring and its effect on reducing stream flow should be discussed in the EA. If it is determined that tapping the spring substantially reduces stream flow, further mitigation and compensation measures to protect native aquatic resources will be recommended by our office.

Koloa (Anas wyvilliana), a listed endangered species, may be found in the project area. However, we do not have any current information on their distribution in the area. We recommend that an ornithological survey be conducted to determine the use of the area by koloa and other endangered Hawaiian waterbirds, and to identify potential impacts of tapping the Makaleha springs on these species. This information should be included in the EA. In addition, we recommend that you consult with the Mr. Thomas C. Telfer, Kauai District Biologist, Division of Forestry and Wildlife, Lihue, Kauai.

Native diadromous species, such as 'o'opu, 'opae, and hihiwai may be found in Makaleha Stream. We recommend that aquatic fauna

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survey(s) be conducted to determine the distribution and abundance of these species in Makaleha upstream and downstream of the project site. The results of these surveys should be included in the EA. We recommend that you contact Mr. Donald Heacock, Aquatic Biologist, Division of Aquatic Resources, Lihue, Kauai.

We appreciate the opportunity to comment.

Sincerely,

Ernest Kosaka

Ernest Kosaka
Project Leader
Office of Environmental Services

cc: DLNR

71

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

February 6, 1986

REPLY TO
ATTENTION OF
Operations Branch

Portugal, Ibara & Associates, Inc.
RECEIVED
FEB 10 1986
By

Mr. Glenn Y. Yamamoto
Portugal, Ibara & Associates, Inc.
4334 Rice Street, Suite 204
Lihue, Hawaii 96766

Dear Mr. Yamamoto:

This is in response to your letter of January 27, 1986 regarding the proposed Makaleha Spring Water Source Development Project in Makaleha Valley, Kapaa, Kauai, Hawaii.

If the proposed project involves any filling of the Makaleha Stream below its ordinary high water mark, a Department of the Army (DA) permit would be required, Likewise, if any fill activity is involved in the construction of any part of a hydropower facility, a DA permit would be required.

At later stages in your study, when more detailed plans are developed on either proposal, we would appreciate the opportunity to review your drawings to determine the DA permit requirements. If you have any further questions on this matter, please contact the Corps Operations Branch at 438-9258.

Sincerely,

Barisa

for Everette A. Flanders
Chief, Construction-Operations
Division

WL

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John Waihee
GOVERNOR OF HAWAII

John C. Lewin, M.D.
DIRECTOR OF HEALTH

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

RECEIVED
87 MAR 2 P12:37
STATE OF HAWAII
APR - 3 1987

In reply, please refer to:
EPHSD

February 24, 1987

MEMORANDUM

To: Honorable William W. Paty, Chairperson
Board of Land and Natural Resources

From: Director of Health

Subject: Environmental Assessment for Upper Makaleha Springs Water Resource Development, Kauai

Thank you for allowing us to review and comment on the subject environmental assessment. The Drinking Water Program has reviewed the Environmental Assessment and it is our understanding that DLNR plans to tap the springs in the Makaleha Mountains on the east side of Kauai to provide water for the Kapaa water system.

Please be advised that the decision to use this spring or other new sources as a source of potable water will require compliance with Section 11-20-29, Chapter 20, Title 11, Administrative Rules. This Section requires Department of Health approval of all new potable water sources serving public water systems. Such approval is based upon the submission of an engineering report satisfactorily addressing all concerns set down in Section 11-20-29, Chapter 20, Title 11, Administrative Rules.

Concerns for water sources identified in Section 11-20-29 of Chapter 20, Title 11, include but are not limited to:

1. Nature of the soil and stratum overlaying the water source;

2. Nature, distance, direction of flow and time of travel of contaminants from present and projected domestic, industrial and agricultural sources of pollution, and waste injection wells and other waste disposal facilities;

3. Probability and effect of surface drainage or contaminated underground water entering the subject water source;

4. Water quality and quantity data during normal and stress periods.

Your careful review of these and other concerns as set down in Section 11-20-29, Chapter 20 is urged. Your consideration and use of this information in the determination of sites for water sources of this nature will serve to avoid possible conflicts in use of resources.

Should you have any questions concerning Chapter 20, Title 11, Administrative Rules, please feel free to contact the Drinking Water Program at 548-2235.

JOHN C. LEWIN, M.D.

cc: DHO, Kauai

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

LESLIE S. MATSUBARA
DIRECTOR OF HEALTH

JEFFREY A. SMITH, M.D., M.P.H.
DISTRICT HEALTH SERVICES ADMINISTRATOR

Portugal, Ibara & Associates, Inc.
RECEIVED
JAN 22 1986
By

January 20, 1986

Mr. Glenn Y. Yamamoto
Portugal, Ibara and Associates, Inc.
Suite 204
4334 Rice Street
Lihue, Hawaii 96766

Dear Glenn:

SUBJECT: Makaleha Spring Water Source Development, Makaleha Valley, Kapaa, Kauai, Hawaii

We are not aware of any sources of contamination in the area that would adversely affect springs proposed for potable source.

This proposed project should be reviewed by our engineers in Drinking Water Section.

Sincerely,

Theodore Inouye
Chief Sanitarian, Kauai

TI:CF/plo

75

HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
KAUAI DISTRICT
P. O. BOX 1671
LIHUE, KAUAI, HAWAII 96766

RECEIVED
DEC 12 1986
By

IN REPLY REFER TO

December 10, 1986

A-3c

Mr. Glenn Y. Yamamoto
Portugal & Associates, Inc.
4334 Rice Street, Suite 204
Lihue, Kauai 96766

Dear Mr. Yamamoto:

The following is in response to your letter of November 17, 1986 relating to environmental assessment of a water project being considered for the Makaleha Stream area in the Kealia Forest Reserve.

The purpose that the Kealia Forest Reserve was established on March 9th, 1906 was specifically for watershed protection for water supply purposes so the proposed use is certainly an appropriate one. Today recreational hunting is also a multiple forest reserve use in the area.

Concerning plant life in the project area, we have no references to any past plant collecting or observation studies in the area and I have not traversed the stream area mauka of the Forest Reserve boundary. It would therefore be important to include provisions for a plant survey along the project route prior to scheduling any active construction work so if there are some sensitive areas alternative actions can be considered.

Concerning wildlife considerations, Wildlife Biologist Tom Telfer, whom manages the Wildlife Branch on Kauai relates the following:

" 1. I have never surveyed the Makaleha Stream area for wildlife;

2. By its location and vegetation, I strongly suspect that the area is inhabited by the Koloa (Anas wyvilliana) and the Hawaiian Bat (Lasiurus cinereus semotus), both endangered species.

The Hawaiian Gallinule (Gallinula chloropus sandwichensis) and the Newell's Shearwater (Puffinus auricularis newelli) probably are found nearby and could be affected;

3. Before the E.I.S. is prepared, a survey of the plants and wildlife found in the area should be conducted by a competent biologist and botanist; and

4. Since the project site is within the Kealia Forest Reserve (Hunting Unit C), there may be impacts upon the recreational use of the area by hunters, particularly with respect to access, or lack of it. More information is needed on the scope of the project before an evaluation can be made on the environmental impacts to be expected."

Thank you for including us in your early planning of this project.

Kindest regards,

RALPH E. DAEHLER
District Forester, Kauai

attachments

cc: Libert K. Landgraf
Roger Evans
Manabu Tagomori

77 John Waihee
GOVERNOR OF HAWAII

Portugal & Associates, Inc.
RECEIVED
JAN 20 1987
By

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

William W. Paty
Chairperson
BOARD OF LAND & NATURAL RESOURCES

Liberty K. Landgraf
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

January 14, 1987

Mr. Glenn Yamamoto
Portugal and Associates, Inc.
4334 Rice Street, Suite 204
Lihue, Hawaii 96766

Dear Mr. Yamamoto:

Subject: Field Inspection Report -- Makaleha Stream Well Project, DLNR, Division of Water and Land Development (DOWALD)
Kealia Forest Reserve, Kawaihau, Kauai
TMK: 4-6-01:portion of 1

On December 19, 1986 Wendell Kam, our staff archaeologist handling Kauai County, conducted a field inspection of the proposed project area (see attached Maps 1 and 2). The purpose of the inspection was to evaluate the recommendations and results of the archaeological reconnaissance survey completed by Cultural Surveys Hawaii (October 20, 1986) for the subject area.

The inspection consisted of walking along the proposed pipeline route (see Map 2) beginning at the existing 1,000,000 gallon water tank (see Photographs 1 - 4). As stated in the archaeological reconnaissance survey (1986:1), the upper half of the proposed pipeline route above the Lihue Plantation diversion becomes heavily vegetated and the valley narrows to the extent that it would be highly unlikely that any agricultural terraces could have been built there. Thus, we concur with the survey's conclusion that "no terraces were found in the project area" (1986:2).

However, there exists the possibility that construction of the proposed access road may expose historic sites which may be currently covered by dense vegetation. To deal with this possibility, we recommend that the applicant notify our office at least thirty days prior to construction of the road, so we can possibly make arrangements to have a Staff Archaeologist monitor the road construction activities while on island for other purposes.

Should you have any further questions, please contant Mr. Kam at 548-7460.

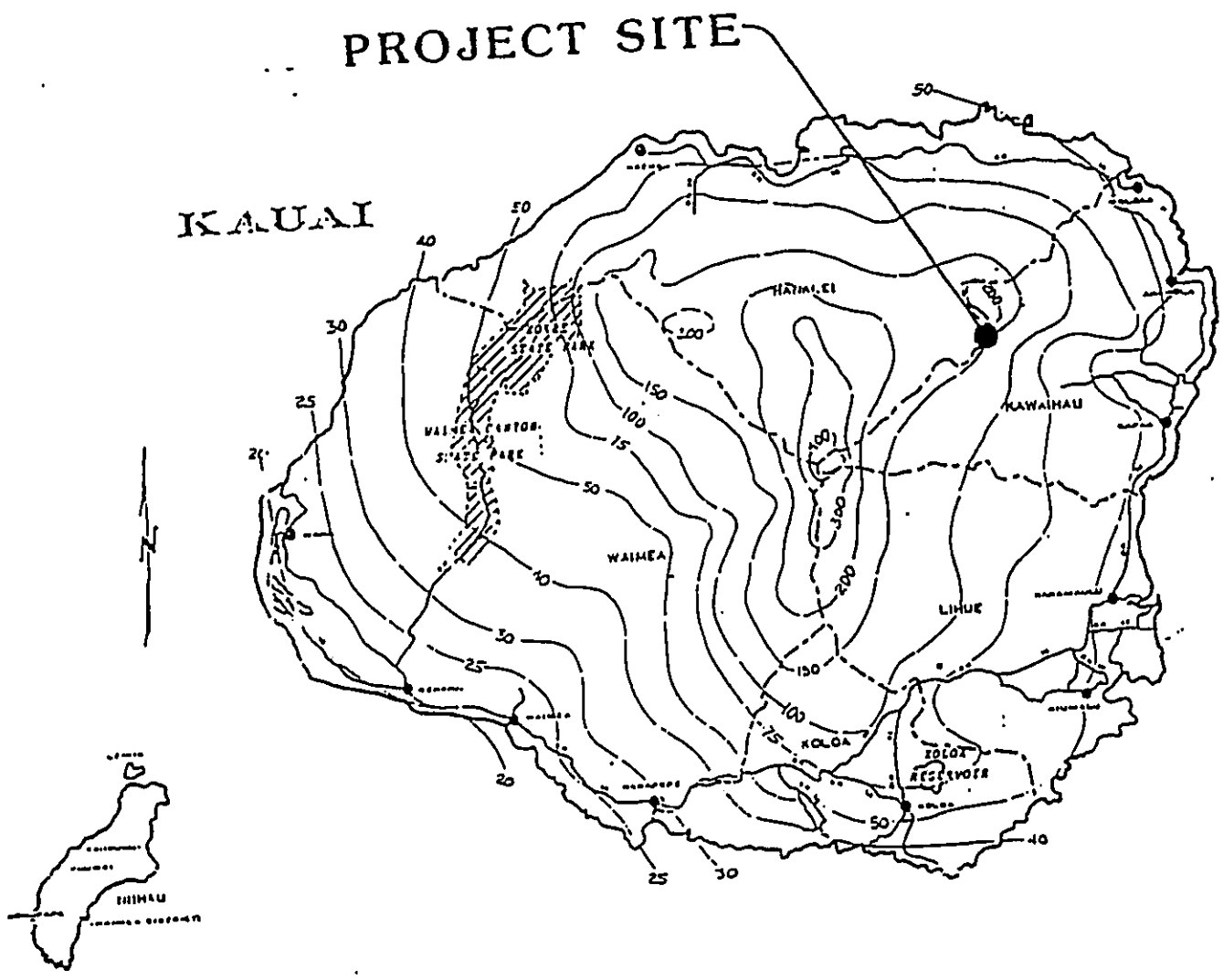
Sincerely,

RALSTON H. NAGATA
State Parks Administrator

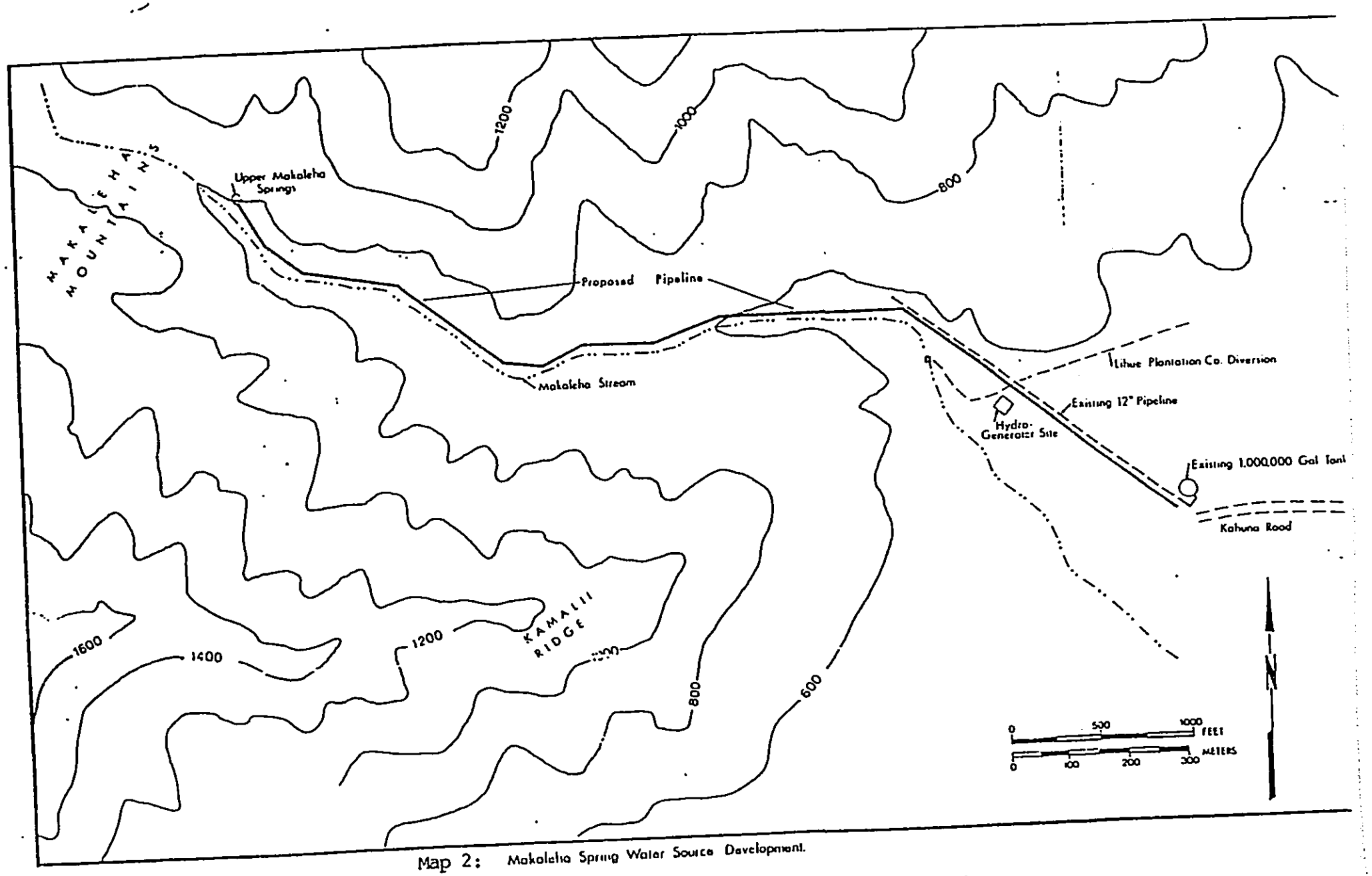
Attachments (2 maps, 4 photographs)

cc: Paul Matsuo, DOWALD

Map 1



ANNUAL PERCIPITATION
Island of Kauai, Hawaii



Map 2: Makaleha Spring Water Source Development.

TONY T. KUNIMURA
MAYOR

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

AVERY H. YOUN
PLANNING DIRECTOR

TOM H. SHIGEMOTO
DEPUTY PLANNING DIRECTOR

TELEPHONE (808) 245-3919

Portugal & Associates, Inc.
RECEIVED
DEC - 1 1986
By

November 26, 1986

Mr. Glenn Yamamoto
Portugal & Associates, Inc.
4334 Rice Street, Suite 204
Lihue, Hawaii 96766

Subject: Proposed Spring Catchment
Makaleha Mountains, Kauai

In response to your letter dated November 17, 1986, we have reviewed the maps submitted and have determined that the project site is located outside the Special Management Area of the County of Kauai. As such, no SMA permit is required.

Thank you for consulting us on this matter.

Tom H. Shigemoto
for AVERY H. YOUN
Planning Director

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THE LIHUE PLANTATION CO., LTD.

P.O. BOX 751
LIHUE, HAWAII 96766

Portugal & Associates, Inc.
RECEIVED
MAR 8 9 1987
By

February 18, 1987

Mr. William W. Paty, Jr.
Chairperson of the Board
Board of Land and
Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

Subject: Proposed Withdrawal of Waters from Makaleha Spring, G.L. S-3827

Dear Mr. Paty:

We have received your January 20, 1987 letter notifying us of DLNR's intention to withdraw 720,000 gpd from the Makaleha Spring source that is currently covered under our East Kauai Water Co. GL S-3827. We have several substantive concerns with this action which need to be addressed before we can concur with such a withdrawal and waive our contractural right to adequate advanced notice.

The primary concerns are summarized as follows:

1) Paragraph 11 of GL S-3827 states in part "Any development or diversion of water from the drainage area by any person other than the Lessee under the General Lease No. 3827 which results in a diversion of less than fifty (50) million gallons of water per day by said Lessee during the months of June, July, August and September shall be deemed an unreasonable interference with the then existing operations of the Lessee . . ." Our analysis shows that over the last ten (10) years, substantially more than half of the average monthly flows for the June to September period have been below fifty (50) mgd with some months as low as twenty-seven (27) mgd. Further taking of waters from the system is in conflict with Paragraph 11 and could be construed as an "unreasonable" interference.

2) The existing Makaleha intake is one of the few dependable sources to provide water to our Kealia fields. This area is already a water deficit area and subject to a severe seasonal water shortage. Lihue Plantation Co. has invested substantially

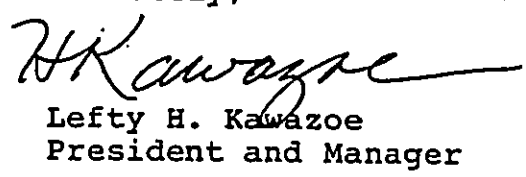
in water conservation efforts in Kealia including drip irrigation, yet the supply of waters to Kealia remain an ongoing concern. Any additional reductions in our current supply of water to Kealia pose a threat to future crop viabilities in that area.

3) The Kauai Department of Water Supply proposes to withdraw 720,000 gpd from new intakes to be constructed upstream from the Makaleha Ditch. This amounts to 16% of the stream's base flow which is most critical during dry periods. The intake system that is being proposed, however, has the capacity to take twice as much water as is being requested with no apparent mechanism to meter and monitor the withdrawal on a regular basis.

As you are well aware, the value of water to an agricultural operation is amplified at times of seasonal shortage. During a portion of the year, the withdrawal for domestic use may have no substantive effect on our current operations. Our concerns are focused on times of shortage and the need to protect our supplies when they are most needed.

Given all the above, we would like to request a meeting with your department to discuss our concerns to be scheduled at your earliest convenience.

Sincerely,



Lefty H. Kawazoe
President and Manager

LK:JM/kk

xc: B. Hatton
S. Hance

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Portugal
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FEB 19 1987
By

Box 641
Honolulu, HI. 96809
February 13, 1987

Mr. Glenn Yamamoto
Portugal & Associates, Inc.
4334 Rice St., Suite 204
Lihue, Hi. 96766

Dear Mr. Yamamoto:

SUBJECT: Proposed Upper Makaleha Springs Water Resource Development, Makaleha Mountains, Kaua'i. TMK: 4-6-01: 1

I am an archaeologist working in the Office of Hawaiian Affairs, and it is important to me to be well informed regarding current projects in Hawaiian archaeology. As archaeological resources are subject to state and federal laws, I anticipate that archaeological studies will be required for the above undertaking, which is in an area likely to contain significant archaeological resources. Please send me a copy of all archaeological studies sponsored by the proposed undertaking, including preliminary reports, reconnaissance survey reports, comprehensive survey reports, salvage excavation reports, monitoring reports, data recovery plans, research designs, and cultural resources management plans. Mahalo for your help.

Aloha,

Earl Neller

Earl Neller

APPENDIX B

RESPONSES TO THE ORIGINAL DRAFT EIS

APPENDIX B

RESPONSES TO THE ORGINAL DRAFT EIS

INTRODUCTION

Appendix B provides copies of correspondence from various agencies and private organizations following their review of the original draft EIS prepared by Portugal and Associates, Inc. in 1987. Following its receipt of agency responses to the original draft EIS, Portugal and Associates, Inc. prepared responses to each of the letters received which are also presented in Appendix B.

Following its response to concerned agencies and organizations, two of the agencies (University of Hawaii Environmental Center and State of Hawaii Department of Business and Economic Development) initially responding to the draft EIS, prepared a second letter voicing expanded descriptions of their concerns regarding the proposed Upper Makaleha Springs project. This correspondence and related responses by Portugal and Associates, Inc., and James Pedersen, Planning Consultant, are presented at the end of Appendix B.

It should also be noted that four of the agencies initially responding to the draft EIS never received responses to their comments submitted in September through November, 1987. Despite the significant lapse of time since the receipt of their correspondence, James Pedersen, Planning Consultant has prepared responses to their initial concerns which are also included within Appendix B.

A chronology of correspondence received and related responses is provided in the following Summary of Responses to the Original Draft EIS.

APPENDIX B

SUMMARY OF RESPONSES TO THE ORIGINAL DRAFT EIS

(Page 1 of 2 pages)

Date of Letter	From/Agency	Date of Response
9/9/87	John C. Lewin, M.D. State of Hawaii, Department of Health	9/21/87
9/8/87	Suzanne D. Peterson State of Hawii, Department of Agriculture	9/21/87
9/3/87	William W. Paty State of Hawaii, Department of Land & Natural Resources	9/21/87
8/27/87	Laurie K. Ho, Kauai District U.S. Dept. of Agriculture, Soil Conservation Service	9/18/87
8/12/87	Russell N. Fukumoto State of Hawaii, Hawaii Housing Authority	9/18/87
8/10/87	Ralph E. Daehler, Div. of Forestry and Wildlife State of Hawaii, Department of Land & Natural Resources	9/18/87
8/5/87	Kisuk Cheung, Engineering Division U.S. Department of the Army	9/21/87
7/30/87	Capt. T. L. Ferrier U.S. Department of the Navy	9/18/87
7/29/87	Major Jerry M. Matsuda, Hawaii Air National Guard U.S. Department of Defense	9/18/87
7/29/87	Teuane Tominaga, Public Works Division State of Hawaii, Dept of Accounting & General Services	9/21/87
7/29/87	Edward Y. Hirata State of Hawaii, Department of Transportation	
8/18/87	Charles J. Ewart University of Hawaii, Water Resources Division	9/18/87
8/7/87	Richard N. Duncan U.S. Dept. of Agriculture, Soil Conservation Service	9/18/87

APPENDIX B

SUMMARY OF RESPONSES TO THE ORIGINAL DRAFT EIS

(Page 2 of 2 pages)

Date of Letter	From/Agency	Date of Response
9/15/87	Ilima A. Piianaia State of Hawaii, Hawiian Homes Commission	11/25/90
9/8/87	Ernest Kosaka, Environmental Services, Pacific Division U.S. Dept of the Interior, Fish and Wildlife Service	11/25/90
9/2/87	Lefty Kawazoe Lihue Plantation Company	12/30/91
9/4/87 7/27/90	Donald E. Heacock, Kauai Aquatic Resources Division State Dept of Land & Natural Resources	12/30/91
8/14/87	Eric Onizuka/Paul Kawamoto, Div. of Aquatic Resources State of Hawaii Dept of Land & Natural Resources	12/30/91
11/19/87	Raymond Sato County of Kauai, Dept of Water	12/30/91
8/19/87	Roger A. Ulveling State of Hawaii, Dept of Business & Economic Development	9/21/87
9/29/87	Roger A. Ulveling State of Hawaii, DBED	11/25/90
9/8/87	Jacquelin N. Miller University of Hawaii Environmental Center	9/21/87
10/28/87	Jacquelin N. Miller UH-Manoa Environmental Center	11/25/90

JOHN WAIHEE
GOVERNOR OF HAWAII

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

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

COPY

Portugal & Associates,

RECEIVED
SEP 18 1987
By

In reply, please refer to:
EPHSD

September 9, 1987

MEMORANDUM

To: Dr. Marvin T. Miura, Director
Office of Environmental Quality Control

From: Director of Health

Subject: Draft Environmental Impact Statement (DEIS) for Upper Makaleha Springs Water Resource Development, Kapaa, Kauai

Thank you for the opportunity to comment on the subject DEIS.

Drinking Water

The Department of Health is vested with the responsibility to assure that public water systems in the State are providing water which is in compliance with the State's drinking water rules known as Chapter 20, Title 11, Administrative Rules, and are in compliance with all other applicable terms and conditions of Chapter 20. A public water system is defined as a system serving 25 or more individuals at least 60 days per year or having a minimum of 15 service connections. In the event that the new well is intended to serve these minimum numbers of persons or service connections, please be advised that the well and distribution system will be subject to the terms of Section 11-20-29 and Section 11-20-30 of Chapter 20 respectively.

Briefly, Section 11-20-29 of Chapter 20 requires all new sources of potable water serving public water systems to be approved by the Director of Health prior to their use to serve potable water. Such approval is based primarily upon the satisfactory submission of an engineering report which adequately addresses all concerns as set down in Section 11-20-29. The engineering report must be prepared by a registered professional engineer and bear his or her seal upon submittal.

Should there be any questions regarding Chapter 20, Title 11, Administrative Rules, please contact the Drinking Water Program at 548-2235.

Other Concerns

1. The applicant shall provide mitigative measures to ensure that there is no degradation of stream water quality during the construction of the proposed facilities.

2. We reserve the right to implement further environmental health requirements when more detailed plans are submitted to our Department.

JOHN C. LEWIN, M.D.

cc: Chief Sanitarian, Kauai
Portugal & Associates, Inc.

90

PORTUGAL, ~~IBARRA~~ & ASSOCIATES, INC.

September 21, 1987

JOHN C. LEWIN, M.D. DIRECTOR OF HEALTH
DEPARTMENT OF HEALTH
STATE OF HAWAII
P. O. BOX 3378
HONOLULU, HAWAII 96801

Re: Draft Environmental Impact Statement - Review, Upper Makaleha Springs Water Resource Development, Kapaa, Kauai, Hawaii.

Dear Dr. Lewin:

Thank you for your review comments of the draft EIS for the subject project as provided in your letter to Dr. Marvin T. Miura, Director, OEQC dated September 9, 1987.

Thank you for reminding us of the need to submit an engineering report addressing the concerns set forth in Sections 11-20-29 and 11-20-30 of Chapter 20, Title 11, Administrative Rules.

The mitigating measures being considered to ensure that no degradation of the stream water quality occurs during the construction of the proposed project, include:

1) Alignment: The proposed pipeline shall be located as far away from the stream as deemed practical. This shall minimize construction traffic in the vicinity of the stream bed and shall allow any eroded material the longest possible time for siltation prior to reaching the stream.

2) Diversion Swales: Diversion swales leading to temporary stilling basins shall be constructed between the pipeline and the stream to divert and detain construction debris and eroded material collected by the rain water runoff. This diversion ditch system would probably be adequate to accommodate the occasional heavy showers, but would not have adequate capacity to the extremely heavy rainfall.

Consulting Engineers & Land Surveyors • Suite ~~XXX~~ 4444 Rice Street • Lihue, Kauai Hawaii 96766 • Telephone (808) 245-6749

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PORTUGAL, YAMAMOTO & ASSOCIATES, INC.

3) Limited Exposure: Construction of the pipeline shall be done in sections to limit the exposure to the elements, and, therefore, limit the extent to which the construction would be susceptible to the weather.

4) Replanting: After each section of the pipeline has been constructed to finish grades and tested, the area shall be immediately revegetated. Construction on the next section of pipeline shall not be allowed to proceed until all exposed areas have been adequately protected against erosion.

5) Fabric Barrier: The use of fabric barriers as a filter material to control sedimentation and limit erosion may prove to be an effective tool during the construction of the pipeline.

We acknowledge your right to implement further environmental health requirements on the subject project when more detailed plans are submitted for your review.

Once again, thank you for your review comments of the draft EIS.

Very truly yours,

PORTUGAL & ASSOCIATES, INC.

GLENN Y. YAMAMOTO

GYY:jmi

cc: OEQC
DLNR-DOWALD w/letter dated 9-9-87

JOHN WAIHEE
GOVERNOR

SUZANNE D. PETERSON
CHAIRPERSON, BOARD OF AGRICULTURE

TADASHI TOJO
DEPUTY TO THE CHAIRPERSON

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

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96822-0159

RECEIVED
SEP 10 1987
By

September 8, 1987

MEMORANDUM

To: Dr. Marvin T. Miura, Director
Office of Environmental Quality Control

Subject: Draft Environmental Impact Statement (DEIS) for
Upper Makaleha Springs Water Resource Development
Division of Water and Land Development
Department of Land and Natural Resources
TMK: 4-6-01: por. 1 Kapaa, Kauai
Area: unknown

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

According to the DEIS, the applicant proposes to capture the source of the Upper Makaleha Springs and pipe it to an existing water tank for domestic use. The amount of diversion is said to be about one-sixth of Makaleha Stream's total streamflow (DEIS, page 10).

The Lihue Plantation Company has a surface water diversion dam downstream of the proposed source development that is operated pursuant to conditions set forth in G.L. S-3827. The diverted water is used to irrigate sugarcane fields in the Kealia area. According to a letter from the Lihue Plantation to the Board of Land and Natural Resources, the Plantation's concern is that during the dry months of the year, the proposed diversion of water for domestic use may "...pose a threat to

future crop viabilities in that (Kealia) area" (DEIS, Section 11). Neither specification of the potential adverse impacts on the Plantation nor mitigating factors have been addressed in the DEIS. We strongly suggest that both issues be fully addressed in the EIS.

Thank you for the opportunity to comment.

for SUZANNE D. PETERSON
Chairperson, Board of Agriculture

cc: Portugal and Associates, Inc.
DLNR

PORTUGAL, ~~IBARRA~~ & ASSOCIATES, INC.

September 21, 1987

MS. SUZANNE D. PETERSON, CHAIRPERSON
BOARD OF AGRICULTURE
DEPARTMENT OF AGRICULTURE
STATE OF HAWAII
1428 SOUTH KING STREET
HONOLULU, HAWAII 96814-2512

Re: Draft Environmental Impact Statement - Review, Upper Makaleha Springs Water Resource Development, Kapaa, Kauai, Hawaii.

Dear Ms. Peterson:

Thank you for your review comments of the draft EIS for the subject project as provided in your letter to Dr. Marvin T. Miura, Director, OEQC dated September 8, 1987.

The Lihue Plantation Company, through provisions in General Lease S-3827, presently diverts nearly all of the surface water from the Makaleha Stream. The subject project proposes to capture and utilize up to 1.0 MGD for domestic purposes. Provisions for such a withdrawal are provided in said General Lease S-3827.

You have indicated in your letter that you believe "neither specification of the potential adverse impacts on the Plantation (Lihue Plantation) nor mitigating factors have been addressed in the draft EIS.

We offer the following comments:

Potential Adverse Impacts:

Based on the assumption that the base flow serving the Lihue Plantation Company's Makaleha Spring water irrigation system shall be reduced by 16%, the maximum adverse impact would be a 16% reduction of cane lands in the affected area.

Mitigating Factors:

With the withdrawal of 1.0 MGD for domestic purposes, we have assumed Lihue Plantation Company's surface diversion

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irrigation system should experience an approximate one to one reduction in the quantity of water available for agricultural purposes.

No affirmative mitigating factors can be presented to provide immediate relief of the proposed withdrawal of water from the irrigation system.

However, there are some areas where further investigation might be warranted in order to insure that the irrigation water user's transmission and storage system utilizes the most effective and efficient use of the <u>available</u> water with minimal waste. Some of these areas are:

1) Conduct field reconnaissance and study to identify portions of the irrigation transmission and storage systems where leaks and/or seepage are suspected;

2) Take appropriate measures to insure that the irrigation system makes the most efficient use of the water;

3) Where leaks in the earthen ditches are suspected, due to deterioration of its walls and/or the presence of excessively porous material along the ditch walls, investigate the possibility of converting all or portions of the open ditch system to a closed conduit system and/or a lined ditch system;

4) If excessive water loss is suspected at the storage facilities, investigate the possibility of providing a lined basin; and

5) Investigate the possibility of expanding the use of more water efficient irrigation systems like the "drip system".

PORTUGAL, IDARA & ASSOCIATES, INC.

MS. SUZANNE D. PETERSON, CHAIRPERSON
Page 3
September 21, 1987

Once again, thank you for your review comments on the draft EIS for the subject project.

Very truly yours,

PORTUGAL & ASSOCIATES, INC.

GLENN Y. YAMAMOTO

cc: OEQC
DLNR-DOWALD w/letter dated 9-8-87

JOHN WAIHEE
GOVERNOR OF HAWAII

RECEIVED
SEP - 4 1987
By

WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

HERBERT K. LANDGRAF
DEPUTY

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

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

SEP 3 1987

DOC. NO.: 1094E
FILE NOs.: 88-45

Honorable Marvin T. Miura, Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

SUBJECT: Draft Environmental Impact Statement (EIS), Upper Makaleha Springs Water Resource Development, Kapaa, Kauai

Thank you for the opportunity to review the EIS cited above. We offer the following comments:

Aquatic Resources Concerns:

We understand that the primary purpose of the Kealia Forest Reserve is to serve as a source of water supply and that the project is consistent with such purpose. We concur that the use of the springwater for domestic purposes is more desirable than for irrigation purposes.

We suggest that the system be operated to insure water flow be provided in the Stream for aquatic resources. The Biological Reconnaissance study in the document indicates that only small numbers of the native species occur above the diversion and that the lower Makaleha and Kapaa Streams are of poor quality and highly degraded. These conditions are created by the existing diversion and water use practices which are not conducive to the diadromous native species. Accordingly, with the inserted release of sufficient quantities of springwater during all times of the year, aquatic fauna in Makaleha Stream should be protected.

Forestry and Wildlife Concerns:

Kauai District Forester and Wildlife Biologist corresponded with the applicant at the pre-EIS stage.

The current draft EIS adequately assesses the flora and fauna concerns and we agree with the conclusions.

Thank you for your consideration of our concern.

Very truly yours,

WILLIAM W. PATY, Chairperson
Board of Land and Natural Resources

cc: Portugal & Associates, Inc.

PORTUGAL, IBARRA & ASSOCIATES, INC.

September 21, 1987

MR. WILLIAM W. PATY, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES
STATE OF HAWAII
P. O. BOX 621
HONOLULU, HAWAII 96809

Re: Draft Environmental Impact Statement - Review, Upper Makaleha Springs Water Resource Development, Kapaa, Kauai, Hawaii.

Dear Mr. Paty:

Thank you for your review comments of the draft EIS for the subject project as provided in your letter to Dr. Marvin T. Miura, Director, OEQC dated September 3, 1987.

We offer the following response to your comments.

Aquatic Resources Concerns:

We are pleased to note that you concur with our belief that the use of valuable spring water resources of the Kealia Forest Reserve for "domestic purposes is more desirable than for irrigation purposes".

Your suggestion that the domestic water collection system be operated in such a manner that flow to the stream for aquatic resources be insured has been noted. We concur with the belief that the diversion of the stream waters for irrigation purposes was probably the major contributor to the degradation of the aquatic environment in the lower Makaleha and Kapaa Streams. We also concur with your belief that "with the inserted release of sufficient quantities of spring water during all times of the year, aquatic fauna in Makaleha Stream should be protected". Therefore, it may be prudent to reserve sufficient water for stream flow to protect the aquatic environment. However, there are competing "users" for the valued water supply, namely the domestic consumers, the aquatic habitants and Lihue Plantation Company (for irrigation purposes). The allocation of water between competing users would pose a serious problem during the periods of extremely dry weather, when the water level in the stream is well below

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PORTUGAL & ASSOCIATES, INC.

that adequate to satisfy the domestic (potable), agricultural and environmental needs.

Forestry and Wildlife Concerns:

We are pleased to hear that the current draft EIS adequately assesses the flora and fauna concerns of the Kauai District Forester and Wildlife Biologist.

Once again, thank you for your review comments on the draft EIS.

Very truly yours,

PORTUGAL & ASSOCIATES, INC.

GLENN Y. YAMAMOTO

cc: OEQC
DLNR-DOWALD w/letter dated 9-3-87

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01

Portugal & Associates, Inc.

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AUG 28 1987

United States
Department of
Agriculture

Soil
Conservation
Service

Lihue Field Office
4334 Rice St, Rm 104
Lihue, HI 96766

August 27, 1987

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
465 S. King St., Room 104
Honolulu, HI 96813

Dear Dr. Miura:

SUBJECT: Draft Environmental Impact Statement
Upper Makaleha Springs
Water Resource Development

I received your request to review the above-mentioned EIS document. I have no further comments to offer.

Sincerely,

Laurie K. Ho

Laurie K. Ho
Soil Conservationist

cc:
Portugal & Associates, 4444 Rice St., Suite 109, Lihue, HI 96766

102

PORTUGAL, ~~IBARA~~ & ASSOCIATES, INC.

September 18, 1987

MS. LAURIE K. HO
SOIL CONSERVATIONST
U.S. DEPARTMENT AGRICULTURE
SOIL CONSERVATION SERVICE
4334 RICE STREET, SUITE 104
LIHUE, HAWAII 96766

Re: Environmental Impact Statement-Makaleha Springs Water Development

Dear Ms. Ho:

Thank you for review of the draft EIS for the subject project as stated in your letter to Office of Environmental Quality Control, dated August 27 1987.

Very truly yours,

PORTUGAL & ASSOCIATES, INC.

GLENN Y. YAMAMOTO

GYY:jmi

cc: Office of Environmental Quality Control
DLNR - DOWALD w/letter dated 8-27-87

Consulting Engineers & Land Surveyors • Suite ~~220~~ 4444 Rice Street • Lihue, Kauai, Hawaii 96766 • Telephone: (808) 245-6749

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D8

JOHN WAIHEE
GOVERNOR

File

Portugal & Associates, Inc.
RECEIVED
AUG 14 1987
By

RUSSELL N. FUKUMOTO
EXECUTIVE DIRECTOR

STATE OF HAWAII
Department of Human Services
HAWAII HOUSING AUTHORITY
P. O. BOX 17907
HONOLULU, HAWAII 96817

IN REPLY REFER TO:
87:PLNG/3452

August 12, 1987

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Re: Draft Environmental Impact Statement (dEIS) for the Proposed Upper Makaleha Springs Water Resource Development

We have reviewed the dEIS for the subject water resource development and have no comments to offer.

Thank you for consulting us.

Sincerely,

RUSSELL N. FUKUMOTO
Acting Executive Director

cc: Portugal & Associates, Inc.

170

104

PORTUGAL, ~~IBARA~~ & ASSOCIATES, INC.

September 18, 1987

MR. RUSSELL N. FUKUMOTO
ACTING EXECUTIVE DIRECTOR
DEPARTMENT OF HUMAND SERVICES
HAWAII HOUSING AUTHORITY
P. O. BOX 17907
HONOLULU, HAWAII 96817

Re: Environmental Impact Statement-Makaleha Springs Water Development

Dear Mr. Fukumoto:

Thank you for review of the draft EIS for the subject project as stated in your letter to Office of Environmental Quality Control, dated August 12, 1987.

Very truly yours,

PORTUGAL & ASSOCIATES, INC.

GLENN Y. YAMAMOTO

GYY:jmi

cc: Office of Environmental Quality Control
DLNR - DOWALD w/letter dated 8-12-87

Consulting Engineers & Land Surveyors • Suite ~~XXX~~ 4444 Rice Street • Lihue, Kauai, Hawaii 96766 • Telephone (808) 245-6749

HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
KAUAI DISTRICT
P. O. BOX 1671
LIHUE, KAUAI, HAWAII 96766

RECEIVED
AUG 12 1987
By

August 10, 1987

IN REPLY REFER TO
A-3c

MEMORANDUM

TO: ROGER EVANS, Administrator, O.C.E.A.

THRU: RONALD L. WALKER, Acting Administrator

FROM: RALPH E. DAEHLER, District Forester, Kauai

SUBJECT: Environmental Review - Upper Makaleha Springs Water Development
(ref. OCEA memo dtd July 30, 1987)

Wildlife Biologist Thomas Telfer and I corresponded previously with Portugal Associates, Inc. at the pre E.I.S. development stage.

The current draft environmental impact statement adequately assesses the flora and fauna concerns and we agree with the conclusions.

RALPH E. DAEHLER
District Forester, Kauai

Attachs: memo dtd 7/30/87 with/attachs.

cc: Portugal Associates, Inc.

PORTUGAL, ~~XIBARRA~~ & ASSOCIATES, INC.

September 18, 1987

MR. RALPH E. DAEHLER
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
KAUAI DISTRICT
P. O. BOX 1671
LIHUE, HAWAII 96766

Re: Environmental Impact Statement-Makaleha Springs Water Development

Dear Mr. Daehler:

Thank you for review of the draft EIS for the subject project as stated in your letter to Mr. Roger Evans, Administrator, O.C.E.A, dated August 10, 1987.

Very truly yours,

PORTUGAL & ASSOCIATES, INC.

GLENN Y. YAMAMOTO

GYY:jmi

cc: with copies of letters
Office of Environmental Quality Control
DLNR - DOWALD

Consulting Engineers & Land Surveyors • Suite ~~XXX~~ 4444 Rice Street • Lihue, Kauai, Hawaii 96766 • Telephone (808) 245-6749

07

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

REPLY TO
ATTENTION OF:

August 5, 1987

Portugal & Associates, Inc.
RECEIVED
AUG - 6 1987
By

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
465 S. King Street, Room 104
Honolulu, HI 96813

Dear Dr. Miura:

Thank you for the opportunity to review and comment on the draft EIS for Upper Makaleha Springs Water Resource Development. We offer the following comments:

a. The Corps Operations Branch would like the opportunity to review more detailed plans (when available) of the pipeline and road where they cross the stream to determine the need for a Department of the Army permit.

b. The parcel is shown on the attached tax map for the Kealia/Kapaa area. According to the Flood Insurance Study for Kauai County, the parcel is located in Zone X, an area of minimal flooding.

Sincerely,

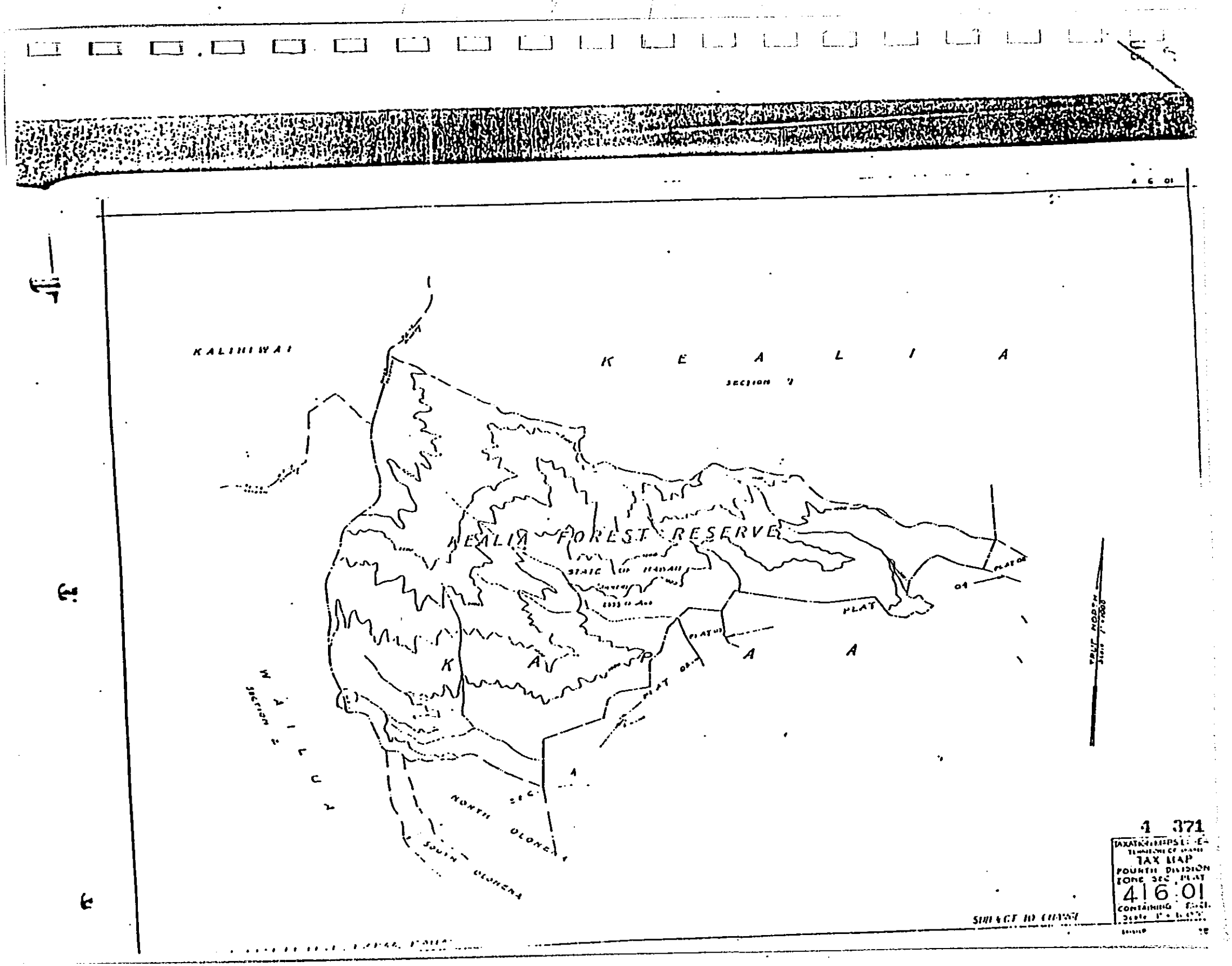
CLARENCE S. FUJII
Deputy Chief, Engineering Division

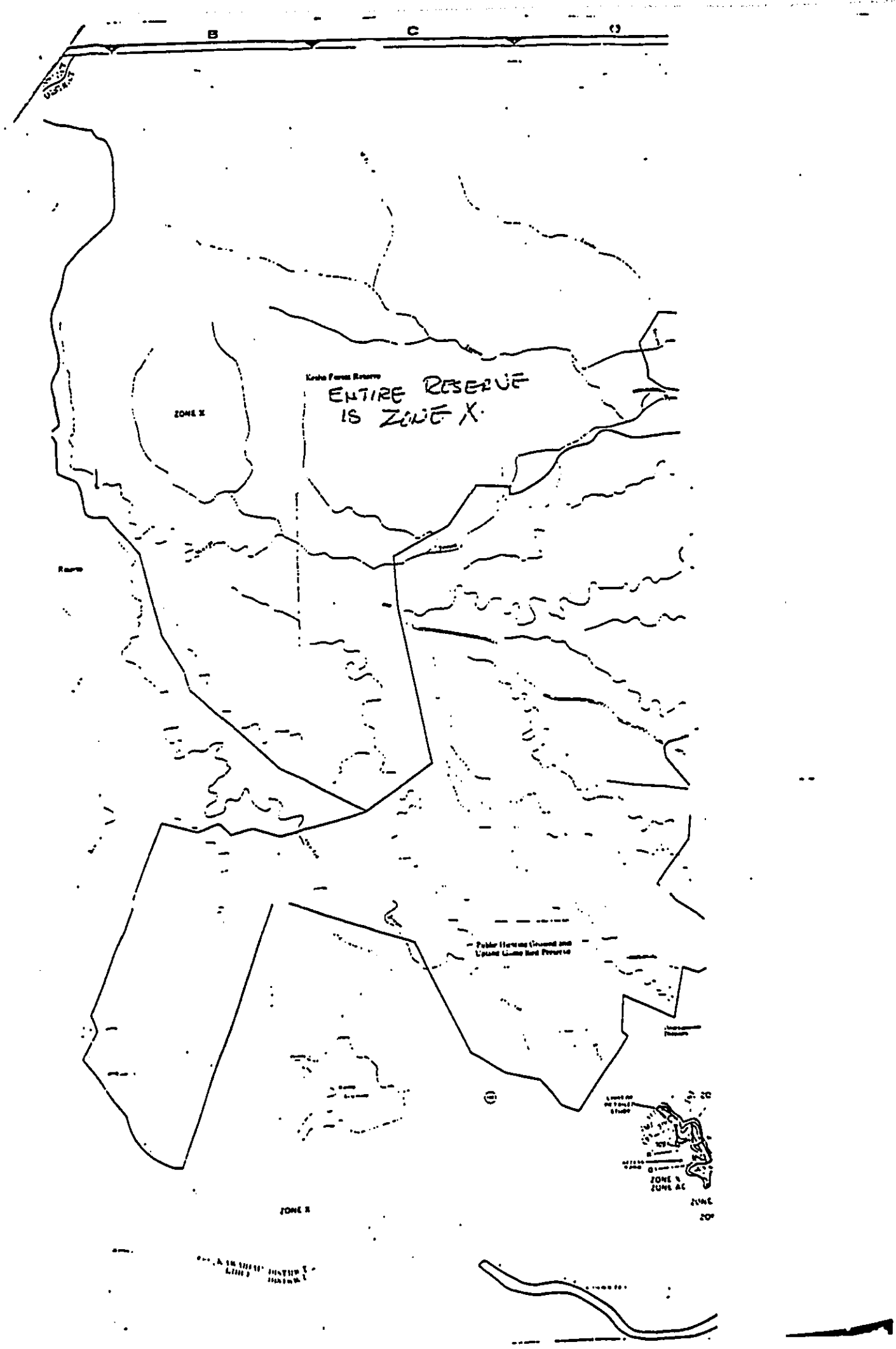
Kisuk Cheung
Chief, Engineering Division

Enclosure

Copy Furnished:

Portugal & Associates, Inc.
4444 Rice Street, Suite 109
Lihue, Kauai 96766


KALIHIWAI
K E A L I A
SECTION 2
KEALIA FOREST RESERVE
STATE OF HAWAII
PLAT
K A P A A
W A I L U A
SECTION 2
NORTH OLONENA
SOUTH OLONENA
SUBJECT TO CHANGE
4 371
TAX MAP
FOURTH DIVISION
ZONE SEC PLAT
416 01


B
C
ZONE X
ENTIRE RESERVE
IS ZONE X.
ZONE X

110

PORTUGAL, ~~IBARRA~~ & ASSOCIATES, INC.

September 21, 1987

MR. KISUK CHEUNG, CHIEF
ENGINEERING DIVISION
DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER, HAWAII 96858-5440

Re: Draft Environmental Impact Statement - Review, Upper Makaleha Springs Water Resource Development, Kapaa, Kauai, Hawaii.

Dear Mr. Cheung:

Thank you for your review comments of the draft EIS for the subject project as provided in your letter to Dr. Marvin T. Miura, Director, OEQC dated August 5, 1987.

More detailed plans of the pipeline and road where they cross the stream shall be sent to you for your review and comments when they become available.

Thank you for your confirmation that the subject project is in a parcel identified as being within Zone X, "an area of minimal flooding" according to the Flood Insurance Study for the County of Kauai.

Very truly yours,

PORTUGAL & ASSOCIATES, INC.

GLENN Y. YAMAMOTO

GYY:jmi

cc: OEQC
DLNR-DOWALD w/letter dated 8-5-87

Consulting Engineers & Land Surveyors • Suite XXX 4444 Rice Street • Lihue, Kauai, Hawaii 96766 • Telephone (808) 245-6749

DEPARTMENT OF THE NAVY
COMMANDER
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860-5020

RECEIVED
AUG - 3 1987
By: 5090

IN REPLY REFER TO:
Ser N5B/1656
30 JUL 1987

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, HI 96813

Dear Dr. Miura:

DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)
UPPER MAKALEHA SPRINGS WATER RESOURCE DEVELOPMENT

The Draft EIS on the Upper Makaleha Springs Water Resource Development has been reviewed and we have no comments. Since we have no further use for the EIS, it is being returned to your office.

Thank you for the opportunity to review the Draft.

Sincerely,

T. L. Ferrier

T. L. FERRIER
Captain, U.S. Navy
Chief of Staff

Enclosure

Copy to:
Portugal & Associates, Inc.
4444 Rice Street, Suite 109
Lihue, Kauai, HI 96766

12

PORTUGAL, ~~XXXXX~~ & ASSOCIATES, INC.

September 18, 1987

T. L. FERRIER
CAPTAIN, U.S. NAVY
CHIEF OF STAFF
DEPARTMENT OF THE NAVY
NAVAL BASE PEARL HARBOR
BOX 110
HONOLULU, HAWAII 96860-5020

Re: Environmental Impact Statement-Makaleha Springs Water Development

Dear Capt. Ferrier:

Thank you for review of the draft EIS for the subject project as stated in your letter to Office of Environmental Quality Control, dated July 30, 1987.

Very truly yours,

PORTUGAL & ASSOCIATES, INC.

GLENN Y. YAMAMOTO

GYY:jmi

cc: Office of Environmental Quality Control
DLNR - DOWALD w/letter dated 7-30-87

Consulting Engineers & Land Surveyors • Suite ~~230~~ 4444 Rice Street • Lihue, Kauai, Hawaii 96766 • Telephone (808) 245-6749

109

13

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816-4495

Portugal & Associates, Inc.
RECEIVED
JUL 31 1987
By

July 29, 1987

Engineering Office

Dr. Marvin T. Miura, Director
Office of Environmental
Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Upper Makaleha Springs Water Resource Development
Kapaa, Kauai

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

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

Yours truly,

signed

Jerry M. Matsuda
Major, Hawaii Air
National Guard
Contr & Engr Officer

Enclosure

cc: Portugal & Associates, Inc.

14

PORTUGAL, ~~XXXXX~~ & ASSOCIATES, INC.

September 18, 1987

MR. JERRY M. MATSUDA
MAJOR, HAWAII AIR NATIONAL GUARD
DEPARTMENT OF DEFENCE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD
HONOLULU, HAWAII 96816-4495

Re: Environmental Impact Statement-Makaleha Springs Water Development

Dear Mr. Matsuda:

Thank you for review of the draft EIS for the subject project as stated in your letter to Office of Environmental Quality Control, dated July 29, 1987.

Very truly yours,

PORTUGAL & ASSOCIATES, INC.

GLENN Y. YAMAMOTO

GYY:jmi

cc: Office of Environmental Quality Control
DLNR - DOWALD w/letter dated 7-29-87

Consulting Engineers & Land Surveyors • Suite ~~XXX~~ 4444 Rice Street • Lihue, Kauai, Hawaii 96766 • Telephone. (808) 245-6749

115

Portugal & Associates, Inc.
RECEIVED
JUL 30 1987
By

(P)1618.7

JUL 29 1987

Dr. Marvin T. Miura
Director
Office of Environmental
Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Subject: Upper Makaleha Springs
Water Resource Development

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

Very truly yours,

T. Tominaga

TEUANE TOMINAGA
State Public Works Engineer

SS:jk
cc: Portugal & Associates, Inc.

16

PORTUGAL, ~~XXXXX~~ & ASSOCIATES, INC.

September 21, 1987

MR. TEUANE TOMINAGA
STATE PUBLIC WORKS ENGINEER
DEPARTMENT OF ACCOUNTING &
GENERAL SERVICES
P. O. BOX 119
HONOLULU, HAWAII 96810-0119

Re: Draft Environmental Impact Statement - Review, Upper Makaleha Springs Water Resource Development, Kapaa, Kauai, Hawaii.

Dear Mr. Tominaga:

Thank you for your review of the draft EIS for the subject project as stated in your letter to to Dr. Marvin T. Miura, Director, OEQC dated July 29, 1987.

Very truly yours,

PORTUGAL & ASSOCIATES, INC.

GLENN Y. YAMAMOTO

GYY:jml

cc: OEQC
DLNR-DOWALD w/letter dated 7-29-87

Consulting Engineers & Land Surveyors • Suite ~~XXX~~ 4444 Rice Street • Lihue, Kauai, Hawaii 96766 • Telephone (808) 245-6749

File 01 FEB

JOHN WAIHEE
GOVERNOR

DIRECTOR
EDWARD Y. HIRATA

DEPUTY DIRECTORS
JOHN K. UCHIMA
RONALD N. HIRANO
DAN T. KOCHI

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

IN REPLY REFER TO:
STP 8.2237

July 29, 1987

Dr. Marvin Miura, Director
Office of Environmental Quality Control
465 South King Street, Room 115
Honolulu, Hawaii 96813

Dear Dr. Miura:

Draft Environmental Impact Statement, Upper Makaleha Springs Water Resource Development, Kapaa, Kauai

We have reviewed the subject draft EIS and find the proposed action will have no significant adverse effect on any of the Department of Transportation's programs and facilities.

Thank you for this opportunity to review and comment on this draft EIS.

Very truly yours,

Edward Y. Hirata
Director of Transportation

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

August 18, 1987

Portugal & Associates, Inc.
RECEIVED
AUG 19 1987
By

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
465 S. King Street, Room 104
Honolulu, Hawaii 96813

Dear Mr. Miura:

We have reviewed the Environmental Impact Statement (EIS) that was prepared pursuant to Chapter 343, Hawaii Revised Statutes and Chapter 11-200, Administrative Rules and have no comments.

Thank you for the opportunity to review the notice.

Sincerely,

Charles J. Ewart
Acting District Chief

cc: Portugal & Associates, Inc.

PORTUGAL, ~~XXXXX~~ & ASSOCIATES, INC.

September 18, 1987

MR. CHARLES J. EWART
ACTING DISTRICT CHIEF
UNIVERSITY OF HAWAII
WATER RESOURCES DIVISION
P. O. BOX 50L66
HONOLULU, HAWAII 96850

Re: Environmental Impact Statement-Makaleha Springs Water Development

Dear Ewart:

Thank you for review of the draft EIS for the subject project as stated in your letter to Office of Environmental Quality Control, dated August 18 1987.

Very truly yours,

PORTUGAL & ASSOCIATES, INC.

GLENN Y. YAMAMOTO

GYY:jmi

cc: Office of Environmental Quality Control
DLNR - DOWALD w/letter dated 8-18-87

Consulting Engineers & Land Surveyors • Suite ~~XXX~~ 4444 Rice Street • Lihue, Kauai, Hawaii 96766 • Telephone (808) 245-6749

UNITED STATES
DEPARTMENT OF
AGRICULTURE

SOIL
CONSERVATION
SERVICE

P. O. BOX 50004
HONOLULU, HAWAII
96850

August 7, 1987

Portugal & Associates, Inc.
RECEIVED
AUG 11 1987
By

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, HI 96813

Dear Dr. Miura:

Subject: Draft EIS - Upper Makaleha Springs Water Resource Development

The above-mentioned document has been reviewed as requested. We have no further comments to offer, except to endorse the comments made by our Lihue Field Office personnel.

Sincerely,

ACTING

RICHARD N. DUNCAN
State Conservationist

cc:
Portugal & Associated, Inc., 4444 Rice St., Suite 109, Lihue, Kauai, HI 96766

PORTUGAL, ~~XXXXX~~ & ASSOCIATES, INC.

September 18, 1987

MR. RICHARD N. DUNCAN
STATE CONSERVATIONST
U.S. DEPARTMENT AGRICULTURE
SOIL CONSERVATION SERVICE
P. O. BOX 50004
HONOLULU, HAWAII 96850

Re: Environmental Impact Statement-Makaleha Springs Water Development

Dear Mr. Duncan:

Thank you for review of the draft EIS for the subject project as stated in your letter to Office of Environmental Quality Control, dated August 7, 1987.

Very truly yours,

PORTUGAL & ASSOCIATES, INC.

GLENN Y. YAMAMOTO

GYY:jmi

cc: Office of Environmental Quality Control
DLNR - DOWALD w/letter dated 8-7-87

Consulting Engineers & Land Surveyors • Suite ~~XXX~~ 4444 Rice Street • Lihue, Kauai, Hawaii 96766 • Telephone (808) 245-6749

121

JOHN WAIHEE
GOVERNOR OF HAWAII

DISTRICT OFFICES

WEST HAWAII OFFICE
P. O. BOX 125
KAMUELA, HAWAII 96743

EAST HAWAII OFFICE
160 BAKER STREET
HILO, HAWAII 96720

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

DISTRICT OFFICES

MAUI OFFICE
P. O. BOX HHH
WAILUKU, MAUI 96793

MOLOKAI OFFICE
P. O. BOX 196
HOOLEHUA, MOLOKAI 96729

KAUAI OFFICE
P. O. BOX 332
LIHUE, KAUAI 96766

September 15, 1987

Portugal & Associates, Inc.
RECEIVED
OCT - 6 1987
By

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

SUBJECT: EIS: Upper Makaleha Springs
Water Resource Development

This project seems to be a sensible, cost-effective means of tapping an under-used water resource for a large growth area. Because this source already provides some supply to a Hawaiian Home Lands lessee, we must state the following concerns, which are not reported in the environmental impact statement. Foremost, further development of Makaleha Springs should reserve a portion of the yield to Department of Hawaiian Home Lands' (DHHL's) beneficiaries.

DHHL has both a constitutional and a development interest in Makaleha Springs water. The Hawaiian Homes Commission Act authorizes DHHL "to use, free of all charge, government-owned water not covered by any water license or covered by a water license issued after the passage of this Act or covered by a water license issued previous to the passage of this Act but containing a reservation of such water for the benefit of the public." (Sec. 221 (c), Hawaiian Homes Commission Act, 1920, as amended.) The proposed Anahola Development Plan calls for additional water development, primarily for domestic homestead use and secondarily for agricultural uses.

Further, the viability of sugar cultivation on Lihue Plantation leased lands impacts DHHL revenues, as 30% of all State sugar lease receipts feed the Native Hawaiian Rehabilitation Fund. We note the concerns of Lihue Plantation Company that the proposed action will reduce the water available for its sugarcane cultivation and possibly infringe on its lease rights under General Lease S-3827 for the agriculture lands at Kealia.

22

Finally, should Lihue Plantation find it necessary to consolidate activities, homestead lands might be opened up sooner. With Makaleha water available, this will have a significant impact on current planning for the sizing of new well development.

For these reasons, we are concerned with the long-term distribution of Makaleha Springs water. They are plainly issues that need to be addressed in the environmental impact statement.

The document does not discuss storage options, although it appears to us that there may be significant advantages to increasing capacity, especially for residential use during the dry season. Such storage might be fed by the proposed spring intake, during the period when spring waters are not being diverted for agriculture.

Conservation measures are mentioned as integral to any water supply program rather than as alternatives to the project, but none are discussed. It seems to us that currently available fixtures, especially coupled with water rate incentives, could significantly impact overall demand, at very low cost.

Thank you for the opportunity to comment. You may refer any questions to Charley Ice of our Planning Office at 548-8785.

Sincerely,

Ilima A. Piianaia, Chairman
Hawaiian Homes Commission

IAP:CI:eh

23

PORTUGAL & ASSOCIATES, INC.
P.O. Box 807
Lihue, Kauai, Hawaii 96766
Tel: (808) 245 - 6749
Fax: (808) 246 - 9391

November 25, 1990

Ms. Ilima A. Piianaia
Chairperson
Hawaiian Homes Commission
State Department of Hawaiian Homes Lands
P.O. Box 1879
Honolulu, Hawaii 96805

Dear Ms. Piianaia:

Subject: Draft Environmental Impact Statement
Upper Makaleha Springs Water Resource Development Project
Kapaa, Kauai

We are in receipt of your correspondence to Dr. Marvin Miura dated September 15, 1987. We appreciate the time that you and other members of your department have expended to review this project. The project has been considerably delayed to our performance of additional field studies and related modifications to our preliminary design plans and draft EIS document.

The final EIS addresses the loss in flows presented diverted to Lihue Plantation Company for the irrigation of some 1000 acres of sugar cane. Since preparation of the draft EIS, my staff has met with representatives of the East Kauai Water Company, Ltd.; however, these discussions have not yielded any definitive information concerning the true impact upon sugarcane field irrigation. However, our estimates in the final EIS indicate that, in the worst case, the diversion of water for domestic supplies would adversely affect some 75-150 acres of sugar cane lands in production.

In terms of the use of HHL land for residential purposes, we concur that the development of additional water source(s) should only expedite such proposals. The delay of such development would only further deter the potential use of HHL lands for residential purposes.

In terms of water storage options, we do not share your concept that additonal water storage would increase capacity because the existing 1.0 mgd is often depleted of its present storage capacity.

We agree that water conservation is an integral part of any water supply program. "Water savings" generated via a conservation program would help the present water system better accommodate maximum day demands. However, anticipated population growth in the Kapaa-Wailua area during the next 20 years cannot be supported by only "water savings" obtained through water conservation. Consequently, water conservation was identified as a viable project alternative.

120
124

Since your review of the draft EIS, the performance of additional field studies has led us to somewhat modify the proposed project. Specifically, the earlier concept of constructing an access road along Makaleha Stream has been eliminated from the overall project scope. Further, the contractor will not be permitted to mobilize land vehicles past the mauka end of Kahuna. Consequently, the stream will not be unnecessarily impacted by construction activities and roadway development.

Many thanks for your thoughtful comments which were very useful in our preparation of the final EIS. Thank you also for your patience in receiving our response to your comments to the draft EIS. However, we feel that the delay has been fruitful in terms of reducing the potential environmental consequences of the project and refining the overall approach to water resource development in Kauai's Kapaa-Wailua area.

Should you have any questions, please contact us at your convenience.

Sincerely,

Cesar C. Portugal

Cesar C. Portugal
President-Treasurer

United States Department of the Interior

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

RECEIVED
SEP 25 1987
By Room 6307
DIV. OF WATER & LAND DEVELOPMENT
SEP 8 1987
87 SEP 10 P 4:39

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Re: Draft Environmental Impact Statement, Upper Makaleha Springs Water Resource Development Project, Kapaa, Kauai

Dear Dr. Miura:

We have reviewed the referenced Draft Environmental Impact Statement (EIS) and offer the following comments for your consideration.

General Comments

No construction road shall be built.

The proposed diversion of approximately 1.1 cubic feet per second from the Upper Makaleha Springs may decrease streamflow in Makaleha Stream. The reduction in streamflow may reduce the amount of habitat available for native freshwater species such as o'opu alamo'o (Lentipes concolor), o'opu nakea (Awaous stamineus), and 'opae kala'ole (Atyoida bisulcata). Road construction and increased human activity within the project site may reduce the stream's value as habitat for the endangered Hawaiian Duck (Anas wyvilliana).

The State Water Code provides for the dedication of instream flows to protect and maintain fishery and wildlife resources by establishing instream flow standards. The Water Code requires that interim instream flows for Kauai be established by December 31, 1987.

Specific Comments

a. Page 4. Proposed Structures. The adjustable intake structure that regulates the amount of water entering the basin is not described. A description of the intake structure should be described in the Draft EIS.

b. Page 7. Drill a New Well at Akulikuli Ridge. The alternative of well drilling at Akulikuli Ridge is not considered since "recent geological studies suggest there is little or no high level dike-confined groundwater in the Makaleha area." These geological studies should be referenced.

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

c. Page 9. Physical Aspects of Makaleha Stream Valley. The Draft EIS should provide additional information on the frequency and magnitude of water diversion by Lihue Plantation on stream flow in Makaleha Stream.

d. Page 10. The assumption that Upper Makaleha Springs contributes approximately 17% of the streamflow in Makaleha Stream is based on "few measurements." A more complete study of the discharge of Upper Makaleha Springs and its relative contribution to Makaleha Stream should be conducted. Reliable information on the contribution of spring flow on Makaleha Stream is important in determining the magnitude of potential adverse impacts to stream habitats and water quality.

e. Page 18. Long Term Effects. This section states that additional springwater will be released into the stream if the new diversion affects stream fauna. However, a monitoring program to determine adverse impacts to native stream fauna is not described. The Draft EIS should discuss the monitoring study.

f. The alignment of the access road along Makaleha Stream should be coordinated with our office and the Division of Forestry and Wildlife to minimize potential adverse impacts to stream habitats.

Summary Comments

The Draft EIS does not adequately address the following issues:

a. The relationship of the proposed springs diversion project to the State Water Code and instream flow standards is not discussed. Specifically, the Draft EIS should discuss the establishment of biologically defensible instream flow standards to protect native stream fauna and endangered Hawaiian waterbirds in the affected stream reach.

b. The contribution of springflow from the Upper Makaleha Springs to streamflow in Makaleha Stream is not well documented. We recommend additional hydrological studies to determine the contribution of springwater to streamflow.

If the project is funded, authorized, or carried out by any Federal agency, and if the project may affect any listed endangered or threatened species, Section 7 of the Endangered Species Act requires that such a project be reviewed by the Service to determine the extent of possible impacts on those species.

Re: Makaleha Springs Diversion Project

We appreciate the opportunity to comment.

Sincerely,

William R. Kramer
for Ernest Kosaka
Project Leader, Environmental Services
Pacific Islands Office

cc: DLNR
✓DOWALD
CE, Operations Branch

PORTUGAL & ASSOCIATES, INC.
P.O. Box 807
Lihue, Kauai, Hawaii 96766
Tel: (808) 245 - 6749
Fax: (808) 246 - 9391

November 25, 1990

Mr. Ernest Kosaka
Project Leader, Environmental Services
Pacific Islands Office
U.S. Fish and Wildlife Service
300 Ala Moana Boulevard
P.O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Kosaka:

Subject: Draft Environmental Impact Statement
Upper Makaleha Springs Water Resource Development Project, Kapaa, Kauai

Thank you for your letter to Dr. Marvin Miura dated September 8, 1987. We appreciate the time that you and your staff took to review this project. The project has been delayed to our performance of additional field studies and related modifications to our preliminary design plans and draft EIS document.

The comments that you and your staff provided to us assisted us greatly in our substantive revision of the draft EIS. In preparation of the final EIS, each of your general comments prompted the inclusion of greater analyses and discussion concerning the impact of decreased streamflow upon native aquatic resources and the surface water quality of Makaleha Stream.

Additional information has also been presented concerning the proposed intake structure, the physical characteristics of Makaleha Stream and the adjoining valley, the contribution of Makaleha Spring flows to overall Stream flows, and the relationship of the proposed project to the instream flow standards.

More significantly, the performance of additional field studies has led us to modify the proposed project. Specifically, the earlier concept of constructing an access road along Makaleha Stream has been eliminated from the overall project scope. Further, the contractor will not be permitted to mobilize land vehicles past the mauka end of Kahuna. Consequently, the stream will not be unnecessarily impacted by construction activities and roadway development.

Thank you for your patience in receiving our response to your comments to the draft EIS. However, we feel that the delay has been fruitful in terms of reducing the potential environmental consequences of the project.

Should you have any questions, please contact us at your convenience.

Sincerely,

Cesar C. Portugal

Cesar C. Portugal
President-Treasurer

RECEIVED AS FOLLOWS

THE LIHUE PLANTATION CO., LTD.

AN amfac COMPANY

P.O. BOX 751
LIHUE, HAWAII 96766

September 2, 1987

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
State of Hawaii
465 S. King Street, Room 104
Honolulu, Hawaii 96813

Subject: EIS for Proposed Upper Makaleha Springs Water Resource Development

Dear Dr. Miura:

We are in receipt of the draft Environmental Impact Statement for the Upper Makaleha Springs Water Development Project. The Lihue Plantation Company, Limited (LPCo) would like to make the following comments:

- LPCo is deeply concerned about this project because of the fact that this development will permanently reduce the amount of available irrigation water in the Kealia area of the plantation.

- No replacement water is available to the plantation in this section. Further, the Kealia portion of the plantation is already short of water during certain times of the year.

- LPCo would like to see the State and County develop new sources of water and not take an existing water source upon which the plantation depends. The proposed project will take water which is part of the base flow of the Makaleha Ditch system. This base flow is the most important part of an irrigation system since this portion of flow is available at all times. Reducing the base flow will adversely impact the amount of land which can be economically cultivated in Kealia.

- Page 15, Section 7 states that "the dubious future of the sugar industry" is cause enough to take irrigation water for domestic use. By taking irrigation water, the State will only harm an already troubled agricultural [redacted] The [redacted] be accomplished by [redacted] than developing [redacted] water. We [redacted] should pursue the development [redacted] domestic [redacted]

RECEIVED AS FOLLOWS

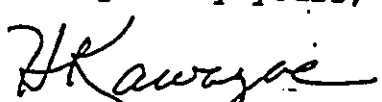
- The land which this water irrigates is dedicated agricultural land. If this project proceeds, it is conceivable that LPCo would be in a very difficult position of not having adequate water to irrigate the dedicated ag land. We wish to avoid the occurrence of this type situation.

Our primary objective at LPCo is to continue to remain as a sugar plantation. In order to accomplish this goal, we must continue to protect the resources which we currently utilize. We hope that our concerns will be heard and an alternate source of water can be developed.

Additionally, we have not received a proper response to our February 18, 1987 letter which was sent to the DLNR. This letter was included in the draft EIS with no response. We feel that our concerns raised in that letter, as well as this letter, should be properly addressed before this project advances.

Thank you for this opportunity to comment.

Very truly yours,



Lefty H. Kawazoe
President and Manger

LHK:MB/kk

xc: W. D. Balfour, Jr.
M. Burke
W. Paty, DLNR
Portugal & Associates

JAMES PEDERSEN
PLANNING CONSULTANT
P.O. Box 22
Volcano, Hawaii 96785
Tel/Fax: (808) 967 - 7619

December 30, 1991

Mr. Mike Furukawa
President and Manager
Lihue Plantation Company
P.O. Box 751
Lihue, Kauai, Hawaii 96766

Dear Mr. Furukawa:

Subject: Original Draft Environmental Impact Statement
Upper Makaleha Springs Water Resource Development Project
Kapaa, Kauai, Hawaii

On September 2, 1987, the former president and manager of Lihue Plantation Company provided comments to Dr. Marvin Miura, former director of the State Office of Environmental Quality Control, concerning the original draft EIS for the subject project. It is our understanding that your organization did not receive a response to Mr. Kawazoe's concerns. For this reason, we are providing a formal written response to these comments on behalf of Portugal and Associates, Inc. As you are well aware, we have had more recent discussions with you and Mr. Mike Burke in early November, 1991 concerning this project. In this regard, we appreciate your taking the time to recently discuss this project with you and other members of your organization.

This project has been significantly delayed due to the performance of additional field studies and related modifications to preliminary design plans and the original draft EIS document. The comments that Mr. Kawazoe initially provided to us assisted us greatly in our substantive revision of the original draft EIS. The final EIS was published in December, 1990; however, the expanded content of the final EIS and other related concerns prompted the State Division of Water Resource Management to prepare a revised draft EIS. Since publication of this document by the State is anticipated during the next week or so, you can expect receiving a copy for your review and comment in early 1992.

We recognize that Lihue Plantation Company's continuing concern is the availability of irrigation water for some 1,800 acres of land in the Kealia area. Your existing lease with the State of Hawaii (General Lease S-3827) provides LPCO with the right to divert 50 million gallons per day from the drainage basins of the North Wailua, Kapaa, Anahola, and Hanalei Rivers. This lease expires on May 10, 1994. However, the same lease agreement also provides the State of Hawaii with the right to use up to 1.0 mgd of water from these drainage areas for domestic purposes.

Earlier LPCO concerns expressed concerning the potential impact upon sugar cane cultivation in the Kealia area have clearly been influenced by the more recent decision by LPCO to cease sugar cane cultivation in this area. Potential short-term uses, e.g. pasture, will require significantly reduced irrigation requirements.

Despite changes in your irrigation water requirements, the County of Kauai, Department of Water, has assured us that it will not divert water to the Wailua-Kapaa System if Makaleha Stream discharges are insufficient to meet irrigation water requirements of the Plantation. This commitment has been incorporated as part of the project description provided in the soon-to-be published revised draft EIS.

We again thank you for your patience in receiving our response to your comments to the original draft EIS. Should you have any questions, please contact us at your convenience.

Sincerely,

Jim Pedersen
Principal Planner

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JOHN WAIHEE
GOVERNOR OF HAWAII

WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

LIBERT K. LANDGRAF
DEPUTY

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
P. O. BOX 1671
LIHUE, KAUAI 96766

4 September 1987

Dr. Marvin T. Miura, Director
OEQC
465 S. King St., Rm 104
Honolulu, HI 96813

Subject: Review of the Draft EIS for Upper Makaleha Springs Water Development, Kapaa, Kauai, HI, TMK: 4-6-01:1.

Dear Dr. Miura:

I have reviewed this document to assess the potential negative impacts the proposed project may have on native diadromous species, particularly the rare gobiid fish Lentipes concolor ('o'opu alamo'o). I concur with our Division's previous comments (attached) that sufficient quantities of springwater should be released throughout the year in order to insure adequate instream flows to sustain the native fishes and shrimp, particularly L. concolor. A further reduction in instream flow may disrupt the migratory pathway of native stream animals and cause decreased recruitment and a concomitant decrease in production.

However, the Draft EIS does not state how "an adequate instream flow" will be determined, or who will determine and regulate it? For example, page 18, last para. states that the intake at the springs will be adjustable and, if at times more water is diverted than is acceptable for aquatic life, the intake can be reduced to allow more springwater to flow into the stream. Although water is a renewable resource, its "renewability" is a function of rainfall. It seems unlikely that during a drought that people would give up running water in their houses to small fishes living in the stream!

Although L. concolor was listed as a "Threatened" species by Miller (1972) and as a species of "Special Concern" by Deacon et al. (1979), it is important to realize that by 1986, more than 90% of the 202 species of fish that Deacon recommended to be in need of protection were provided at least partial protection (ie. Special Concern) and 126 species (62%) were fully protected by state or federal law (Johnson 1987). Unfortunately, Hawaii, Alabama, Arkansas, and Louisiana are the only four states in the United States that have not officially listed any fishes as Protected or of Special Concern.

In summary, freshwater is the most limited natural resource that occurs in Hawaii. Because the Hawaiian Islands are the most isolated (geographically) islands in the world, over 70% of the native freshwater fauna is endemic. Stream habitats throughout the state will continue to be degraded by both water development projects (eg. domestic, hydroelectric, and agriculture) and by chemical and biological (ie. alien species) pollution. Although L. concolor has been

RE: Draft EIS for the Upper Makaleha Springs Development

recommended for the endangered species list (Maciolek 1977), currently there is insufficient biological data on which such listing may be warranted (Kinzie et al. 1984). There is a great need to collect baseline data on the biology, ecology and population dynamics of the native Hawaiian stream fauna so that these species can be protected through proper management.

Sincere Aloha,

Don E. Heacock

Donald E. Heacock
Aquatic Biologist, Kauai District

cc. Mr. Paul Kawamoto, Environmental Protection Branch Chief, DAR/DLNR

BIBLIOGRAPHY (note: with the exception of the reference listed below, all others are listed in the Draft EIS).

Johnson, James E. 1987. Protected Fishes of the United States and Canada. American Fisheries Society, Bethesda, Maryland, 42pp.

State of Hawaii
Division of Aquatic Resources
Department of Land & Natural Resources
P.O. Box 1671
Lihue, Kauai, HI 96766

MEMORANDUM 27 July 1990

To: Bill Devick, Program Manager
From: Don Heacock, Kauai Distric Aquatic Biologist
Subject: **Lentipes concolor population in Makaleha Stream, Kauai: potential impacts of proposed groundwater development.**

In March 1990 I surveyed Makaleha Stream (Figure 1 and 2) in order to assess the species composition, relative abundance, and distribution of native macrofauna. Additionally, I wanted to compare the relative abundance of L. concolor with earlier data from this stream collected by Timbol (1986 unpubl. report -attachment 1).

The species composition and relative abundance of stream macrofauna observed in March 1990 are shown in Table (1).
Note that although atyid shrimp were seen at each sampling location this species was not recorded because visual estimates of this species are not reliable.

The most significant finding in 1990 was the relative increase in L. concolor at sample stations 3 and 4. These same pools were sampled by Timbol in 1986 (ie. my station 3=Timbol's station 2; my station 4=Timbol's station. 1). In 1986, Timbol (attachment 1) classified native stream animals as absent (none occurred), uncommon (1 animal/20 m2= 0.05 animal/m2), common (0.1-0.25 animal/m2), abundant (0.3-0.5 animal/m2), or very abundant (0.55-5.0 animals/m2.

A comparison of the relative abundance of L. concolor in Makaleha Stream between 1986 and 1990 are shown in Table 2.

Table 2. A comparison of the relative abundance of Lentipes concolor at two identical sampling stations between 1986 and 1990 in Makaleha Stream, Kauai.

Species Observed (Year observed)	Sampling Stations	
	Stn #3 (=Timbol's#2)	Stn #4 (=Timbol's #1)
L. concolor		
(1986)	absent (none seen)	common (0.1-0.25/m2)
(1990)	common (0.2/m2)	Common (o.16/m2)

The most important finding was that in 1986, L. concolor was only seen in two

pools out of a total of eight surveyed by direct underwater observation, whereas in 1990 L. concolor was seen in seven out of eight sample locations. Additionally, in 1986 no juvenile Lentipes were seen. However, in 1990 Lentipes as small as 2.5 and 3.0cm were measured, showing that recruitment had recently taken place.

I agree with Timbol and the USFWS that development of a well on the spring located along the bank of Makaleha Stream may substantially reduce the flow in Makaleha Stream, and therefore may affect recruitment of the native stream macrofauna, of which L. concolor is of special concern.

Don E. Heacock

Donald E. Heacock

JAMES PEDERSEN
PLANNING CONSULTANT
P.O. Box 22
Volcano, Hawaii 96785
Tel/Fax: (808) 967 - 7619

December 30, 1991

Mr. Donald E. Heacock
Aquatic Biologist, Kauai District
State Division of Aquatic Resources
Department of Land and Natural Resources
P.O. Box 1671
Lihue, Kauai, Hawaii 96766

Dear Mr. Heacock:

Subject: Original Draft Environmental Impact Statement
Upper Makaleha Springs Water Resource Development Project
Kapaa, Kauai, Hawaii

On September 4, 1987, you provided comments to Dr. Marvin Miura, former director of the State Office of Environmental Quality Control, concerning the original draft EIS for the subject project. It is our understanding that you did not receive a response to your concerns. For this reason, we are providing a formal written response to these comments on behalf of Portugal and Associates, Inc. As you may recall, we more recently had a brief telephone discussion with you in early November, 1991 concerning this project. In this regard, we appreciate your clarifying the scope of your concerns which you indicated were reflected in your letter of September 4, 1987.

This project has been significantly delayed due to the performance of additional field studies and related modifications to preliminary design plans and the original draft EIS document. The comments you initially provided to us assisted us greatly in our substantive revision of the original draft EIS. The final EIS was published in December, 1990; however, revisions in the original project proposal, the expanded content of the final EIS, and other related concerns prompted the State Division of Water Resource Management to prepare a revised draft EIS for the project. Since publication of this document by the State is anticipated during the next week or so, you can expect receiving a copy for your review and comment in early 1992.

We concur with your statements indicating that there is limited biological data concerning the biology, ecology and population dynamics of native Hawaiian stream fauna. As you are well aware, additional biological and physiochemical field studies were conducted by Amadeo Timbol, Ph.D., in March-April, 1990. If I recall correctly, you also accompanied Dr. Timbol during, at least, one day of the supplemental field investigations.

We share your concerns for the native aquatic fauna of Makaleha Stream and we believe that the proposed capture of water from Upper Makaleha Springs will somewhat degrade the physiochemical characteristics of Makaleha Stream. The potential extent of this degradation

is unknown given the limited information about native Hawaiian Stream fauna. The measurement of adequate flow can practically be addressed through periodic monitoring of the Upper Makaleha Stream by the State Division of Aquatic Resources. If monitoring detects significant adverse impacts upon Upper Makaleha Stream fauna, the County of Kauai is committed to discontinuing its use of water from the springs. This commitment has been added to the scope of the proposed project and is reflected in the soon-to-be published revised draft EIS.

We also believe that a greater potential stress of the proposed project is the potential effects via additional dewatering downstream of the existing Makaleha Ditch diversion. However, with the impending closure of sugarcane cultivation in Kealia, a significant opportunity exists for enhancing DO and temperature levels in Makaleha Stream, downstream of the Makaleha Ditch diversion. Given the reduced irrigation requirement in the Kealia area, it is recommended that the State Board of Land and Natural Resources negotiate a reduction in the volume of surface flow diversion from Makaleha Stream to Makaleha Ditch with Lihue Plantation Company. Increased streamflow, downstream of the Makaleha Ditch diversion, would: 1) enhance the quality of stream habitat in the lower portions of Makaleha Stream; and 2) virtually eliminate any potential risks of the proposed project upon the habitat of the o'opu-alamo'o. Should efforts to negotiate with Lihue Plantation fail, the only other option would be for the State Board of Land and Natural Resources to not renew any application by the Plantation for renewal of its existing water rights.

Thanks again for your patience in receiving this response. However, we feel that the delay has been fruitful in terms of reducing the potential environmental consequences of the project and refining the overall approach to water resource development in Kauai's Kapaa-Wailua area.

Regards,

Jim Pedersen
Principal Planner

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4/82

State of Hawaii
Department of Land and Natural Resources
- DIVISION OF AQUATIC RESOURCES

Date August 14, 1987

MEMORANDUM
TO: Paul Kawamoto, Program Manager, Aquatic Res. & Env. Protection
FROM: Eric Onizuka, Program Manager, Aquatic Recreation
SUBJECT: Comments on Environmental Review
Comment Requested by Roger Evans, Office of Con. & Env. Affairs
Date of Request 7/30/87 Date Rec'd 7/30/87

Summary of Proposed Project

Title: Draft Environmental Impact Statement for the Upper Makaleha Springs Water Resource Development

Project by: Department of Land and Natural Resources, Division of Water and Land Development

Location: Makaleha Valley, Kealia Forest Reserve, Kapaa, Kauai

Brief Description:

DOWALD has submitted the DEIS to tap natural springs in upper Makaleha Valley and pipe the water to Kapaa for domestic uses. It involves exposing the source of the springs, installing an adjustable intake structure (to allow more springflow release into Makaleha Stream to maintain satisfactory flows for aquatic life and irrigation), and installing some 4,000 feet of 8-inch ductile iron pipeline to connect the springs to an existing 1-million gallon reservoir at the end of Kahuna Road in Kapaa. The spring site and pipe route will be cleared of vegetation (mostly hau and rose apple thickets), and a temporary access road will be constructed from the reservoir to about three-fourths of the way to the springs. The last one-fourth of the way to the springs is inaccessible to heavy equipment, and clearing must be done by hand. Some blasting may be required to excavate bedrock at the springs and along the pipeline. Replanting of disturbed areas is proposed as a mitigating measure.

The amount of water flowing from the springs are estimated to range between 400 gpm (or about 0.6 mgd or 0.9 cfs) during prolonged dry periods to 1,500 gpm (or about 2.2 mgd or 3.3 cfs) during wet periods. It is pointed out that the average flow of Makaleha Stream is 4,000 gpm (or about 5.8 mgd or 8.9 cfs), thus the springs typically contribute about one-sixth of the Stream's flow.

Makaleha Stream is interrupted by Lihue Plantation's concrete dam (located about 2,500 feet downstream from the springs) which diverts a significant portion of the flow for (sugarcane) irrigation purposes before its confluence with Kapaa Stream. The DEIS indicates that during dry periods, "In fact, more often than not, all of the water is so diverted and none reaches Kapaa Stream.". The water to be needed for domestic use is essentially part of the water currently diverted for irrigation purposes. Also, additional diversions occur in downstream areas of Kapaa Stream.

The native o'opu alamo'o and opae kalaole inhabit upper Makaleha Stream. Other aquatic life include the mosquitofish, wild guppy, swordtail, wrinkled frog and bullfrog.

This water source is estimated to increase the overall potable water supply in the Kapaa-Waialua area by about 16% and partially alleviate existing water shortages in the area.

Subject: Draft Environmental Impact Statement for the Upper Makaleha Springs Water Resource Development

COMMENTS:

We understand that the primary purpose of the Kealia Forest Reserve is to serve as a source of water supply and that the project is consistent with such purpose. We concur tha the use of the springwater for domestic purposes is more desirable than for irrigation purposes.

We suggest that the system be operated to insure water flow be provided in the Stream for aquatic resources. The Biological Reconnaissance study in the document indicates that only small numbers of the native species occur above the diversion and that the lower Makaleha and Kapaa Streams are of poor quality and highly degraded. These conditions are created by the existing diversion and water use practices which are not conducive to the diadromous native species. Accordingly, with the inserted release of sufficient quantities of springwater during all times of the year, aquatic fauna in Makaleha Stream should be protected.

Paul Y. Kawamoto
for ERIC ONIZUKA

cc: D. Heacock

JAMES PEDERSEN
PLANNING CONSULTANT
P.O. Box 22
Volcano, Hawaii 96785
Tel/Fax: (808) 967 - 7619

December 30, 1991

Mr. Paul Kawamoto, Program Manager
Mr. Eric Onizuka, Program Manager
Division of Aquatic Resources
State Department of Land and Natural Resources
1151 Punchbowl St., Room 330
Honolulu, Hawaii 96813

Dear Mssrs. Kawamoto and Onizuka:

Subject: Original Draft Environmental Impact Statement
Upper Makaleha Springs Water Resource Development Project
Kapaa, Kauai

We are in receipt of your inter-office correspondence to Mr. Roger Evans of the Office of Conservation and Environmental Affairs dated August 14, 1987. It is my understanding that you did not receive a response to your concerns. For this reason, we are providing a formal written response to these comments on behalf of Portugal and Associates, Inc.

This project has been significantly delayed due to the performance of additional field studies and related modifications to preliminary design plans and the original draft EIS document. The comments you initially provided has assisted us in our substantive revision of the original draft EIS. A final EIS for the project was published in December, 1990; however, revisions in the original project proposal, the expanded content of the final EIS, and other related concerns prompted the State Division of Water Resource Management to prepare a revised draft EIS for the project. Since publication of this document by the State is anticipated during the next week or so, you can expect receiving a copy for your review and comment in early 1992.

We concur with your statements concerning the primary purpose of the Kealia Forest Reserve as a source of potable water supply. In addition, we share your concern for the amount of water being diverted for irrigation. The State of Hawaii's lease with Lihue Plantation Company (General Lease S-3827) provides LPCO with the right to divert 50 million gallons per day from the drainage basins of the North Wailua, Kapaa, Anahola, and Hanalei Rivers. This lease expires on May 10, 1994. However, the same lease agreement also provides the State of Hawaii with the right to use up to 1.0 mgd of water from these drainage areas for domestic purposes.

We also believe that a greater potential stress of the proposed project is the potential effects via additional dewatering downstream of the existing Makaleha Ditch diversion. However, with the impending closure of sugarcane cultivation in Kealia, a significant opportunity exists for enhancing DO and temperature levels in Makaleha Stream, downstream of the existing

Makaleha Ditch diversion. Given the reduced irrigation requirement in the Kealia area, it is recommended that the State Board of Land and Natural Resources negotiate a reduction in the volume of surface flow diversion from Makaleha Stream to Makaleha Ditch with Lihue Plantation Company. Increased streamflow, downstream of the Makaleha Ditch diversion, would: 1) enhance the quality of degraded stream habitat in the lower portions of Makaleha Stream; and 2) virtually eliminate any potential risks of the proposed project upon the habitat of the o'opu-alamo'o. Should efforts to negotiate with Lihue Plantation fail, the only other option would be for the State Board of Land and Natural Resources to not renew any application by the Plantation for renewal of its existing water rights.

Ensuring adequate streamflow can practically be addressed through future periodic monitoring of the Upper Makaleha Stream by the State Division of Aquatic Resources. If monitoring detects significant adverse impacts upon Upper Makaleha Stream fauna, the County of Kauai is committed to discontinuing its use of water from the springs. This commitment has been added to the scope of the proposed project and is reflected in the soon-to-be published revised draft EIS.

Many thanks for your thoughtful evaluation of the original draft EIS and your patience in receiving this response.

Regards,

Jim Pedersen
Principal Planner

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DEPARTMENT OF WATER

COUNTY OF KAUAI
P. O. BOX 1706
LIHUE, HAWAII 96766-5706

November 19, 1987

Honorable William W. Paty
Chairperson of the Board
Board of Land & Natural Resources
P. O. Box 621
Honolulu, HI 96809

Re: Proposed Interim Instream Flow Standards for Kauai

The interim instream flow standard for Kauai should be set at a flow equal to 25 percent of the median streamflow derived from actual flow records where available or estimated through the empirical formula developed by the U. S. Geological Survey.

Our recommendation of 25 percent is based on the need to allow for further stream diversions that may be necessary to provide water for future economic development on Kauai.

We would also like the Board of Land and Natural Resources to consider allowing increased diversion of stream water, providing the adopted percent of diversion is not exceeded, for all governmental water purveyors without having to receive the Board's approval. Water purveyors who are serving their existing consumers through stream diversion may need to increase the diversion amount to provide adequate water for future development. It is our opinion that this increased amount of stream diversion should be considered "grandfathered" as allowed for under the Water Code.

For Raymond H. Sato
Manager and Chief Engineer

WH/JK:rm

JAMES PEDERSEN
PLANNING CONSULTANT
P.O. Box 22
Volcano, Hawaii 96785
Tel/Fax: (808) 967 - 7619

December 30, 1991

Mr. Raymond H. Sato
Manager and Chief Engineer
County of Kauai, Department of Water
P.O. Box 1706
Lihue, Kauai, Hawaii 96766-5706

Dear Mr. Sato:

Subject: Original Draft Environmental Impact Statement
Upper Makaleha Springs Water Resource Development Project
Kapaa, Kauai

We are in receipt of your correspondence to the Honorable William Paty of the State Department of Land and Natural Resources dated November 19, 1987. It is my understanding that you did not receive a response to your concerns. For this reason, we are providing a formal written response to these comments on behalf of Portugal and Associates, Inc.

This project has been significantly delayed due to the performance of additional field studies and related modifications to preliminary design plans and the original draft EIS document. The comments you initially provided has assisted us in our substantive revision of the original draft EIS. A final EIS for the project was published by Portugal and Associates, Inc. in December, 1990; however, revisions in the original project proposal, the expanded content of the final EIS, and other related concerns prompted the State Division of Water Resource Management to prepare a revised draft EIS for the project. Since publication of this document by the State is anticipated during the next week or so, you can expect receiving a copy for your review and comment in early 1992.

We concur with your proposals for a proposed interim instream flow standard of 25 percent of median streamflow because of the need and opportunity to use a portion of available surface water for potable purposes. Your department is more than aware that a significant cost related to the use of a developed groundwater supply is the electrical energy used to pump groundwater to the surface. I recall Mr. Greg Fujikawa of your department indicating that the operation a 750 gpm well generates an annual energy cost of about $50,000 per year.

Since little is known about the biology and ecology of native aquatic fauna, we believe that the use of this standard could be used in conjunction with increased monitoring of the biological and physiochemical characteristics of local streams by the State Division of Aquatic Resources. This management approach would encourage a greater use of surface water while using caution in stream locations where sensitive or degraded aquatic habitats are present.

Many thanks for your insights and comments.

Regards,

Jim Pedersen
Principal Planner

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DEPARTMENT OF BUSINESS AND ECONOMIC DEVELOPMENT

KAMAMALU BUILDING, 250 SOUTH KING ST., HONOLULU, HAWAII
MAILING ADDRESS: P.O. BOX 2359, HONOLULU, HAWAII 96804 TELEX: 7430250 HIOPED

JOHN WAIHEE
GOVERNOR
ROGER A. ULVELING
DIRECTOR
MURRAY E. TOWILL
DEPUTY DIRECTOR
BARBARA KIM STANTON
DEPUTY DIRECTOR

Portugal & A...

RECEIVED
AUG 25 1987
By

Ref. No. P-7077

August 19, 1987

MEMORANDUM

TO: Dr. Marvin T. Miura, Director
Office of Environmental Quality Control

FROM: Roger A. Ulveling

SUBJECT: Draft Environmental Impact Statement
Upper Makaleha Springs Water Resource Development

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

HAWAII COASTAL ZONE MANAGEMENT PROGRAM

The lower portion of the project which traverses Kapaa Homesteads Lands is within the Coastal Zone Management (CZM) area. Though the upper portion is in a Forest Reserve area, the nature of the project may have an ecological spillover effect on downstream resources. Therefore, the EIS should include an assessment and discussion of the overall project relative to CZM objectives and policies.

Coastal Ecosystems

A CZM policy calls for the protection of valuable ecosystems. The proposed activity's potential impact from erosion and siltation are identified in the DEIS. However, mitigating measures other than replanting are not identified.

In order to access heavy equipment a temporary road is proposed from the existing water tank approximately 3,000 feet upstream along the Makaleha Stream. Erosion and siltation potential are significant due to heavy rainfall, steep banks along the stream, and an estimated one-year construction period. In view of this potential, other mitigating measures and alternatives should be discussed more fully. As an example, since the proposed catchment will require only annual maintenance, is the roadway necessary only for construction purposes. Correspondingly, is it feasible to elevate the upper 2,500 feet of the pipeline, requiring burial of only that portion that parallels an existing pipeline.

The proposed activity has potential for impacting stream species as a result of erosion and siltation. The faunal survey included in the DEIS indicates the siting of a Koloa duck, an endangered species, in the Makaleha Stream and notes that the stream and valley provide the type of habitat common to this species. As indicated in this report, construction of the pipeline and roadway would alter stream ecology. The roadway "could allow greater human intrusion into the area and likewise degrade the habitat for koloa." Mitigation of this potential should be discussed.

Scenic Resources

The scenic value of Makaleha Valley is recognized in the DEIS. However, this resource should be more fully evaluated with respect to alternative impacts and corresponding mitigating measures. As an example, scenic resources will be altered by the proposed construction of the roadway and the proposed section of elevated pipeline. Alternately, a buried pipeline may reduce visual impacts but increase shorter term ecological impacts. This aspect of alternate action should be more fully described in the final EIS.

LAND USE DIVISION

The final EIS should consider in greater detail how the proposed water diversion will affect current and potential agricultural land uses in the area. This concern is also reflected in the February 18, 1987, comments from Lihue Plantation, which indicates that signficant impacts to their agricultural operations may result if further diversion of their primary irrigation source is permitted. Lihue Plantation is especially concerned about diversion during the summer months of lowest flow levels and feels that the area is already "water deficient and subject to severe seasonal water shortage."

The final EIS should compare the ecological qualities of this drainageway system to other streams on Kauai and in the State. This analysis should also include a discussion on how the diversion would impact stream fauna during periods of lowest flow volumes. Of special concern is whether agricultural or urban users will be given usage priority over the minimum needs of aquatic ecosystems during the dryer summer months of low flow volume.

Thank you for the opportunity to review this DEIS.

cc: Portugal and Associates, Inc.

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PORTUGAL, ~~ABARA~~ & ASSOCIATES, INC.

September 21, 1987

MR. ROGER A. ULVELING, DIRECTOR
DEPARTMENT OF BUSINESS & ECONOMIC DEVELOPMENT
P. O. BOX 2359
HONOLULU, HAWAII 96804

Re: Draft Environmental Impact Statement - Review, Upper Makaleha Springs Water Resource Development, Kapaa, Kauai, Hawaii.

Dear Mr. Ulveling:

Thank you for your review comments of the draft EIS for the subject project as provided in your letter to Dr. Marvin T. Miura, Director, OEQC dated August 19, 1987.

We offer the following response to your comments.

Hawaii Coastal Zone Management Program

The existing Makaleha Water Tank, located at the upper end of Kahuna Road, represents the lower limits of the project site, and it is our belief that this area is not within the Coastal Zone Management (CZM) area. In fact, a copy of the area from the CZM maps available at the County of Kauai, Planning Department seem to indicate that the Makaleha Water Tank is approximately four and a half (4.5) miles from the nearest coastline and over four (4) miles from the nearest CZM line. Therefore, we contend that an assessment and discussion of the overall project relative to CZM objectives and policies are not necessary. However, we are cognizant of the fact that any construction within the project site may have detrimental effects of the ecosystems further downstream. Therefore, we have included in the draft EIS the mitigative measures intended to protect the valued existing ecosystems.

The mitigating measures being considered to ensure that no degradation of the stream water quality occurs during the construction of the proposed project, include:

1) Alignment: The proposed pipeline shall be located as far away from the stream as deemed practical. This shall minimize construction traffic in the

Consulting Engineers & Land Surveyors • 4444 Rice Street • Lihue, Kauai, Hawaii 96766 • Telephone (808) 245-6749

vicinity of the stream bed and shall allow any eroded material the longest possible time for siltation prior to reaching the stream.

2) Diversion Swales: Diversion swales leading to temporary stilling basins shall be constructed between the pipeline and the stream to divert and detain construction debris and eroded material collected by the rain water runoff. This diversion ditch system would probably be adequate to accommodate the occasional heavy showers, but would not have adequate capacity to the extremely heavy rainfall.

3) Limited Exposure: Construction to the pipeline shall be done in sections to limit the exposure to the elements, and, therefore, limit the extent to which the construction would be susceptible to the weather.

4) Replanting: After each section of the pipeline has been constructed to finish grades and tested, the area shall be immediately revegetated. Construction on the next section of pipeline shall not be allowed to proceed until all exposed areas have been adequately protected against erosion.

5) Fabric Barrier: The use of fabric barriers as a filter material to control sedimentation and limit erosion may prove to be an effective tool during the construction of the pipeline.

As presently proposed, the access road's primary purpose is to serve as a construction road to transport men and equipment to and from the construction site. The road is intended to service approximately 75% of the pipeline--the last 25% of the waterline being excluded as a mitigative measure to limit the impact to the existing topography. As a secondary use, the road shall serve as an access for periodic checking and maintenance of the waterline and inlet structure. The access road is necessary in terms of facilitating construction and maintenance of the pipeline and inlet structure.

Elevating a larger segment of the waterline is possible with probable corresponding increase in the construction cost and visual impact, and decrease in accessibility for

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inspection and maintenance.

With regards to the proposed roadway degrading the possible habitat of the "Koloa Duck", mitigative measures shall be discussed in the Final EIS, including physical barriers limiting unauthorized access to the site.

Scenic Resources

In the Final EIS, the discussion on alternative impacts and mitigating measures with regards to the scenic characters of the Makaleha Valley shall be expanded, including the discussion on elevated versus underground pipeline.

Land Use Division

The Final EIS shall consider in greater detail, the effect of the proposed water diversion on current agricultural usage. Lihue Plantation's concern on the added diversion, especially since they consider the area "water deficient and subject to severe seasonal water shortage", is most certainly echoed by the agencies entrusted to provide an adequate supply of water to the ever growing populus for their domestic consumption.

The Final EIS shall address the ecological qualities of the drainageway system along with any significant peculiarities which should be preserved and/or warranting mitigative measures.

Presently, during the dryer months of the year, Lihue Plantation effectively diverts all of the water in the Makaleha Stream for irrigation purposes. How the diversion would impact the stream fauna during periods of lowest flow may never be determined with certainty.

PORTUGAL, ~~HARVA~~ & ASSOCIATES, INC.

Once again, thank you for your review comments on the draft EIS. We hope you'll find the Final EIS addresses all of your concerns.

Very truly yours,

PORTUGAL & ASSOCIATES, INC.

GLENN Y. YAMAMOTO

cc: OEQC
DLNR-DOWALD w/letter dated 8-19-87

JOHN WAIHEE
GOVERNOR
ROGER A. ULVELING
DIRECTOR
MURRAY E. TOWILL
DEPUTY DIRECTOR
BARBARA KIM STANTON
DEPUTY DIRECTOR

DEPARTMENT OF BUSINESS AND ECONOMIC DEVELOPMENT

KAMAMALU BUILDING, 250 SOUTH KING ST., HONOLULU, HAWAII
MAILING ADDRESS: P.O. BOX 2359, HONOLULU, HAWAII 96804 TELEX: 7430250 HIDPED

Portugal & Associates, Inc.
RECEIVED
OCT - 5 1987
By

Ref. No. P-7357

September 29, 1987

Mr. Glenn Y. Yamamoto
Portugal & Associates, Inc.
4444 Rice Street
Lihue, Hawaii 96766

Dear Mr. Yamamoto:

Subject: Draft Environmental Impact Statement, Upper Makaleha Springs Water Resource Development Kapaa, Hawaii

Thank you for your September 21, 1987, response to our comments on the subject document. Your response is helpful in further understanding the various alternative activities of the project, their potential impacts and corresponding mitigating measures. However, in the first paragraph of your response under the Hawaii Coastal Zone Management Program heading, you contend that "an assessment and discussion of the overall project relative to CZM objectives and policies are not necessary."

This is not an uncommon misconception of the scope of application of the CZM program. I believe the CZM map to which you refer describes the special management area (SMA) for the County of Kauai. SMA's include coastal regions of the State that are more closely scrutinized through a County administrated permit and review process. This part of the CZM program is described in Chapter 205A, Part II of Hawaii Revised Statutes. Broader application of the program objectives and policies are provided for in Chapter 205A-1 (2), Part II, to include all lands in the State with the exception of forest reserves and Federal lands.

Should you have any questions on this matter, please do not hesitate to contact our CZM staff at 548-8465.

Sincerely,

Murray E. Towill

Roger A. Ulveling

150

PORTUGAL & ASSOCIATES, INC.
P.O. Box 807
Lihue, Kauai, Hawaii 96766
Tel: (808) 245 - 6749
Fax: (808) 246 - 9391

November 25, 1990

Mr. Roger A. Ulveling
Director
State Department of Business and Economic Development
P.O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Ulveling:

Subject: Draft Environmental Impact Statement
Upper Makaleha Springs Water Resource Development Project, Kapaa, Kauai

We are in receipt of your correspondence to Mr. Glenn Yamamoto dated September 29, 1987. We appreciate the time that you and other members of your department have expended to review this project. The project has been considerably delayed to our performance of additional field studies and related modifications to our preliminary design plans and draft EIS document.

We are grateful for your clarification of Chapter 205A and the broader application of CZM program objectives and policies. The final EIS has been revised to reflect your comments. In addition, we have identified those CZM objectives and policies that we believe are relevant to the proposed project.

Since your review of the draft EIS, the performance of additional field studies has led us to somewhat modify the proposed project. Specifically, the earlier concept of constructing an access road along Makaleha Stream has been eliminated from the overall project scope. Further, the contractor will not be permitted to mobilize land vehicles past the mauka end of Kahuna. Consequently, the stream will not be unnecessarily impacted by construction activities and roadway development.

Thank you for your patience in receiving our response to your comments to the draft EIS. However, we feel that the delay has been fruitful in terms of reducing the potential environmental consequences of the project and refining the overall approach to water resource development.

Should you have any questions, please contact us at your convenience.

Sincerely,

Cesar C. Portugal

Cesar C. Portugal
President-Treasurer

University of Hawaii at Manoa

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

RECEIVED
SEP - 9 1987
By

September 8, 1987
RE:0469

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Draft Environmental Impact Statement
Upper Makaleha Springs Water Resources Development
Kapaa, Kauai

The proposed project would divert spring water from Upper Makaleha Springs by building an entrapment basin into the spring and diverting the water to help supply the growing need for fresh water in Kapaa-Wailua. The project would increase the water availablity by 16 percent while reducing the base flow of Makaleha Stream by the same. The entrapment basin's measurements are indefinite at this time, however, they are not expected to exceed 5 feet wide, 5 feet deep and 50 feet long. Our review of this Draft EIS was completed with the assistance of Leonard Freed, Zoology; Michael Graves, Anthropology; DeWolfe Miller, School of Public Health; Edwin Murabayashi, Henry Gee, and Yu-Si Fok, Water Resources Research Center; James Parrish, Hawaii Cooperative Fisheries Research Unit; Frank Peterson, Geology and Geophysics; and Steven Armann, Environmental Center.

General

This Draft EIS is a superficial document which does not adequately discuss associated impacts of this project. Furthermore, it lacks professional quantitative studies and mitigation plans which are necessary for a comprehensive evaluation of environmental impacts. Inadequate planning and lack of development of alternatives characterize this Draft EIS. In its present form, this document is totally unacceptable.

Given the lack of quantitative data regarding the hydrology of the stream and the spring, we must question if any hydrological study was ever conducted. On page 10 and various other pages of the Draft EIS, Upper Makaleha Springs are said to contribute approximately 16 percent of the base flow for Makaleha Stream; however, exact measurements and data to justify these claims are absent. How was this figure obtained and what methodology was used for the study, if any? Was a duration curve plotted indicating the level of year round stream flow? Was any study conducted to inquire into the biological effects of the reduction in stream water?

Alternatives

The alternatives listed in this document are not sufficiently addressed. The alternative of drilling a new well at Akulikuli Ridge is dismissed because recent geological studies suggest insufficient dike-confined groundwater. This general statement should be backed up by quantitative data from the recent survey. Attendant claims of contamination potential and flow reduction are unsubstantiated and prejudicial in the absence of quantitative survey data.

Biological

A biological study was conducted in the area over the course of only one day. Given that endangered species were found, we believe that a more comprehensive biological survey is justified. Without such a study to determine the biological make-up of the area in greater detail, we must assume that this is a habitat for these endangered species and not simply a one time sighting. Further study is also need to determine the effects of water withdrawal on the biology of the stream. We suggest that an In Stream Flow Incremental Model (IFIM) be used to assess the impacts on the hydrology and biology of the stream.

Lihue Plantation

The Draft EIS has not adequately addressed the impacts of this project on down stream users. In particular, the comments provided by Lihue Plantation during the EIS preparation stage are not adequately addressed. Further discussion is needed regarding the economic impact this project will have on the sugar industry in the area. Removal of 16 percent of the base flow from Makaleha Stream would insure the change in balance of competing uses. In competing with world sugar production, almost all Hawaiian sugar plantations have converted to some form of drip irrigation to reduce costs and conserve water. Since the sugar fields located in Kealia are located in a water deficit area, reduction of their water supply would change the dubious future of the Lihue Plantation to one with a pessimistic future. The water rights issue is highly significant and inadequately resolved in the Draft EIS. The impacts on down stream users are the most important issues of this project and this document does not adequately address these impacts.

Stream Flow

If one follows the philosophy that "the clearest and purest water available should be rightfully reserved for the highest priority uses, namely human ingestion," then an unmetered and unmonitored withdrawal system would mean that intake would not likely be reduced when the base flow essential for aquatic life becomes critical which also corresponds to low water levels in the storage tanks. In other words, if all the water is being used for subdivisions, why should they cut down on water usage to save a few animals? What regulatory agency will insure that the Kauai Department of Water will monitor base stream flow in Makaleha Stream? Once the stream flow is reduced to a critical point, with increasing

temperature, the endangered and endemic species will be diminished if not eliminated entirely.

Health

The Draft EIS does not address any potential health related risks which may be associated with this project. What protective measures will be taken to insure that contamination does not occur, and what mitigative measures will be taken in the event that contamination does occur? This question and other health related issues need further addressing in order to properly evaluate the potential for health risks.

Road Construction

The Draft EIS states clearly that an access road is necessary to reach the entrapment area, and that construction may take over one year. No plans are mentioned for the type of road to be built. Will it be paved or unpaved? Has a survey been conducted to determine the path of the access road? Has the topography been studied for both the access road and for the watermain? Furthermore, some type of drainage development is necessary and mitigation plans need to be prepared to avoid unnecessary erosion running into the stream. Mitigation plans also need to be developed to protect the area after the road is no longer needed. We cannot consider that this access road will be a temporary impact since human intrusion is bound to keep the path open and not allow full vegetation to grow back.

Archaeology

We agree that few archaeological sites are likely to be found in this area. Any road building activity, however, should be monitored closely for the occurrence of archaeological materials.

Given the inadequacies of this document we strongly suggest that it not be accepted. Thank you for this opportunity to review this Draft EIS. We hope our comments will be helpful.

Yours truly,

Jacquelin N. Miller

Jacquelin N. Miller
Associate Environmental Coordinator

cc: Portugal & Associates, Inc.
L. Stephen Lau
Michael Graves
Leonard Freed
Henry Gee
DeWolfe Miller
James Parrish
Frank Peterson
Yu-Si Fok
Edwin Murabayashi

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PORTUGAL, ~~IBARA~~ & ASSOCIATES, INC.

September 21, 1987

MS. JACQUELIN N. MILLER
ASSOCIATE ENVIRONMENTAL COORDINATOR
ENVIRONMENTAL CENTER
UNIVERSITY OF HAWAII AT MANOA
2550 CAMPUS ROAD
HONOLULU, HAWAII 96822

Re: Draft Environmental Impact Statement - Review, Upper Makaleha Springs Water Resource Development, Kapaa, Kauai, Hawaii.

Dear Ms. Miller:

Thank you for your review of the draft EIS for the subject project as stated in your letter to to Dr. Marvin T. Miura, Director, OEQC dated September 8, 1987.

We offer the following comments:

The draft EIS does not attempt to discuss in greatest detail every aspect of the proposed project. Much of the data you seek is available in other reports which we will be glad to share with you. Some of the data you seek is not available anywhere that we know of, and cannot be obtained within a reasonable time and expense.

Lihue Plantation Company:

Based on the assumption that the base flow serving the Lihue Plantation Company's Makaleha Spring water irrigation system shall be reduced by 16% , the maximum adverse impact would be a 16% reduction of cane lands in the affected area.

With the withdrawal of 1.0 MGD for domestic purposes, we have assumed Lihue Plantation Company's surface diversion irrigation system should experience an approximate one to one reduction in the quantity of water available for agricultural purposes.

No affirmative mitigating factors can be presented to provide immediate relief of the proposed withdrawal of water from the irrigation system.

Consulting Engineers & Land Surveyors • Suite ~~XXX~~ 4444 Rice Street • Lihue, Kauai, Hawaii 96766 • Telephone (808) 245-6749

However, there are some areas where further investigation might be warranted in order to insure that the irrigation water user's transmission and storage system utilizes the most effective and efficient use of the available water with minimal waste. Some of these areas are:

1) Conduct field reconnaissance and study to indentify portions of the irrigation transmission and storage systems where leaks and/or seepage are suspected;

2) Take appropriate measures to insure that the irrigation system makes the most efficient use of the water;

3) Where leaks in the earthen ditches are suspected, due to deterioration of its walls and/or the presence of excessively porous material along the ditch walls, investigate the possibility of converting all or portions of the open ditch system to a closed conduit system and/or a lined ditch system;

4) If excessive water loss is suspected at the storage facilities, investigate the possibility of providing a lined basin; and

5) Investigate the possibility of expanding the use of more water efficient irrigation systems like the "drip system".

Stream Flow:

Lihue Plantation Company's present policy regarding the diversion of water for irrigation purposes is essentially "unmetered and unmonitored".

During the dryer months of the year, Lihue Plantation effectively diverts all of the water in the Makaleha Stream for irrigation purposes. How this diversion has, and how the proposed "additional" diversion would impact the stream fauna during periods of lowest flow may never be determined with certainty.

Health:

Health concerns shall be more specifically addressed in during the process of obtaining the water use permit from the State Health Department. At which time, compliance with the State's drinking water rules -- Chapter 20, Title 11, Administrative Rules, shall be assured.

Road Construction:

Design of the proposed waterline and access roadway has not been completed, and therefore, details of the improvements are not available at this time.

Mitigating measures being considered to ensure that no degradation of the stream water quality occurs during the construction of the proposed project include:

1) Alignment: The proposed pipeline shall be located as far away from the stream as deemed practical. This shall minimize construction traffic in the vicinity of the stream bed and shall allow any eroded material the longest possible time for siltation prior to reaching the stream.

2) Diversion Swales: Diversion swales leading to temporary stilling basins shall be constructed between the pipeline and the stream to divert and detain construction debris and eroded material collected by the rain water runoff. This diversion ditch system would probably be adequate to accommodate the occasional heavy showers, but would not have adequate capacity to the extremely heavy rainfall.

3) Limited Exposure: Construction of the pipeline shall be done in sections to limit the exposure to the elements, and, therefore, limit the extent to which the construction would be susceptible to the weather.

4) Replanting: After each section of the pipeline has been constructed to finish grades and tested, the area shall be immediately revegetated. Construction on the next section of pipeline shall not be allowed to proceed until all exposed areas have been adequately protected against erosion.

PORTUGAL, NAKAYA & ASSOCIATES, INC.

5) Fabric Barrier: The use of fabric barriers as a filter material to control sedimentation and limit erosion may prove to be an effective tool during the construction of the pipeline.

Once again, we thank you for your critical comments. We shall bear them in mind in preparing the Final EIS.

Very truly yours,

PORTUGAL & ASSOCIATES, INC.

GLENN Y. YAMAMOTO

GYY:jmi

cc: OEQC
DLNR-DOWALD w/letter dated 9-8-87

University of Hawaii at Manoa

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

RECEIVED
NOV - 2 1987
By

October 28, 1987
(RE:0469)

Dr. Marvin T. Miura, Director
Office of Environmental Quality Control
465 South King Street, Room 104
Honolulu, Hawaii 96813

Dear Dr. Miura:

Response to Environmental Center Comments
Draft Environmental Impact Statement
Upper Makaleha Springs Water Resources Development
Kapaa, Kauai

The Environmental Center submitted comments on the Draft EIS for Upper Makaleha Springs Water Resources Development on September 8, 1987, (RE:0469). In our review, we called attention to the general inadequacy of the document, the absence of quantitative studies and mitigative plans, the lack of development of alternatives, deficiencies in assessment of biological impacts, the need for assessment of instream water uses, health risks, road construction impacts, and highly significant water rights issues.

The initial review and these subsequent comments regarding the above mentioned document were prepared with the assistance of Leonard Freed, Zoology; Michael Graves, Anthropology; DeWolfe Miller, School of Public Health; Edwin Murabayashi, Henry Gee, and Yu-Si Fok, Water Resources Research Center; James Parrish, Hawaii Cooperative Fishery Research Unit; Frank Peterson, Geology and Geophysics; and John Harrison and Steven Armann, Environmental Center.

We agree that the "draft Environmental Impact Statement does not attempt to discuss in greatest detail every aspect of the proposed project". However, the purpose of the EIS is to provide substantive information on a proposed action and to disclose the environmental effects of the action. If the information exists elsewhere, as the response letter states, then it should be summarized and referenced within the Draft EIS so that a comprehensive evaluation can be made in accordance with the EIS regulations (11-200-19). If the information is not available, consultants must be hired to provide the needed studies.

The response to our review is superficial and inadequately addresses the issues and concerns we raised. The questions and the present concerns need to be adequately addressed before the EIS is considered for acceptance. It is not the responsibility of the readers to seek out, or compile the pertinent information.

This document does not satisfy the content requirements of an EIS as set forth in the regulations, and the response to comments submitted during the review phase is not supported by quantitative data or referenced studies. The document should not be accepted until the deficiences identified in the review phase are adequately addressed.

Lihue Plantation Company

The basis for the statement regarding the assumption that 16 percent of the spring water irrigation system flow to Lihue Plantation will be reduced, is not supported or referenced. The 16 percent figure needs to be substantiated quantitatively with a hydrological study. What is the base flow for Makaleha Stream; who conducted the base flow study; when was the base flow study conducted? What economic data were used to evaluate the effect of a 16 percent irrigation water reduction on Lihue Plantation? Can the company survive a 16 percent reduction in output? What will be the socio-economic impacts to the community should the plantation fold?

Responsibility is inappropriately placed on Lihue Plantation for the mitigative measures suggested in the response letter. The Kauai Department of Water Supply should be the responsible party for initiating mitigation measures to reduce the impacts to current users, ie. Lihue Plantation. Furthermore, we suspect that many of the proposed suggestions for improving the "effective and efficient use of the available water with minimal waste" are already practiced by the Plantation. For example, it is our understanding that Lihue Plantation already employs the drip irrigation system over much of their lands.

The "unmetered and unmonitored" diversion of water may be the policy of the Lihue Plantation at the present time; however their policy should not set a precedent for the Kauai Department of Water. Monitoring and regulatory control should be conducted, and our question was and still is, "what regulatory agency will insure that the Kauai Department of Water will monitor base stream flow in Makaleha Stream?"

The certainty of impact is never known before a project is developed. However, methods have been developed to estimate the potential impacts, and we previously suggested that plotting a duration curve or doing an Instream Flow Incremental Model (IFIM) study would help to estimate potential impacts. We believe that such analyses are necessary considering the quality of the environment in Makaleha Valley. Such studies can identify potential problems and permit planning for adequate mitigation measures so as to avoid unnecessary impacts.

Road Construction

The response stated that "design of the proposed waterline and access roadway, has not been completed", therefore, "details of the improvements are not available at this time." The purpose of the EIS is not met, if the impacts of the action cannot be reasonably evaluated. The response suggests that the EIS process is premature for this project. The statement that "the proposed pipeline shall be located as far away from the stream as deemed practical" inadequately defines the distance. What guidelines will be used to determine the definition of "practical" distance?

Alternatives

No response is provided to our comments regarding the inadequacy of the discussion of alternatives.

Summary

The Draft EIS document and the responses given do not provide adequate information by which to evaluate the potential environmental impacts of this project. The information is very superficial and based on assumptions and unsubstantiated approximations rather than quantitative or verifiable studies. It is apparent that some of the deficiencies can be traced to inadequate project planning before the preparation of the EIS. We urge that significant modifications and amendments of this document be required, and that an additional review of these amendments be solicited prior to acceptance of the EIS.

In closing, this EIS presents a very adversarial position toward Lihue Plantation. Water is essential to both the Kauai Department of Water Supply and the Plantation. Cooperative solutions to the respective needs of each are needed, not confrontational dialogue.

We appreciate the opportunity to comment and hope our comments will be taken into consideration.

Yours truly,

Jacquelin N. Miller

Jacquelin N. Miller
Associate Environmental Coordinator

cc: Portugal & Associates, Inc.
L. Stephen Lau
Leonard Freed
Yu-Si Fok
Henry Gee
Michael Graves
DeWolfe Miller
Edwin Murabayashi
James Parrish
Frank Peterson
John Harrison
Steven Armann

PORTUGAL & ASSOCIATES, INC.
P.O. Box 807
Lihue, Kauai, Hawaii 96766
Tel: (808) 245 - 6749
Fax: (808) 246 - 9391

November 25, 1990

Mr. John Harrison, Director
U.H. Environmental Center
University of Hawaii at Manoa
2550 Campus Road, Crawford 317
Honolulu, Hawaii 96822

Dear Mr. Harrison:

Subject: Draft Environmental Impact Statement
Upper Makaleha Springs Water Resource Development Project, Kapaa, Kauai

We are in receipt of correspondence from Ms. Jacquelin Miller to Dr. Marvin Miura dated October 28, 1987. We appreciate the time that you and other affiliate staff of the Environmental Center expended to review this project. The project has been considerably delayed to our performance of additional field studies and related modifications to our preliminary design plans and draft EIS document.

We recognize the deficiencies of the draft EIS and concur that various revisions were required to satisfy the content requirements for an EIS. The final EIS has been substantively revised to include a full discussion and comparison of project alternatives and the potential impacts of diverting additional streamflow from Makaleha Stream. We have also incorporated a number of mitigation measures into the final EIS which we intend to incorporate into the design plans and specifications for this project.

While an Instream Flow Incremental Model was not established to further evaluate the project, additional evaluations were made of the potential impacts upon the water quality, aquatic resources and wildlife of the Stream environment.

More significantly, the performance of additional field studies has led us to somewhat modify the proposed project. Specifically, the earlier concept of constructing an access road along Makaleha Stream has been eliminated from the overall project scope. Further, the contractor will not be permitted to mobilize land vehicles past the mauka end of Kahuna. Consequently, the stream will not be unnecessarily impacted by construction activities and roadway development.

Thank you for your patience in receiving our response to your comments to the draft EIS. We feel that the delay has been fruitful in terms of reducing the potential environmental consequences of the project and refining the overall approach to water resource development.

Should you have any questions, please contact us at your convenience.

Sincerely,

Cesar C. Portugal

Cesar C. Portugal
President-Treasurer

APPENDIX C

RESPONSES TO THE FINAL EIS

APPENDIX C

SUMMARY OF RESPONSES TO THE FINAL EIS

Name/Agency	Date of Letter	Response Date
Hoaliku L. Drake State of Hawaii Department of Hawaiian Home Lands	3/12/91	12/30/91
John Harrison University of Hawaii-Manoa Environmental Center	3/20/91	12/30/91
Brian J. J. Choy State of Hawaii Office of Environmental Quality Control	3/27/91	12/30/91
Don Heacock Kauai District Aquatic Biologist State of Hawaii, Dept. of Land & Nat. Resources	4/22/91 5/16/91	12/30/91 12/30/91
James Nishida 1000 Friends of Kauai	5/22/91	12/30/91

RECEIVED AS FOLLOWS

JOHN WAIHEE
GOVERNOR
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAII 96805

HOALIKU L. DRAKE
CHAIRMAN
HAWAIIAN HOMES COMMISSION

March 12, 1991

The Honorable William W. Paty, Chairperson
Board of Land and Natural Resources
P. O. Box 373
Honolulu, Hawaii 96809

Dear Mr. ~~Paty~~ Bill:

Final EIS Upper Makaleha Springs
Water Resource Development
Kapaa, Kaua'i

On February 1, 1991, the Department of Hawaiian Home Lands received the consultant's reply, dated November 25, 1990, regarding the Final Environmental Impact Statement for the subject project. The consultant has not provided a sufficient response. Our comments are as follows:

1. Use of Makaleha Springs water on Hawaiian Home Lands

   Makaleha Springs is one source for the irrigation system that serves Hawaiian home lands in upper Anahola. The EIS states that the prospective diversion of Makaleha Springs water from this system would most likely result in cutbacks in sugar cultivation, but does not mention what effects it will have on continued agricultural use of Hawaiian home lands.

2. Storage Options

   [redacted] The EIS does not indicate that winter surpluses are targeted for capture, thus reducing the need to divert irrigation flows in summer.

3. Conservation Measures

   Conservation measures are mentioned as integral to any water supply program, but none are discussed. If conservation were pursued as vigorously as development, it might produce far more supply than acknowledged; this is worth exploring.

RECEIVED AS FOLLOWS

The Hawaiian Homes Commission Act of 1920, as amended, for which the State has fiduciary responsibility, provides that the Department shall receive water needed for homesteading purposes upon demand. This project has definite impacts upon the homesteading of Hawaiian Home Lands, and we request these issues be more adequately addressed.

Should you have additional questions, please call me at 548-6450, or contact Charley Ice in our Planning Office at 548-8785.

Warmest aloha,

Hoaliku L. Drake

Hoaliku L. Drake, Chairman
Hawaiian Homes Commission

HLD/CI:as

JAMES PEDERSEN
PLANNING CONSULTANT
P.O. Box 22
Volcano, Hawaii 96785
Tel/Fax: (808) 967 - 7619

December 30, 1991

Hoaliku L. Drake, Chairman
Department of Hawaiian Home Lands
State of Hawaii
P.O. Box 1879
Honolulu, Hawaii 96805
Attention: Mr. Charles Ice, DHHL Planning Office

Dear Mr. Drake:

Subject: Original Final Environmental Impact Statement
Upper Makaleha Springs Water Resource Development Project
Kapaa, Kauai, Hawaii

Thank you for your comments to the Honorable William Paty, dated March 12, 1991, concerning the original final EIS for this project which was published by Portugal and Associates, Inc. in December, 1990. We appreciate the time that you and Mr. Charles Ice have made in reviewing the earlier final EIS for this project, as well as Mr. Ice's participation in an August 2, 1991 to discuss unresolved project issues.

This project has been significantly delayed due to the performance of additional field studies and related modifications to preliminary design plans and the original draft EIS document. While the final EIS was published in December, 1990, the expanded content of the final EIS and other related concerns prompted the State Division of Water Resource Management to prepare a revised draft EIS. Since publication of this document by the State is anticipated during the next week or so, you can expect receiving a copy for your review and comment in early 1992.

Use of Makaleha Springs on Hawaiian Home Lands

We recognize that your department's continuing concern is the availability of irrigation water in the Upper Anahola area. Lihue Plantation Company's existing lease with the State of Hawaii (General Lease S-3827) provides LPCO with the right to divert 50 million gallons per day from the drainage basins of the North Wailua, Kapaa, Anahola, and Hanalei Rivers. This lease expires on May 10, 1994. However, the same lease agreement also provides the State of Hawaii with the right to use up to 1.0 mgd of water from these drainage areas for domestic purposes.

Earlier comments in the original EIS stating that the proposed diversion would result in potential cutbacks in sugar cultivation have been influenced by the more recent decision by LPCO to cease sugar cane cultivation in the Kealia area. Potential short-term uses, e.g. pasture, will require significantly reduced irrigation requirements. Within the short-term, the reduced

consumption of irrigation water by LPCO, in essence, ensures a greater availability of water for Hawaiian Home Lands despite the use of 1.0 mgd for potable consumption within the Kauai's Wailua-Kapaa water system. In addition, recent discussions with Mr. Charles Ice indicate that present consumption of irrigation water is very limited. Consequently, short-term impacts upon the agricultural use of Hawaiian Home lands is negligible.

The longer-term requirements of Hawaiian Home Lands are more tied to the future land uses in the Kealia area that may eventually be proposed by LPCO and future negotiations between the State Water Commission and LPCO for continuing water rights. In this context, it is believed that State DHHL should be an active participant in any future negotiations of future water leases.

Irrigation requirements of future agricultural uses on Hawaiian Home lands are dependent upon the type and extent of anticipated agricultural activities in the Anahola-Kamalomalo and Moloaa area. DHHL's development plan for this area recommends the size and location of proposed agricultural parcels but does not indicate irrigation water requirements for agricultural uses. Water requirements discussed in the plan consider only potable water requirements which leads us to the conclusion that DHHL and its consultants may have assumed that local rainfall was adequate to support anticipated agricultural uses. Consequently, future water supply concerns for Hawaiian Home lands in this area may be for the lack of potable, rather than irrigation, water supplies and related storage and distribution facilities.

Water Storage Options

Alternative D presented in the final EIS, published in December, 1990, reflects consideration of one approach of increasing the storage capacity of the Kapaa system. However, this option would still require use of surface waters from Makaleha Springs and/or the Stream. In addition, the cost effectiveness of using a surface water supply diminishes rapidly with the cost of a 1.0 mgd storage tank being about $1.0 million.

Conservation Measures

In light of your comments concerning water conservation, the revised draft EIS that will be published in January, 1992 includes a water conservation option (Alternative F). Under this option, water conservation would be pursued by the County of Kauai, Department of Water, via its implementation of programs to minimize system losses and encourage water consumption by residential and commercial consumers. System conservation efforts would involve leak detection and monitoring; public education would be used to encourage reduced consumer consumption.

Available technologies for water fixtures in the home and most commercial facilities suggest that water savings of up to 40 percent could be achieved with 100 percent participation. More realistically, consumer participation might more realistically range between 10 and 20 percent.

While clearly desirable, the cost-effectiveness of this option is questionable and the amount of water savings generated would not be expected to provide the desired volume of additional water supply to the Wailua-Kapaa system.

This is not to suggest that implementation of an aggressive water conservation should not be pursued by the County of Kauai. During the past decade, some conservation efforts have already been made in terms of restricted use for residential consumers. As an option to the proposed project, water conservation does not provide the sole answer to increasing water demands in the Wailua-Kapaa area.

We again thank you for your patience in receiving our response to your comments to the original draft EIS. Should you have any questions, please contact us at your convenience.

Regards,

Jim Pedersen
Principal Planner

University of Hawaii at Manoa

Environmental Center
A Unit of Water Resources Research Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 956-7361

RECEIVED MAR 26 1991

March 20, 1991
RE:0573

Mr. William W. Paty
Department of Land and Natural Resources
Kalanimoku Building
1151 Punchbowl Street, Room 130
Honolulu, Hawaii 96813

Dear Mr. Paty:

(Revised) Final Environmental Impact Statement (EIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai

The Department of Land and Natural Resources (DLNR), Division of Water Resource Management, proposes to tap natural springs located on state land in the Makaleha Mountains of East Kauai. The proposed construction includes a concrete water "catchment" basin, and approximately 4000 feet of iron pipe which will be used to transport the water to Kapaa for domestic use.

Our review of the revised Final EIS was prepared with the assistance of Alex Buttaro of our staff.

General Comments

Procedures followed in the withdrawal and subsequent resubmission of this Final EIS failed to meet both the letter and the intent of the law. Section 11-200-23(h), Department of Health Administrative Rules, states,

> "...Subsequent resubmittal of the [withdrawn] EIS shall meet all requirements for filing, distribution, publication, review, acceptance, and notification as the original EIS."

Noting that the listed requirements reflect the topical sequence of Sections 11-200-20, 11-200-21, 11-200-22, and 11-200-23 of the EIS Rules, the intent of Section 11-200-23(h) is for a resubmittal of a withdrawn EIS to enter the EIS process at the Draft EIS stage. This conclusion follows logically, since it is presumed that a resubmitted EIS will contain new or revised information not previously offered for public review. Responding to reviewers comments, the preparers repeatedly refer to "performance of

additional field studies and related modifications to our preliminary design plans and Draft EIS document." If the inclusion of these new elements is considered sufficiently important to warrant withdrawal and resubmission of the EIS, the finding of Chapter 343, HRS, that,

> "...the process of reviewing environmental effects is desirable...and public participation during the review process benefits all parties involved and society as a whole."

effectively is disregarded by simply revising and reissuing the Final EIS.

Aquatic Resources

We took exception to the summary treatment of substantive information on aquatic fauna provided in Dr. Timbol's field study. Appendix C, Section 5.1 (page 28) states,

> "The 'o'opu-nakea will survive the development, the 'o'opu-alamo'o and the opae-kala'ole may not survive where there will be dewatering..."

Dr. Timbol's assessment appears to conflict with the statement (Section 4.2.1, page 4-2) that "...it is not believed that these impacts will generate any significant impacts upon the stream biota." In particular, the species identified by Dr. Timbol as being most at risk, Lentipes concolor, has been recommended for listing as endangered by the U.S. Fish and Wildlife Service in Honolulu (Appendix C, page 12). Certainly, the potential elimination of this species from lower reaches of the stream constitutes an important issue. Thus, pursuant to Sections 11-200-17 and 11-200-19 of the EIS rules, specific discussion of potential impacts to Lentipes populations should be included in the text of the EIS, and general references to the material in the appendices fail to satisfy the requirements of the EIS Rules.

Content Requirements

Another area of inadequacy in this document lies in the incomplete and general nature of the responses to comments by public agencies on the earlier draft. Section 11-200-18(4) of the EIS Rules specifies that responses to public comments on the EIS,

> "shall describe the disposition of significant environmental issues raised..."

In its revised form, the Final EIS continues to provide casual and insubstantial responses to substantive issues raised by a number of reviewers. Consequently, this document fails to satisfy content requirements of an EIS, and it should not be accepted in its present form.

Summary

We continue to be dissappointed with the cursory treatment afforded to substantive issues within this EIS. A great deal of extremely important information reported in the Appendices was insufficiently reflected in the body of the document.

Of greater concern is the failure to comply with the procedural intent of the EIS system. Public participation is the cornerstone of the EIS process, and acquiescence to the procedures followed in this instance would establish a precedent which effectively would disenfranchise the very segment of society that the EIS system was designed to serve.

Thank you for the opportunity to comment on this document.

Sincerely,

John T. Harrison, Ph.D.
Environmental Center

cc: OEQC
Portugal & Associates, Inc. ✓
Roger Fujioka
Alex Buttaro

72

JAMES PEDERSEN
PLANNING CONSULTANT
P.O. Box 22
Volcano, Hawaii 96785
Tel/Fax: (808) 967 - 7619

December 30, 1991

Mr. John T. Harrison, Ph.D.
Environmental Center
University of Hawaii Water Resources Research Center
Crawford 317, 2550 Campus Road
Honolulu, Hawaii 96822

Dear Mr. Harrison:

Subject: Final Environmental Impact Statement
Upper Makaleha Springs Water Resource Development Project
Kapaa, Kauai, Hawaii

Thank you for your comments to the Honorable William Paty, dated March 20, 1991, concerning the original final EIS for this project which was published by Portugal and Associates, Inc. in December, 1990. We appreciate the time that you and your staff have made in reviewing the earlier final EIS for this project, as well as your personal participation in an August 2, 1991 meeting to discuss unresolved project issues.

This project has been significantly delayed due to the performance of additional field studies and related modifications to preliminary design plans and the original draft EIS document. While the final EIS was published in December, 1990, the expanded content of the final EIS and other related concerns prompted the State Division of Water Resource Management to prepare a revised draft EIS. Since publication of this document by the State is anticipated during the next week or so, you can expect receiving a copy for your review and comment in early 1992.

General Comments

Your general concerns expressed regarding the procedural aspects of the EIS should be addressed through the preparation of a revised draft EIS for the project. For clarification, it should be noted that only one final EIS was ever prepared for this project; no final EIS was resubmitted. However, we concur that the scope of new information provided in the final EIS, submitted in December, 1990, warrants the preparation of a revised draft EIS.

Aquatic Resources

We concur with your findings that some of the discussions concerning aquatic ecology did not correlate well with information provided by Dr. Timbol in Appendix C of the final EIS. This section has been revised and expanded in the soon-to-be published revised draft EIS.

We also share your concern for potential stress upon the L. concolor in the lower section of Makaleha Stream between the Spring and the Kapaa Stream confluence. As Dr. Timbol noted, the survival of this specie is dependent upon the extent of dewatering downstream of the existing Makaleha Ditch diversion. At the present time, the most significant stress upon this water body is the diversion of surface water to Lihue Plantation Company for irrigation purposes.

With the recent closure of sugarcane cultivation in Kealia, a significant opportunity exists for enhancing DO and temperature levels in Makaleha Stream, downstream of the Makaleha Ditch diversion. Given the reduced irrigation requirement in the Kealia area, it is recommended that the State Board of Land and Natural Resources negotiate a reduction in the volume of surface flow diversion from Makaleha Stream to Makaleha Ditch with Lihue Plantation Company. Increased streamflow, downstream of the Makaleha Ditch diversion, would: 1) enhance the quality of the more degraded stream habitat in the lower portions of Makaleha Stream; and 2) significantly reduce potential risks of the proposed project upon the habitat of the o'opu-alamo'o. Should efforts to negotiate with Lihue Plantation fail, the only other option would be for the State Board of Land and Natural Resources to not renew any application by the Plantation for renewal of its existing water rights.

Between the Springs and the Makaleha Ditch diversion, however, the potential adverse impacts upon L. concolor may still occur. Dr. Timbol and other aquatic biologists, e.g., Don Heacock, have advised us that little is known about the aquatic biology and ecology of native Hawaiian stream fauna. For this reason, we believe that the only practical mitigation to this potential impact is to periodically monitor this portion of Upper Makaleha Stream after construction. The logical agency to conduct such investigations would be the State Division of Aquatic Resources. Dependent upon the results of future monitoring, the County Department of Water is prepared to adjust the rate and timing of water capture in order to ensure the integrity of the stream habitat. This commitment will be reflected in the revised draft EIS. Such adjustments would be possible through the proposed installation of a valve at the proposed intake structure.

Content Requirements

We concur that a number of significant issues were raised during the initial consultation and public review of the draft EIS. Further, the identification of an issue by a given agency, organization or individual does not mean that it is either significant or necessarily relevant. While our firm was not involved in the preparation of the draft EIS, our detailed review of agency comments indicate that some of the substantive project issues were addressed by Portugal and Associates, Inc.

We concur that the final EIS was deficient in that comments from some private and public agencies were unintentionally omitted from the document. Since our firm was inadvertently provided an incomplete set of all agency comments, we did not respond to them. However, we take exception to your assessment that we have made casual and incomplete responses to

responding agencies. Our organization has devoted considerable effort to reviewing comments and concerns from a variety of public agencies, special interest groups, community organizations, private corporations, and individuals for this project. Our level of response varies to our perception of the level of detail required and desired by each reviewer and the organization represented. Subjectively, we also assess how significant or "major" the issue raised is to the impact of the overall project.

Regards,

Jim Pedersen
Principal Planner

BRIAN J. J. CHOY
Acting Director

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813

March 27, 1991

William W. Paty, Chairperson
Board of Land and Natural Resources
P.O. Box 373
Honolulu, Hawaii 96809

Dear Mr. Paty:

SUBJECT: FINAL ENVIRONMENTAL IMPACT STATEMENT
UPPER MAKALEHA SPRINGS WATER RESOURCE DEVELOPMENT

The Office of Environmental Quality Control acknowledges the receipt of the above listed document. This is the second Final EIS submitted for this project by the Department of Land and Natural Resources. No action, either an acceptance or non-acceptance letter, was prepared for the previous document by this Office in 1987. Although not specifically stated in the Administrative rules, precedence has been previously set by interpretation of Chapter 200 by the Environmental Council. When a FEIS has substantive changes, it must be resubmitted as a revised Draft EIS to allow for public comment.

Chapter 200, Title 11 of Administrative Rules, is as follows:

§11-200-23 Acceptability. ...(h) A proposing agency or applicant may withdraw an EIS by sending a letter to the office. Subsequent resubmittal of the EIS shall meet all requirements for filing, distribution, publication, review, acceptance, and notification as the original EIS.

The Environmental Council's decision was based on the interpretation of the above section stating that there is no "review" for FEIS's, therefore, the document must be resubmitted as a Draft EIS.

The Office also has reviewed the document for content and possible acceptability. As written, it does not fulfill the requirement of Chapter 343. Listed below are the items we found to be deficient. Please note that the items listed are for the most part objective and not subjective comments.

RECEIVED AS FOLLOWS

1) No unresolved issues are listed. The first FEIS submitted listed several valid unresolved issues.

2) The list of organizations and individuals commenting on the draft Environmental Impact Statement is missing.

3) There is one section of comment letters (comments referred to the DEIS) present in the first FEIS that was not included in the present FEIS. This section has 14 comment letters with coinciding responses. The responses should be directly behind the corresponding comment letters.

4) OEQC's files included two substantive letters not included in either FEIS. (These are enclosed with this letter.) It is required that all substantive comment letters and their responses be included in the FEIS. Responses to Environmental Assessment comment letters must also be include in the FEIS.

5) There is a letter in Appendix B from the Department of Health which should be in Appendix A since it is in response to the Environmental Assessment.

6) Socio-economic impacts are not listed as such. Reference is made in other sections but not dealt with directly. The socio-economic effects need to be addressed directly especially with reference to the Lihue Plantation and subsequently the island workforce. (This issue was noted in several of the comment letters, but not dealt with in the FEIS.)

7) [redacted] on the environment, since only sporadic measurements of the spring discharge were performed, how will the long-term impact be monitored? Which agency will be responsible for assuring that the stream not be subjected to major adverse impacts? Who will monitor the unmetered withdrawal from the springs? (These issues were also raised in the comment letters submitted during the EIS process.)

8) Related to the item above, is the Division of Water [redacted] aware [redacted] and Wildlife Service is in the final stages of processing an opinion regarding an endangered [redacted] status of the o'opu, Lentipes concolor. Also, the o'opu, Awaous stamineus is listed as threatened in scientific publications. Both species are reported in Appendix C, however, the subject is not addressed in the text of the document. While the purpose of the Kealia Forest Reserve

RECEIVED AS FOLLOWS

is "to conserve the watershed of Makaleha Mountains for water supply purposes," DLNR must assure that the other natural resources in the area will not be compromised. Will a monitoring program be instituted to assure that the habitat of the possible/probable endangered species will be protected, especially during the dry months?

We respectfully suggest that the agency withdraw this document and submit a Revised Draft Environmental Impact Statement with appropriate changes to fulfill the requirements of Chapter 343 and Administrative Rules, Chapter 200.

If you or your staff have any questions, please feel free to call me or Ms. Cecilia Ornellas at 548-6915.

Sincerely,

Brian J.J. Choy

cc: Environmental Center
Lihue Plantation
DLNR, Kauai Div. of Aquatic Resources

FOR YOUR INFORMATION:

REQUIREMENTS FOR FEIS, INCLUDED AS PART OF THE ACCEPTANCE REPORT

EIS CONTENT

The Final EIS consists of one volume. This document contains as required:

1. Summary Sheet
2. Table of Contents
3. Statement of purpose and need for action
4. Project description
5. Discussion of known alternatives to the proposed action
6. Description of the environmental setting
7. A statement of the proposed actions relationship to the land use plans, policies, and controls for the affected area
8. A statement of probable impact on the environment
9. Relationship between local short-term uses and enhancement of long-term productivity
10. Discloses all irreversible and irretrievable commitments of resources
11. Addresses all probable unavoidable adverse environmental effects
12. Description of mitigation measures to minimize impacts
13. A summary of unresolved issues
14. List of organizations and individuals consulted in preparation of the Environmental Impact Statement
15. Reproduction of all substantive comments and responses made during the consultation process
16. A list of organizations and individuals commenting on the Draft EIS
17. Reproductions of all substantive comments and responses made during the EIS review period

OEQC has determined that the content requirements of the EIS, as specified in Section 11-200-17 of the EIS Rules, have been met.

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JAMES PEDERSEN
PLANNING CONSULTANT
P.O. Box 22
Volcano, Hawaii 96785
Tel/Fax: (808) 967 - 7619

December 30, 1991

Mr. Brian J.J. Choy
Office of Environmental Quality Control
State of Hawaii
220 South King Street, Fourth Floor
Honolulu, Hawaii 96813

Dear Mr. Choy:

Subject: Final Environmental Impact Statement
Upper Makaleha Springs Water Resource Development Project
Kapaa, Kauai, Hawaii

Thank you for your comments to the Honorable William Paty, dated March 27, 1991, concerning the original final EIS for this project which was published by Portugal and Associates, Inc. in December, 1990. We appreciate the time that you and your staff have made in reviewing the earlier final EIS for this project, as well as your guidance to the State Division of Water Resource Management staff.

This project has been significantly delayed due to the performance of additional field studies and related modifications to preliminary design plans and the original draft EIS document. While the final EIS was published in December, 1990, the expanded content of the final EIS, and related agency concerns, and the request of your agency, prompted the State Division of Water Resource Management to prepare a revised draft EIS. Since publication of this document by the State is anticipated during the next week or so, you can expect receiving a copy for your review and comment in early 1992.

In terms of your more specific concerns, we offer the following comments for your review.

UNRESOLVED ISSUES

Section 4.4 of the final EIS identified and briefly discussed three unresolved issues. These issues included: 1) the uncertain quantity of potential discharges from Makaleha Spring following construction of catchment system; 2) future land development of the adjacent Kealia area, which is owned by Lihue Plantation Company, and the transition in local land uses; and 3) potential impacts upon native fish and shrimp. This section will be expanded and updated in the revised draft EIS because of the availability of some new, additional information.

COMMENTS AND CONCERNS FROM ORGANIZATIONS AND INDIVIDUALS

Having become involved in this project after publication of the original draft EIS and the receipt of subsequent agency correspondence, our firm was unintentionally provided an incomplete set of correspondence received from public agencies, organizations, and individuals. Consequently, appropriate appendices of the final EIS were deficient. We believe that the correspondence included in the soon-to-be published revised draft EIS is complete.

SOCIO-ECONOMIC IMPACTS

Valid private and public concerns regarding potential impacts to former sugar cultivation and local sugar industry employment were expressed in comments to the original draft EIS. The basis for these concerns have been eliminated, or overshadowed, by the more recent announcements by Lihue Plantation Company to cease sugarcane cultivation in Kealia at the end of 1991. Consequently, the proposed project will not impact local sugar industry employment.

AQUATIC RESOURCE IMPACTS

We share the concern expressed by various agencies for the potential stress upon the L. concolor in the lower section of Makaleha Stream, between the Spring and the Kapaa Stream confluence. Dr. Timbol, aquatic biologist, concluded in his investigative report that the survival of this specie is dependent upon the extent of dewatering downstream of the existing Makaleha Ditch diversion. At the present time, the most significant stress upon this water body is the diversion of surface water to Lihue Plantation Company for irrigation purposes.

With the recent closure of sugarcane cultivation in Kealia, a significant opportunity exists for enhancing DO and temperature levels in Makaleha Stream, downstream of the Makaleha Ditch diversion. Given the reduced irrigation requirement in the Kealia area, it is recommended that the State Board of Land and Natural Resources negotiate a reduction in the volume of surface flow diversion from Makaleha Stream to Makaleha Ditch with Lihue Plantation Company. Increased streamflow, downstream of the Makaleha Ditch diversion, would: 1) enhance the quality of the more degraded stream habitat in the lower portions of Makaleha Stream; and 2) significantly reduce potential risks of the proposed project upon the habitat of the o'opu-alamo'o. Should efforts to negotiate with Lihue Plantation fail, the only other option would be for the State Board of Land and Natural Resources to not renew any application by the Plantation for renewal of its existing water rights.

Between the Springs and the Makaleha Ditch diversion, however, the potential adverse impacts upon L. concolor may still occur. Dr. Timbol and other State aquatic biologists, e.g., Don Heacock, have advised us that little is known about the aquatic biology and ecology of native Hawaiian stream fauna. For this reason, we believe that the only practical mitigation to this potential impact is to periodically monitor this portion of Upper Makaleha Stream after construction. The State Division of Aquatic Resources would be the logical agency to carry out such investigations. Dependent upon the results of future monitoring, the County Department of Water is prepared to adjust the rate and timing of water capture in order to ensure the integrity of the stream habitat. This commitment will be reflected in the revised draft EIS. Such adjustments would be possible through the proposed installation of a valve at the proposed intake structure.

Regards,

Jim Pedersen
Principal Planner

MM! Cissy
CO

State of Hawaii
Division of Aquatic Resources
Department of Land & Natural Resources
P.O. Box 1671
Lihue, Kauai, HI 96766
Ph: (808) 241-3400; FAX: (808) 241-3605

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QUALITY C...

Memorandum 22 April 1991

To: Cissy Ornellas, OEQC
From: Don Heacock, Kauai District Aquatic Biologist
Subject: Review of Final EIS for Upper Makaleha Springs Water Development, Kapaa, Kauai, December 1990.

I have reviewed this FEIS, and generally my previous (4 Sept. 1987) comments remain applicable. I recommend that this FEIS should not be accepted for the following reasons:

1. One of the State's water resources management objectives is to conserve the quality of local streams for existing and potential aquatic life. Diverting any additional water from this watershed will decrease instream flow. Instream flows within this watershed, particularly upper portions of Kapaa River and lower reaches of Makaleha Stream, are already severly impacted (ie. portions of streambed become completely dry) during "summer low flow" conditions. Capturing the Makaleha Spring water before it reaches the stream will reduce instream flow below the spring and increase the average number of days that streambed will become completely dry.

2. Makaleha Stream is habitat for the endemic gobies 'o'opu nakea and 'o'opu alamo'o, which is a candidate for listing as a protected species by the USFWS (see Attachment 1).

3. Makaleha Stream is the only headwater stream in the Kapaa-Wailua area which offers relatively good public access, offers recreational opportunities such as fishing for native 'o'opu nakea[1], hiking, photography and aesthetic enjoyment, and it is the only stream in the Kapaa-Wailua area in which the 'o'opu alamo'o can be seen, which gives this stream unique aquatic educational values. Makaleha Valley if it is preserved in its present form, or enhanced, offers the public a wealth of long-term socioeconomic benefits; these inherent values have not been adequately considered in the FEIS evaluation.

I offer the following comments relative to the protection of this native stream ecosystem:

1. Alternative B: The FEIS states (p.2-6) that drilling a well at Akulikuli Ridge (alternative B) is not expected to generate any negative impacts on the adjacent (Akulikuli) stream because the high-level, dike-

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[1] It is important to note that every stream and tributary of the Wailua River watershed is dominated by the introduced, and highly predatory, smallmouth bass, Micropterus dolomiuei. Therefore, native fishes and crustaceans are rare in the Wailua watershed.

Mtg: Grey

RECE

State of Hawaii
Division of Aquatic Resources
Department of Land & Natural Resources
'91 MAY 17 P3:36 P.O. Box 1671
Lihue, Kauai, HI 96766
OFC. OF ... Ph: (808) 241-3400; FAX: (808) 241-3605
QUALITY CO...

Memorandum 16 May 1991

To: Cissy Ornellas, OEQC
From: Don Heacock, Kauai District Aquatic Biologist
Subject: Upper Makaleha Springs Water Development, Kapaa, Kauai: status request

Please inform as to the status of the FEIS for the Makaleha Springs Water development.

In addition to my previous comments (memos dated 22 April 1991 -attached) I would like to offer the following comments:

1. The statement that, "the proposed project will fulfill the primary purpose of the Kealia Forest Reserve which is to serve as a source of water supply" may be true on paper, but it is in reality false. Forest reserves are areas where all natural resources (eg. trees, wildlife, fisheries, and water) are conserved for their long-term optimal use by society. Forest reserves are multi-functional and provide many uses (eg. fishing, swimming, hiking, hunting, drinking water supply, aesthetic enjoyment, nature study, bird watching, fish watching, photography, etc.) which are not necessarily mutually exclusive. A well managed forest reserve produces freshwater habitats (eg. streams and rivers) which are the "fish factories" of the forest.

2. The statement that, "the proposed project is consistent with the Kauai County General Plan and the Hawaii State Plan" is meaningless since the project does not appear to be consistent with one of the specific objectives of the State Water Code and the Hawaii Stream Assessment which is to "protect native stream ecosystems".

If I may be of further help to you please contact me.

Sincerely,

Don E. Heacock

Donald E. Heacock

cc. Ed Pettys, Kauai District Forester
Scott Derrickson, Office of State Planning

attmt: (1)

confined ground water is expected to contain little, if any, native aquatic life. This statement is misleading and generates the question, "Into which aquatic habitat does this dike-confined water normally flow? It seems logical that this water would normally flow downslope into Akulikuli Stream, and if the high-level, dike-confined groundwater is tapped for a potable water supply it is highly likely that the water quality, and the resident aquatic biota, in Akulikuli Stream will be impacted by reduced flows and a reduction in aquatic habitat. It is not known if populations of the relatively rare endemic goby, Lentipes concolor, which occur in Makaleha Stream are also found in Akulikuli and Moalepe (misspelled in FEIS) Streams.

2. Alternative C: Enlarging the Makaleha, Akulikuli, and Moalepe Stream tunnels is not a viable alternative because it will result in the addition of only small quantities of water, and it is not known if Lentipes concolor, which is being considered for protected status, may also occur in Akulikuli and Moalepe Streams.

3. Alternative D: Developing a one-acre surface water impoundment near the existing County water storage tank along Kapaa River. If the impoundment was built on a stream, significant environmental impacts could be generated such as soil erosion/sedimentation during construction and during summer "draw-down" periods, blockage of migratory native stream species, etc. Only when detailed plans become available can a more detailed environmental assessment be done.

4. Alternative E: Makaleha Spring development, although it appears to offer the "best" development alternative, it will degrade the quality of aquatic and wildlife habitats in the lower portion of Makaleha Stream and in the upper portion of Kapaa River since the Makaleha spring water will no longer flow into the watershed, thereby reducing the instream flow.

The most important factor in the long-term conservation and protection of the 'o'opu alamo'o (Lentipes concolor) population in this stream is to maintain or improve instream flow within Makaleha Stream and within Kapaa River in order that adequate recruitment of post-larval 'o'opu alamo'o can occur. Diverting the Makaleha spring water will decrease instream flow within that portion of the stream located below the spring, and therefore may increase the mortality rate of post-larval 'o'opu alamo'o which must migrate from the ocean, through Kapaa River, over at least two cement diversion weirs, and finally reach their adult habitat located in upper Makaleha Stream. All other things being equal, recruitment is the most important factor that affects the biological productivity of fishery resources (Sissenwine 1984)[2].

5. Alternative A, the no project option, which focusses on water conservation efforts, appears to be the best option. However, vacant lands could continue to be developed for residential use by allowing the development of water catchment systems. Much of the Wailua area receives more than ample rainfall to supply catchment systems with adequate water.

Don E. Heacock

Donald E. Heacock

---

[2] M.P. Sissenwine. 1984. The uncertain environment of fishery scientists

JAMES PEDERSEN
PLANNING CONSULTANT
P.O. Box 22
Volcano, Hawaii 96785
Tel/Fax: (808) 967 - 7619

December 30, 1991

Mr. Donald E. Heacock
Aquatic Biologist, Kauai District
State Division of Aquatic Resources
Department of Land and Natural Resources
P.O. Box 1671
Lihue, Kauai, Hawaii 96766

Dear Mr. Heacock:

Subject: Original Draft Environmental Impact Statement
Upper Makaleha Springs Water Resource Development Project
Kapaa, Kauai, Hawaii

On September 4, 1987, you provided comments to Dr. Marvin Miura, former director of the State Office of Environmental Quality Control, concerning the original draft EIS for the subject project. It is our understanding that you did not receive a response to your concerns. For this reason, we are providing a formal written response to these comments on behalf of Portugal and Associates, Inc. As you may recall, we more recently had a brief telephone discussion with you in early November, 1991 concerning this project. In this regard, we appreciate your clarifying the scope of your concerns which you indicated were reflected in your letter of September 4, 1987.

This project has been significantly delayed due to the performance of additional field studies and related modifications to preliminary design plans and the original draft EIS document. The comments you initially provided to us assisted us greatly in our substantive revision of the original draft EIS. The final EIS was published in December, 1990; however, revisions in the original project proposal, the expanded content of the final EIS, and other related concerns prompted the State Division of Water Resource Management to prepare a revised draft EIS for the project. Since publication of this document by the State is anticipated during the next week or so, you can expect receiving a copy for your review and comment in early 1992.

We concur with your statements indicating that there is limited biological data concerning the biology, ecology and population dynamics of native Hawaiian stream fauna. As you are well aware, additional biological and physiochemical field studies were conducted by Amadeo Timbol, Ph.D., in March-April, 1990. If I recall correctly, you also accompanied Dr. Timbol during, at least, one day of the supplemental field investigations.

We share your concerns for the native aquatic fauna of Makaleha Stream and we believe that the proposed capture of water from Upper Makaleha Springs will somewhat degrade the physiochemical characteristics of Makaleha Stream. The potential extent of this degradation

is unknown given the limited information about native Hawaiian Stream fauna. The measurement of adequate flow can practically be addressed through periodic monitoring of the Upper Makaleha Stream by the State Division of Aquatic Resources. If monitoring detects significant adverse impacts upon Upper Makaleha Stream fauna, the County of Kauai is committed to discontinuing its use of water from the springs. This commitment has been added to the scope of the proposed project and is reflected in the soon-to-be published revised draft EIS.

We also believe that a greater potential stress of the proposed project is the potential effects via additional dewatering downstream of the existing Makaleha Ditch diversion. However, with the impending closure of sugarcane cultivation in Kealia, a significant opportunity exists for enhancing DO and temperature levels in Makaleha Stream, downstream of the Makaleha Ditch diversion. Given the reduced irrigation requirement in the Kealia area, it is recommended that the State Board of Land and Natural Resources negotiate a reduction in the volume of surface flow diversion from Makaleha Stream to Makaleha Ditch with Lihue Plantation Company. Increased streamflow, downstream of the Makaleha Ditch diversion, would: 1) enhance the quality of stream habitat in the lower portions of Makaleha Stream; and 2) virtually eliminate any potential risks of the proposed project upon the habitat of the o'opu-alamo'o. Should efforts to negotiate with Lihue Plantation fail, the only other option would be for the State Board of Land and Natural Resources to not renew any application by the Plantation for renewal of its existing water rights.

Thanks again for your patience in receiving this response. However, we feel that the delay has been fruitful in terms of reducing the potential environmental consequences of the project and refining the overall approach to water resource development in Kauai's Kapaa-Wailua area.

Regards,

Jim Pedersen
Principal Planner

RECEIVED
91 JUN 27 P12:14
DIV. OF WATER &
LAND DEVELOPMENT
'91 JUN -3 A11:58
OFC. OF ENVIRONMENTAL QUALITY

1000 Friends of Kauai
P.O. Box 959 Hanalei, Kauai, Hawaii (808) 245-5964

Cissy Ornellas
State OEQC
465 S. King Street
Honolulu, HI 96813

22 June 1991

Dear Ms. Ornellas,

Our Board of Directors is very concerned about the potential negative impact of the proposed Upper Makaleha Springs Water Development Project on the Makaleha watershed area on East Kauai. Hawaiian forest reserve and watershed areas like the Makaleha Mountains, which are included in the State's Kealia Forest Reserve, hold what is left of Hawaii's remarkably unique biological diversity. These areas provide habitat for our native flora and fauna, protect our clean water supply, and are also important recreational areas used extensively by hunters and hikers.

The health of the native components of these ecosystems are good indicators of the health of the water supply which it overlies since these areas are known to act as natural regulators and purifiers of surface water flow. Protection of these areas therefore goes hand in hand with protecting our clean water supplies and should be regarded as a critically important issue in water and land-use planning.

Flowing rivers and streams in particular are good indicators because these systems are the surface reflection of the groundwater supply we depend on and the native components of these freshwater habitat, which require continuous flow to the ocean, are highly sensitive to pollution and other man-induced changes.

Biologically, areas like Makaleha Springs are especially unique habitat in Hawaii and a detailed survey of the spring itself is missing from the original EIS for the project.. Three continuous fresh water sources create habitat for at least two species of endemic Hawaiian Lymnaied snails, one of which *Lymnaea newcombi*, is restricted to Kauai and apparently quite rare (Mike Kido personal communication). Also found in the spring is the endemic mountain *'opae* (*Atyoida bisulcata*) and associated with the spring, endemic plants such as *mamaki* (*Pipturus albidus*) and *Cyrtandra* spp. (Mike Kido personal communication). The EIS for the project also indicates that in the pool supported by the flow of spring water is the category 1 endangered *'o'opu-alamo'o* which

is becoming rare in Hawaiian streams. It seems very likely that this unique resource will be destroyed by this project when the spring's water is cut off.

In the EIS for the project is the statement that the "primary purpose of the Kealia Forest Reserve...is to serve as the source of water supply", which is typical of the prevailing philosophy regarding the importance, or rather the expendability of native areas. The Kauai Water Use and Development Plan similarly overlooks the importance of our stream and wetland resources to our island's people.

The United States has lost over 50% of its natural wetlands in the last 200 years and this loss has been accompanied by the decline in its potable water supply. We need to recognize the value of our forest reserves for the unique Hawaiian biological diversity they perpetuate as well as the clean, healthy water supply which they protect. This should be one of the priorities in water and land use planning in Hawaii if we are serious about maintaining the health of our people in perpetuity.

Cordially yours,

James Nishida
President

cc Andy Yuen - USFWS

129

84

JAMES PEDERSEN
PLANNING CONSULTANT
P.O. Box 22
Volcano, Hawaii 96785
Tel/Fax: (808) 967 - 7619

December 30, 1991

Mr. James Nishida, president
1000 Friends of Kauai
P.O. Box 99
Hanalei, Kauai, Hawaii 96714

Dear Mr. Nishida:

Subject: Final Environmental Impact Statement
Upper Makaleha Springs Water Resource Development Project
Kapaa, Kauai, Hawaii

Thank you for your comments to Ms. Cissy Ornellas of the State Office of Environmental Quality Control, dated May 22, 1991, concerning the original final EIS for this project which was published by Portugal and Associates, Inc. in December, 1990. We appreciate the time you have taken to review the earlier final EIS for this project.

This project has been significantly delayed due to the performance of additional field studies and related modifications to preliminary design plans and the original draft EIS document. While the final EIS was published in December, 1990, the expanded content of the final EIS, and other related agency concerns, prompted the State Division of Water Resource Management to prepare a revised draft EIS. Since publication of this document by the State is anticipated during the next week or so, you can expect receiving a copy for your review and comment in early 1992.

AQUATIC HABITAT

We recognize and concur with your concerns for the aquatic habitat of Makaleha Stream. Our greatest concern is for the potential stress upon the L. concolor in the lower section of Makaleha Stream, between the Spring and the Kapaa Stream confluence. Dr. Timbol, a consulting aquatic biologist on Kauai, concluded in his investigative report that the survival of this specie is dependent upon the extent of dewatering downstream of the existing Makaleha Ditch diversion. At the present time, the most significant stress upon this water body is the diversion of surface water to Lihue Plantation Company for irrigation purposes.

With the recent closure of sugarcane cultivation in Kealia, a significant opportunity exists for enhancing DO and temperature levels in Makaleha Stream, downstream of the Makaleha Ditch diversion. Given the reduced irrigation requirement in the Kealia area, it is recommended that the State Board of Land and Natural Resources negotiate a reduction in the volume of surface flow diversion from Makaleha Stream to Makaleha Ditch with Lihue Plantation Company. Increased streamflow, downstream of the Makaleha Ditch diversion, would: 1) enhance the

quality of the more degraded stream habitat in the lower portions of Makaleha Stream; and 2) significantly reduce potential risks of the proposed project upon the habitat of the o'opu-alamo'o. Should efforts to negotiate with Lihue Plantation fail, the only other option would be for the State Board of Land and Natural Resources to not renew any application by the Plantation for renewal of its existing water rights.

Between the Springs and the Makaleha Ditch diversion, however, the potential adverse impacts upon L. concolor may still occur. Dr. Timbol and other State aquatic biologists, e.g., Don Heacock, have advised us that little is known about the aquatic biology and ecology of native Hawaiian stream fauna. For this reason, we believe that the only practical mitigation to this potential impact is to periodically monitor this portion of Upper Makaleha Stream after construction. The State Division of Aquatic Resources would be the logical agency to carry out such investigations. Dependent upon the results of future monitoring, the County Department of Water is prepared to adjust the rate and timing of water capture in order to ensure the integrity of the stream habitat. This commitment will be reflected in the revised draft EIS. Such adjustments would be possible through the proposed installation of a valve at the proposed intake structure.

KEALIA FOREST RESERVE

The urbanization of the Wailua-Kapaa area has clearly generated an increasing demand of potable water for both residential and commercial consumers. Lifestyle changes, as well as transitioning economic objectives and realities, will continue to intensify the demand for more water consumption.

For over three decades, the water resources of Makaleha Stream have been used to support the irrigation of sugar cane lands in Kealia. Consequently, the aquatic resources have been more directly affected by these uses which were tied to Kauai's former primary industry.

Domestic life support for people, and their related economic interests, are prevailing philosophies because they continue to be the primary factors influencing our human environment. They cannot be ignored as they will continue as long as we all continue to exist. At the same time, the quality and costs associated with our human environment will continue to be degraded if we continue to disregard the quality of our natural resources such as the aquatic habitat in Kauai's fresh-water streams. Our mutual challenge is to merge human lifestyle, economic, and natural resource "requirements" into practical management approaches.

Regards,

Jim Pedersen
Principal Planner

APPENDIX C-1

RESPONSES TO THE REVISED DRAFT EIS

APPENDIX C-1

SUMMARY OF RESPONSES TO THE REVISED DRAFT EIS

(Page 1 of 2 pages)

Date of Letter	From/Agency	Date of Response
5/22/92	Major Jerry M. Matsuda U.S. Department of Defense	1/05/94
5/26/92	Don Hibbard, Division of Historic Preservation State of Hawaii, Dept. of Land and Natural Resources	1/04/94
5/27/92	Murray Towill State of Hawaii, Dept. of Business & Eco. Dev. & Tourism	1/05/94
5/27/92	Rex Johnson State of Hawaii, Department of Transportation	1/05/94
5/28/92	William Bonnet Hawaiian Electric Company, Inc.	1/04/94
5/29/92	Russel Nagata State of Hawaii, Dept. of Accounting and Gen. Services	1/05/94
6/04/92	W. K. Liu U.S. Department of the Navy	1/04/94
6/12/92	Joseph Conant State of Hawaii, Housing Finance & Development Corp.	1/05/94
6/16/92	Raymond Sato Kauai County Department of Water	1/04/94
6/27/92	Fred Jagar 1000 Friends of Kauai	1/04/94
6/29/92	Yukio Kitagawa State of Hawaii, Department of Agriculture	1/05/94
7/02/92	Kisuk Cheung U.S. Army Corps of Engineers	1/04/94

APPENDIX C-1

SUMMARY OF RESPONSES TO THE REVISED DRAFT EIS

(Page 2 of 2 pages)

Date of Letter	From/Agency	Response
7/06/92	Bryan Choy State of Hawaii, Office of Environmental Quality Control	1/05/94
7/07/92	Thatcher Magoun Kauai Outdoor Circle	1/04/94
7/07/92	David Penn Native Hawaiian Advisory Council	1/04/94
7/07/92	John Keppler State of Hawaii, Dept. of Land & Natural Resources	1/10/94
7/09/92	John Lewin M.D. State of Hawaii, Department of Health	1/05/94
7/09/92	Harold S. Masumoto State of Hawaii, Office of State Planning	1/04/94
7/28/92	Brian Choy State of Hawaii, Office of Environmental Quality Control	1/10/94
1/22/93	Raymond Sato Kauai County Department of water	1/04/94
4/23/92	Henry Sakoda, Division of Aquatic Resources State of Hawaii, Dept. of Land & Natural Resources	1/04/94

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816-4495

EDWARD V. RICHARDSON
MAJOR GENERAL
ADJUTANT GENERAL

LYLES M. NAKATSU
COLONEL
DEPUTY ADJUTANT GENERAL

RECEIVED
92 MAY 26 A 8 : 00
DIV. OF WATER &
LAND DEVELOPMENT

May 22, 1992

Engineering Office

Office of Environmental Quality Control
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

Dear Sir:

Subject: Upper Makaleha Spring Water Resource Development,
Kapaa, Kauai, Hawaii

Thank you for providing us the opportunity to review the above mentioned Upper Makaleha Springs Water Resource Development.

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

Sincerely,

Jerry M. Matsuda
Lieutenant Colonel
Hawaii Air National Guard
Contracting and Engineering Officer

Enc.

c: DLNR Div of Water & Land Development
Portugal & Associates, Inc.

NATIONAL GUARD
Americans At Their Best.

JOHN WAIHEE
GOVERNOR OF HAWAII

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

KEITH W. AHUE, Chairperson
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

JOHN P. KEPPELER, II
DONA L. HANAIKE

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

REF:WL-EK

JAN 5 1994

Mr. Jerry M. Matsuda
Lieutenant Colonel
Department of Defense
3949 Diamond Head Road
Honolulu, Hawaii 96813

Dear Mr. Matsuda:

Revised Draft Environmental Impact Statement (RDEIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your letter of May 22, 1992 regarding the subject project. Your letter will be included in the Final Environmental Impact Statement.

Very truly yours,

KEITH W. AHUE

JOHN WAIHEE
GOVERNOR OF HAWAII

WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

JOHN P. KEPPELER, II
DONA L. HANAIKE

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

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

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

May 26, 1992

LOG NO: 5399
DOC NO: 1937w

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

Dear Mr. Choy:

SUBJECT: Historic Preservation Review -- Revised Draft Environmental Impact Statement Upper Makaleha Springs Water Resource Development (DLNR)
TMK: 4-6-01: 01
Kapaa, Kawaihau, Kauai

Our office reviewed the archaeological survey report (Appendix G) by Hammatt 1986 and conducted a field inspection in 1987 of the proposed area. We concur with these previous recommendations, that no historic sites were found.

We concur with the Draft EIS's assessment that no historic sites are present in the proposed project site. Therefore, we believe that this project will have "no effect" on significant historic sites.

It should be noted that as a result of our fieldcheck in 1987, our office asked to be notified 5 days prior to the construction of the access road, so our office staff could be present to archaeologically monitor the grading -- given the possibility the work could expose a buried habitation deposit or artifacts. Based on past experience, subsurface discoveries have been covered by slope wash, and Hammatt's (1986) survey indicated this was a possibility and one of the reasons why he did not find any historic sites. Monitoring might find any such buried sites.

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

Sincerely,

DON HIBBARD, Administrator
State Historic Preservation Division

NM:sty

cc: Andrew Monden, Div. of Water and Land Development
James Pedersen, P.O. Box 22 Volcano, HI 96785

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Water and Land Development

JAN 4 1994

TO: Dr. Don Hibbard, Director
Historic Preservation Division

FROM: Manabu Tagomori, Manager-Chief Engineer

SUBJECT: **Revised Draft Environmental Impact Statement, Makaleha Springs Water Resource Development, Kapaa, Kauai, Hawaii**

Thank you for your comments regarding the subject project.

Please be informed that the earlier concept of constructing an access road along the Makaleha stream has been eliminated from the overall project scope.

Should you have any questions on this matter, please have your staff call Mr. Edward Lau at the Project Development Branch at Extension 70227.

SA:ek

JOHN WAIHEE
Governor
MURRAY E. TOWILL
Director
BARBARA KIM STANTON
Deputy Director
RICK EGGED
Deputy Director
TAKESHI YOSHIHARA
Deputy Director

RECEIVED

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

A9:18

ENERGY DIVISION, 335 MERCHANT ST., RM. 110, HONOLULU, HAWAII 96813 PHONE: (808) 587-3800 FAX: (808) 587-3820

DIV. OF WATER & LAND DEVELOPMENT

May 27, 1992

The Honorable John Waihee
Governor, State of Hawaii
c/o Office of Environmental Quality Control
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

Dear Governor Waihee:

Subject: Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii
District-Kawaihau
Tax Map Key Numbers: 4-6-01:01

We wish to inform you that we have no comments to offer on the subject draft environmental impact statement. We are therefore returning the draft EIS.

Thank you for the opportunity to review the document.

Sincerely,

Murray E. Towill

Murray E. Towill

MHK:hkeis43

cc: ✓DLNR-Division of Water & Land Development
Portugal & Associates, Inc.

JOHN WAIHEE
GOVERNOR OF HAWAII

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

KEITH W. AHUE, Chairperson
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

JOHN P. KEPPELER, II
DONA L. HANAIKE

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

REF:WL-EK

JAN 5 1994

Mr. Maurice Kaya
Department of Business Economic
Development and Tourism
Energy Division
335 Merchant Street, Room 110
Honolulu, Hawaii 96813

Dear Mr. Kaya:

Revised Draft Environmental Impact Statement (RDEIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your letter of May 27, 1992 regarding the subject project. Your letter will be included in the Final Environmental Impact Statement.

Very truly yours,

Keith W. Ahue

KEITH W. AHUE

send copies to appropriate parties

FILE

JOHN WAIHEE
GOVERNOR

RECEIVED

92 JUN 1 P2:45

OFC. OF WATER &
LAND DEVELOPMENT

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

REX D. JOHNSON
DIRECTOR

DEPUTY DIRECTORS
JOYCE T. OMINE
AL PANG
JEANNE K. SCHULTZ
CALVIN M. TSUDA

IN REPLY REFER TO:

STP 8.4705

May 27, 1992

'92 MAY 29 P2:17

OFC. OF ENVIRONMENTAL
QUALITY CONTROL

TO: The Honorable John Waihee, Governor
c/o Office of Environmental Quality Control

FROM: Rex D. Johnson
Director of Transportation

Rex

SUBJECT: REVISED DRAFT ENVIRONMENTAL IMPACT STATEMENT
UPPER MAKALEHA SPRINGS WATER RESOURCES DEVELOPMENT
KAPAA, KAUAI

We reviewed the revised draft environmental impact statement and do not believe that the proposed Upper Makaleha Springs Water Resources Development will have any adverse impact on our department's plans, programs, operations or facilities.

We are returning the extra copies of the revised DEIS. We appreciate this opportunity to provide comments.

Enc.

c: DLNR, Division of Water and Land Development

JOHN WAIHEE
GOVERNOR OF HAWAII

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

KEITH W. AHUE, Chairperson
BOARD OF LAND AND NATURAL RESOURCES

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DONA L. HANAIKE

AQUACULTURE DEVELOPMENT PROGRAM
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LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF:WL-EK

JAN 5 1994

Honorable Rex Johnson, Director
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Johnson:

Revised Draft Environmental Impact Statement (RDEIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your letter of May 27, 1992 regarding the subject project. Your letter will be included in the Final Environmental Impact Statement.

Very truly yours,

KEITH W. AHUE

Hawaiian Electric Comp[illegible], Inc. • PO Box 2750 • Honolulu, HI 96840-[illegible]

RECEIVED

92 JUN 4 A8:35

DIV. OF WATER &
LAND DEVELOPMENT

William A. Bonnet
Manager
Environmental Department

May 28, 1992

Office of Environmental Quality Control
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

Dear Sir:

Subject: Revised Draft Environmental Impact Statement (EIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

The information contained in the subject EIS has no impact on HECO facilities or operations. We have no comments on the proposed project. Thank you for the opportunity to review the EIS.

Sincerely,

Enclosure

cc: Andrew Monden, DLNR,
Div. of Water & Land Development
James Pedersen, Portugal & Associates, Inc.

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER AND LAND DEVELOPMENT
P.O. BOX 373
HONOLULU, HAWAII 96809

JAN 4 1994

KEITH W. AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

JOHN P. KEPPELER, II
DONA L. HANAIKE

AQUACULTURE DEVELOPMENT PROGRAM
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HISTORIC PRESERVATION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

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

Dear Mr. Bonnet:

Revised Draft Environmental Impact Statement (RDEIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your letter of May 28, 1992 regarding the subject project. Your letter will be included in the Final Environmental Impact Statement.

Sincerely,

MANABU TAGOMORI
Manager-Chief Engineer

SA:ek

and copies to appropriate parties

FILE

RECEIVED

92 JUN 3 A8:01

POSTED

JOHN WAIHEE
GOVERNOR

RUSSEL S. NAGATA
COMPTROLLER

ROBERT P. TAKUSHI
DEPUTY COMPTROLLER

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

LETTER NO. (P)1511.2

DIV. OF WATER & LAND DEVELOPMENT

'92 JUN -1 P2:22

OFC. OF ENVIRONMENTAL QUALITY CONTROL

MAY 29 1992

The Honorable John Waihee
Governor, State of Hawaii
c/o Office of Environmental
Quality Control
220 South King Street, 4th Floor
Honolulu, Hawaii

Dear Governor Waihee:

Subject: Upper Makaleha Springs
Water Resource Development
Revised Draft EIS

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

Should there be any questions, please have your staff contact Mr. Ralph Yukumoto of the Public Works Division at 586-0488.

Respectfully,

RUSSEL S. NAGATA
State Comptroller

c: Andrew Monden, DLNR, Div. of Water & Land Dev.
Portugal and Associates, Inc.

JO... WAIHEE
OVERNOR OF HAWAII

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

KEITH W. AHUE, Chairperson
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

JOHN P. KEPPELER, II
DONA L. HANAIKE

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

REF:WL-EK

JAN 5 1994

Honorable Robert Takushi, Director
Department of Accounting and
General Services
Kalanimoku Building, Room 412
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Takushi:

Revised Draft Environmental Impact Statement (RDEIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your letter of May 28, 1992 regarding the subject project. Your letter will be included in the Final Environmental Impact Statement.

Very truly yours,

KEITH W. AHUE

DEPARTMENT OF THE NAVY
COMMANDER
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860-5020

RECEIVED
92 JUN 8 A 9: 2
04 JUN ...
DIV. OF WATER & LAND DEVELOPMENT

IN REPLY REFER TO:
11010
Ser 00F2/2032

Governor, State of Hawaii
c/o Office of Environmental Quality Control
220 S. King Street
4th Floor
Honolulu, Hawaii 96813

Dear Sir,

UPPER MAKALEHA SPRINGS WATER
RESOURCE DEVELOPMENT KAPAA, KAUAI, HAWAII

We have reviewed the subject Revised Environmental Impact Statement (REIS) and have no comments to offer. Since we have no further use for the REIS, it is being returned to the Office of Environmental Quality Control (OEQC).

Thank you for the opportunity to review the REIS.

Sincerely

W. K. Liu

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

Copy to;
Dept. of Land & Natural Resources
Div. of Water & Land Development
(Attn: Andrew Monden)
Portugal & Associates. Inc.
(Attn: James Pedersen)

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER AND LAND DEVELOPMENT
P.O. BOX 373
HONOLULU, HAWAII 96809

KEITH W. AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

JOHN P. KEPPELER, II
DONA L. HANAIKE

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

JAN 4 1994

Mr. W. K. Liu
Department of the Navy
Naval Base Pearl Harbor
P.O. Box 110
Honolulu, Hawaii 96850-5020

Dear Mr. Liu:

Revised Draft Environmental Impact Statement (RDEIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your letter of June 4, 1992 regarding the subject project. Your letter will be included in the Final Environmental Impact Statement.

Sincerely,

MANABU TAGOMORI
Manager-Chief Engineer

SA:ek

JOHN WAIHEE
GOVERNOR

RECEIVED
92 JUN 16 P3: 48
DIV. OF WATER & LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
HOUSING FINANCE AND DEVELOPMENT CORPORATION
SEVEN WATERFRONT PLAZA, SUITE 300
500 ALA MOANA BOULEVARD
HONOLULU, HAWAII 96813
FAX (808) 543-6841 587-0600

JOSEPH K. CONANT
EXECUTIVE DIRECTOR

IN REPLY REFER TO:
92:PPE/2372at

June 12, 1992

TO: Governor, State of Hawaii
c/o Office of Environmental Quality Control
220 S. King Street, 4th Floor
Honolulu, Hawaii 96813

FROM: Joseph K. Conant
Executive Director

SUBJECT: DEIS for the Upper Makaleha Springs Water Resource Development, Kapaa, Kauai

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

c: ✓ DLNR
Portugal & Associates, Inc.

JOHN WAIHEE
GOVERNOR OF HAWAII

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

KEITH W. AHUE, Chairperson
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

JOHN P. KEPPELER, II
DONA L. HANAIKE

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

REF:WL-EK

JAN 5 1994

Honorable Joseph K. Conant
Executive Director
Housing Finance and Development
Corporation
677 Queen Street, Suite 300
Honolulu, Hawaii 96813

Dear Mr. Conant:

Revised Draft Environmental Impact Statement (RDEIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your letter of June 12, 1992 regarding the subject project. Your letter will be included in the Final Environmental Impact Statement.

Very truly yours,

KEITH W. AHUE

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

RECEIVED

92 JUN 17 A9:55

DIV. OF WATER &
LAND DEVELOPMENT

June 16, 1992

Governor, State of Hawaii
c/o Office of Environmental Quality Control
220 S. King Street, 4th Floor
Honolulu, HI 96813

Re: Draft EIS Comments - Upper Makaleha Springs Water Resource Development, Kapaa, Kauai, Hawaii, TMK: 4-6-01:01

This project will help provide the needed additional source capacity for the County's Wailua-Kapaa Water System. Upon its completion, it will provide multiple benefits to the County's water consumers.

The project will provide a valuable water source facility to alleviate the existing water shortage in the Kapaa-Wailua areas and will provide adequate water for pending and future planned developments in this area.

The gravity-feed operation of direct water supply delivery into the water system without any pumping ensures energy conservation by eliminating power costs which have totaled $40,000 to $50,000 per year at comparable water systems.

Besides having no power costs, this project will generate very low operational and maintenance costs due to its simple but effective design which is similar to the County's existing gravity-feed Moelepe, Makaleha and Akulikuli Tunnel Sources.

Raymond H. Sato
Manager and Chief Engineer

GF:rm
cc: Office of Environmental Quality Control
220 S. King Street
Honolulu, HI 96813

Mr. Jim Pedersen
c/o Portugal & Associates, Inc.
P. O. Box 807
Lihue, HI 96766

Mr. Andrew Monden
DLNR-DOWALD
P. O. Box 373
Honolulu, HI 96809

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER AND LAND DEVELOPMENT
P.O. BOX 373
HONOLULU, HAWAII 96809

KEITH W. AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

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JOHN P. KEPPELER, II
DONA L. HANAIKE

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WATER AND LAND DEVELOPMENT

JAN 4 1994

Mr. Murl Nielsen
Manager & Chief Engineer
Department of Water
County of Kauai
P.O. Box 1706
Lihue, Hawaii 96766-5706

Dear Mr. Nielsen:

Revised Draft Environmental Impact Statement (RDEIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your letter regarding the subject project. Your comments will be included in the Revised Final Environmental Assessment.

Sincerely,

MANABU TAGOMORI
Manager-Chief Engineer

SA:ek

RECEIVED

92 JUL 7 A8:54

COMMISSION ON WATER
RESOURCE MANAGEMENT

1000 FRIENDS OF KAUAI - BOARD OF DIRECTORS
PO BOX 99, HANALEI, KAUA'I, HAWAI'I 96714
(808) 828-6728

27 June 1992

Office of Environmental Quality Control
220 South King Street
Honolulu, Hawaii 96813

1000 Friends of Kauai is an island-based organization which supports sound planning and wise management of our natural resources. Our Board of Directors has reviewed the "Revised Draft EIS for the Makaleha Springs Water Resource Development" and has strong concerns about potential negative biological impacts of the project on the *punawai* (spring) as well as on the integrity of the water source. The proposal is the same as the previous Draft EIS despite the attempt to provide additional alternatives for the project (Alternatives D and E are identical).

Close examination of the preferred "Alternative E" reveals that the project will still attempt to catch surface water from the *punawai* through the construction of a "cut off trench". This is not a deep well water source as the document might imply. Surface water should not be a preferred water source because of the potential health risks associated with freshwater pathogens (eg giardia, leptospirosis, liver flukes, etc.). The State Department of Health (DOH) will need assurance that the water coming from this source is safe and therefore will require that a treatment facility be constructed. No mention of this requirement or its cost is mentioned in the Draft EIS. The added financial committment required may make this project economically infeasible.

Biological collections recently made by scientists from Bishop Museum and the University of Hawaii indicate that a unique fauna may be associated with the *punawai* itself. This is not mentioned in the Draft EIS. The proposed project would destroy a unique biological resource which may someday prove to be as diverse and spectacular as any remaining in the Hawaiian Islands.

The potential impact of dewatering the stream by destruction of the *punawai* on endemic stream gobies is stated many times both in the biological studies and in comments made by federal and state agencies as well as by the public.

Based on figures of per capita water consumption in the

Kauai Water Use and Development Plan, the Kapaa area consumes approximately 13% more water than Waimea and approximately 10% more water than Lihue. This added to the fact that the report shows potentially inadequate sustainable yields for Kekaha, Waimea, Makaweli, and Hanapepe should indicate we need to begin island-wide programs for water conservation. Given this situation, Alternative F would be a more sensible choice than further taxing our overall water resources with this project. The cost savings from the project could be used to create a "Kauai Water Conservation Program".

The surface water usage provided for in water leases to East Kauai Water Company (Lihue Plantation) should be incorporated into the estimate of the total water removal projected from the Makaleha water source. Since current water leases held by Lihue Plantation will expire in 1994 and agricultural water needs may decline, there may exist an opportunity to improve aquatic stream habitat by increasing surface water flow in Makaleha. Based on this increase, it may be biologically feasible to develop a new potable water source for Kapaa (if deemed critical) if an alternative deep well site may be found which will still provide clean water but not impact the biological resources of the *punawai*. Both agricultural and domestic dewatering if allowed; however will undoubtedly result in a severe decline in aquatic habitat available for native flora and fauna.

The Board of Directors of 1000 Friends of Kauai is therefore opposed to the project as described in the Draft EIS for the reasons stated above. The only reasonable alternative (Alternative F) is to begin a formal program for water conservation. Thank you for the opportunity to comment on this project.

Respectfully yours,

Fred Jagar - President
1000 Friends of Kauai

cc. UH Environmental Research Center
Norman Takashiba - Chair Kauai Water Board
Mayor Joann Yukimura
State Div. Water Resource Management
Sierra Club Legal Defense Fund

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER AND LAND DEVELOPMENT
P.O. BOX 373
HONOLULU, HAWAII 96809

JAN 4 1994

KEITH W. AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

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JOHN P. KEPPELER, II
DONA L. HANAIKE

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WATER AND LAND DEVELOPMENT

1000 Friends of Kauai
Board of Directors
P.O. Box 99, Hanalei
Kauai, Hawaii 96714

Revised Draft Environmental Impact Statement (DREIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Dear Gentlemen:

Thank you for your letter regarding the subject project. Our review of all correspondence on this matter indicate that your letter was not responded to earlier. We offer the following responses to your comments:

The project involves collecting and utilizing perched, high-level groundwater which percolates down through the Makaleha mountains and appear as a springs discharge. Flow measurements by the USGS show that this spring source is groundwater and not from the a stream source. The proposed intake structure is designed to collect the groundwater and discharge by gravity to the connecting pipeline. The intake structure will be constructed of concrete rubble masonry and reinforced concrete slab material to prevent any contamination by surface water runoff. The water is expected to be of potable quality, which is typical of the other water tunnel sources in this area. Surface water will not enter the intake structure. This fact will allow the source to be used without having to receive surface water treatment. Prior to the use of the facility by the County, approval from the Department of Health will be necessary.

We acknowledge report that there are important native inland fish species and the native opae in the stream. We are also aware that while they are important none of these species are on the endangered list.

The flow from the Makaleha stream along its biota is already capable of being totally dewatered by the Makaleha Ditch during low flow periods. The stream flow within the stream reach between the Makaleha Spring area and the Makaleha Ditch intake will be reduced only 8-17%. The County of Kauai Department of Water (DW) has an informal agreement with the Lihue Plantation Company (LPC), requiring that DW reduce or cease pumping water from the spring source during low flow periods when flows in the Makaleha ditch reach 50 mgd. Thus, the effect of water withdrawal from Makaleha Stream below the Makaleha Ditch intake will remain the same; only the ultimate use and method of withdrawal will be changed with the installation of the spring development.

The sustainable yields referred to in the Kauai Water Use and Development Plan (KWUDP), for Waimea, Hanapepe, and Makaweli are also to a large extent, surface water. The County's water supply utilizes groundwater which, according to the KWUDP, is adequate to handle the full development, water needs of the island.

Every Water Department in the State of Hawaii promotes water conservation . It should be noted that State funds for the construction of this project cannot be used to formulate a Kauai Water Use Conservation Program.

The proposed alternative E is the most desirable alternative which is not expected to generate any significant degradation to the surface water quality, aquatic habitat, or wildlife habitat in the project area. On the other hand, it will significantly improve the health, safety and welfare of all the people of Kauai. The most important factor is that this source will be "hurricane and power outage proof", and will provide a very reliable potable water source that will continue to work during a hurricane such as Iniki.

We hope we have satisfactorily responded to your comments. If you have any questions, please contact Mr. Edward Lau of the Project Development Branch at 587-0227.

Sincerely,

MANABU TAGOMORI
Manager-Chief Engineer

SA:ek

JOHN WAIHEE
Governor

YUKIO KITAGAWA
Chairperson, Board of Agriculture

ILIMA A. PIIANAIA
Deputy to the Chairperson

FAX: 973-9613

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

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

RECEIVED
92 JUL 1 P1:18
DIV. OF WATER &
LAND DEVELOPMENT

June 29, 1992

TO: Brian J. J. Choy, Director
Office of Environmental Quality Control

FROM: Yukio Kitagawa, Chairperson
Board of Agriculture

SUBJECT: Upper Makaleha Springs Water Resource Development
Revised Draft Environmental Impact Statement (DEIS)
TMK: 4-6-01: 01 Kapaa, Kauai

The Department of Agriculture (DOA) has reviewed the Revised DEIS and has the following comments.

The proposed project would result in the diversion of about 1.0 MGD of Upper Makaleha Stream flows allocated to Makaleha Ditch and used by Lihue Plantation Company to irrigate lands at Kealia until April 1991. According to the DEIS, long-term stream flow records indicate an average annual diverted stream flow for this purpose of about 4.4 MGD.

The DEIS estimates that the Department of Hawaiian Home Lands may require about 5.5 MGD for uses including agricultural irrigation in the Anahola-Kamalomalo and Moloaa areas. In addition, the DEIS suggests that the long-term use of the 1,800 acres at Kealia which have recently been withdrawn from sugarcane cultivation may include leasing to smaller agricultural companies for diversified agricultural crop production. Recently the DOA has been evaluating the State-owned portion of the Kealia lands as a potential site for a State Agricultural Park on Kauai. Such a project of 300 acres would require a surface source of irrigation water of 1.5 MGD, as shown in the Inventory of Proposed State Projects in the State Water Projects Plan (Review Draft, February 1992).

The DOA is concerned that the proposed stream diversion would adversely affect the potential future agricultural uses of the Kealia lands, by reducing the quantity of surface water which can be economically delivered through the existing irrigation system to this area. We request that the Final EIS include a complete and accurate schematic of the entire Lihue Plantation irrigation system, including sources and major distribution ditches, and quantities of water at major intake and outflow points. This will enable a better assessment of project impacts and mitigative measures required to maintain diversified agriculture in the Kealia area.

Thank you for opportunity to comment.

c: ✓Dept. of Land and Natural Resources (DOWALD)
Attention: Andrew Monden

Portugal and Associates, Inc.
Attention: James Pedersen

Dept. of Hawaiian Home Lands

JOHN WAIHEE
GOVERNOR OF HAWAII

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

KEITH W. AHUE, Chairperson
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

JOHN P. KEPPELER, II
DONA L. HANAIKE

AQUACULTURE DEVELOPMENT PROGRAM
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FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF:WL-EK

JAN 5 1994

Honorable Yukio Kitagawa, Chairperson
Board of Agriculture
1428 South King St.
Honolulu, Hawaii 96814-2512

Dear Mr. Kitagawa:

Revised Draft Environmental Impact Statement (RDEIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your comments regarding the subject project. Your idea of evaluating the State-owned lands in Kealia for the potential development of a state agricultural park that would require a source of irrigation water for approximately 1.5 million gallons per day will be included in the Revised Final Environmental Impact Statement.

The project involves collecting and utilizing perched, high-level groundwater which percolates down through the Makaleha mountains slope and appear as a spring discharge. Flow measurements by the USGS show that this spring source is groundwater and not from the upper reaches of the stream.

We hope we have satisfactorily responded to your comments. If you have questions on this matter, please have your staff contact Mr. Manabu Tagomori of the Division of Water and Land Development at 587-0227.

Very truly yours,

Keith W. Ahue

KEITH W. AHUE

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER AND LAND DEVELOPMENT
P.O. BOX 373
HONOLULU, HAWAII 96809

KEITH W. AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

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JOHN P. KEPPELER, II
DONA L. HANAIKE

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WATER AND LAND DEVELOPMENT

JAN 4 1994

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

Dear Mr. Cheung:

Revised Draft Environmental Impact Statement (RDEIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your comments regarding the subject project.

We concur that another application for the U.S. Corps of Engineers permit for the subject project is necessary since the permit issued in 1988 is no longer valid. Ms. Suzie Agraan, of my staff, had a telephone consultation with Ms. Ruby Mizue of the Operations Division. Ms. Mizue indicated that a letter and/or any revisions to the project should be submitted for their review.

Should you have any questions regarding this matter, please have your staff contact Mr. Edward Lau of the Project Development Branch at 587-0227.

Sincerely,

MANABU TAGOMORI
Manager-Chief Engineer

SA:ek

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

RECEIVED
92 JUL 6 A 9: 30
DIV. OF WATER & LAND DEVELOPMENT

July 2, 1992

REPLY TO
ATTENTION OF:

Planning Division

Mr. Brian J. J. Choy, Director
Office of Environmental Quality Control
220 South King Street, Fourth Floor
Honolulu, Hawaii 96813

Dear Mr. Choy:

We have reviewed the Revised Draft Environmental Impact Statement for Upper Makaleha Springs Water Resource Development, Kapaa, Kauai, Hawaii. The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act.

a. By letter dated March 30, 1988, the applicant was advised that the proposed work was authorized by the U.S. Army Corps of Engineers nationwide permit authority at 33 CFR 330.5 (a)(12) and (14), and that no further Corps processing was necessary. The nationwide regulations expired on January 13, 1992, and new regulations became effective on January 21, 1992. Since project construction had not been initiated (nor was the project under contract for construction) as of the expiration date, the authorization issued in 1988 is no longer valid. The applicant should consult with the Operations Division at 438-9258 and reapply for authorization.

b. The Zone X (unshaded) flood hazard designation cited in our letter dated August 5, 1987 is still correct; however, the Federal Emergency Management Agency has revised the definition of this zone to "Areas determined to be outside 500-year flood plain."

Sincerely,

pl Ushijima

Kisuk Cheung, P.E.
Director of Engineering

JOHN WAIHEE
GOVERNOR

BRIAN J. J. CHOY
Director

RECEIVED
92 JUL 30 A8:15
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

RECEIVED
92 AUG 3 P3:32
DIV. OF WATER & LAND DEVELOPMENT

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185

July 28, 1992

TO: The Honorable William W. Paty, Chairperson
Board of Land and Natural Resources

FROM: Brian J. J. Choy, Director Brian J. J. Choy

SUBJECT: Revised Draft Environmental Impact Statement (EIS) for the Upper Makaleha Springs Water Resource Development, Kapaa, Kauai, Hawaii

The subject revised draft EIS was prepared by the DLNR's Division of Water and Land Development. The revised draft EIS examined alternatives for increasing the potable water supply for the Wailua-Kapaa area on Kauai.

The comments submitted by the DLNR's Division of Aquatic Resources indicate that the revised draft EIS did not deal adequately with the substantive environmental issues associated with the project and that the deficiencies are great enough to warrant its rejection.

The Office of Environmental Quality Control is responsible for making a recommendation to the Governor regarding the acceptability of the Final EIS for the subject project. If the concerns of the DLNR's Division of Aquatic Resources are not fully addressed and documented in the EIS, we do not believe that the subject EIS would meet the acceptance criteria set forth in the EIS Rules.

If you have any questions, Please call Jeyan Thirugnanam at 586-4185. Thank you for your cooperation.

JOHN WAIHEE
GOVERNOR OF HAWAII

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

KEITH W. AHUE, Chairperson
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

JOHN P. KEPPELER, II
DONA L. HANAIKE

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STATE PARKS
WATER AND LAND DEVELOPMENT

REF:WL-EK

JAN 5 1994

Mr. Brian J.J. Choy, Director
Office of Environmental
Quality Control
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

Dear Mr. Choy:

Revised Draft Environmental Impact Statement
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your letter regarding the subject project. We have responded adequately to the Aquatic Division's comments for the proposed project. Rest assure that our response, fully addressing their concerns, will be included in the Revised Final Environemntal Impact Statement.

If you have any questions regarding this matter, please contact Mr. Manabu Tagomori of our Division of Water and Land Development at 587-0230.

Very truly yours,

KEITH W. AHUE

P.O. BOX
LIHUE, HAWAII 96766

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92 JUL 9 A9:16
DIV. OF WATER &
LAND DEVELOPMENT

THE KAUAI OUTDOOR CIRCLE

July 7, 1992

State of Hawaii
Office of Environmental Quality Control
220 South King Street, Fourth Floor
Honolulu, Hawaii 96813

Dear Sir:

Thank you for the opportunity to review the revised draft of the environmental impact statement for the Upper Makaleha Springs Water Resource Development project, Kapaa, Kauai.

The Circle has no comments at this time to add to the very thorough research into the proposed project.

Sincerely yours,

Mrs. Thatcher Magoun
Acting President,
The Kauai Outdoor Circle

copy for Dept of Land and Natural Resources

100% Recycled Bond

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER AND LAND DEVELOPMENT
P.O. BOX 373
HONOLULU, HAWAII 96809

KEITH W. AHUE, CHAIRPERSON
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DONA L. HANAIKE

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WATER AND LAND DEVELOPMENT

JAN 4 1994

Mrs. Thatcher Magoun
Acting President
The Kauai Outdoor Circle
P.O. Box 921
Lihue, Hawaii 96766

Dear Mrs. Magoun:

Revised Draft Environmental Impact Statement (RDEIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your letter of July 7, 1992 regarding the subject project. Your letter will be included in the Final Environmental Impact Statement.

Sincerely,

MANABU TAGOMORI
Manager-Chief Engineer

SA:ek

NATIVE HAWAIIAN ADVISORY COUNCIL
A NONPROFIT CORPORATION
1088 Bishop Street, Suite 1204, Honolulu, Hawaii 96813
Telephone (808) 523-1445
Facsimile (808) 599-4380

RECEIVED
92 JUL 7 P12: 32
DIV. OF WATER & LAND DEVELOPMENT

1992 July 7

TO: State of Hawaii Office of Environmental Quality Control
220 South King Street, Fourth Floor
Honolulu, HI 96813

RE: Comments on Revised Draft EIS - Upper Makaleha Springs Water Resource Development Project

*PAGE/EXCERPT
COMMENT

*Title/PROPOSING AGENCY: Division of Water Resource Management

Proposing agency should be changed to Division of Water and Land Development to reflect recent changes in DLNR administrative structure. These changes should be incorporated throughout the document.

*Frontspiece/The proposed project will fulfill the primary purpose of the Kealia Forest Reserve which is to serve as a source of water supply.

The "primary purpose of the Kealia Forest Reserve" may not be so clear-cut. Likewise, the proposed project's fulfillment of this purpose may also be debatable.

*Frontspiece/The project is consistent with the Kauai County General Plan and the Hawaii State Plan.

Is it consistent with the Hawaii Water Plan, including the State Water Resource Protection Plan, State Water Quality Plan, State Water Projects PLan, and Kauai Water Use and Development Plan?

*2-2/METHOD OF ALTERNATIVE EVALUATION AND COMPARISON

This section fails to identify the source of project evaluation criteria, assignment of weighted values, numerical ranking of alternatives, and related comparisons. The scope of participants in this exercise must be known in order to analyze its utility.

*2-6/Reduced consumption by residential and commercial consumers would be achieved through the implementation of communiy education programs and the establishment of inverted water rate schedules ...

The best way to reduce consumption may be to legally require certain practices and equipment while monitoring such practices and assisting in the installation and operation of such equipment. Community education will work much better if incentives and resources for implementing educational goals are provided.

*2-13/The level of potential participation by residential and commercial customers cannot realistically be estimated without implementation of the program.

This is not necessarily true. If implementation of program requirements were legally mandated and adequate resources were allocated to guarantee program compliance, participation of close to 100% might be a realistic estimate. The subsequent COMPARISON OF PROJECT ALTERNATIVES is faulty due to this failure to fully explore and document the potential of the conservation option. Given that it is already ranked number 2, it should be given some more serious consideration.

*2-13/However, it is believed that a more realistic target would be from 10 to 20 percent water savings.

What is the basis of this belief? Perhaps a median figure of 55-60% participation should be used until the more detailed assessment suggested above can be completed.

*2-13/The establishment of an intensive consumer education program ...

What would be required to establish a regulatory program? Assistance with retrofits/new installations of water-saving technologies?

*2-14/Alternative F, which would encourage reduced system and household water consumption ...

Alternative F, which would **require more efficient** system, household, **commercial, and agricultural** water consumption ...

*2-14/... this option [conservation] is not believed to be a cost-effective approach for addressing water development ...

Cost effectiveness should not be the sole evaluative criteria for project assessment. This paragraph and subsequent sections inadequately consider the environmental and social benefits of the conservation option and their potential economic value.

*2-15/... the potential water savings via water conservation would be limited to roughly 0.240 mgd to 0.480 mgd for a cost of roughly ...

The validity of these assumptions is not adequately demonstrated in the RDEIS. The scope, costs, and cost-effectiveness of water conservation programs are inadequately considered.

*2-18/A secondary objective of the project is to ensure that the existing water rights of Lihue Plantation Company ... are not adversely affected?

Later sections of the RDEIS inadequately explain LPC water rights, since they fail to place them in the context of water rights of Hawaiian Home Lands, riparian and appurtenant lands, and declared uses of Makaleha water. Within this expanded context, what would constitute adverse effects?

*2-20/To accomplish this objective, the Kauai County Department of Water will not divert water to the Wailua-Kapaa system if the Makaleha Stream discharges are insufficient to meet irrigation water requirements of the Plantation and the Department of Hawaiian Home Lands.

What are the water requirements of these parties? What constitues "insufficiency?" Why isn't it also a project objective to ensure that the existing water rights of DHHL are not adversely affected, as with LPC?

The RDEIS must be aware of and discuss the primacy of DHHL water rights with regard to water allocation and proposed project impacts. Within this discussion there must be reference to the legislatively-mandated reservation of water to DHHL in the Hawaii Water Plan (HWP). Since the HWP currently contains no explicit reference to DHHL reserved water as required, it seems that the RDEIS cannot be completed/accepted until the HWP requirements are met.

If this water is developed, what portion of it would be delivered to Hawaiian Home Lands? To other ceded lands? What revenues would flow to the Hawaiian Homes Land Trust and Ceded Lands Trust from the exploitation of the resource for general public benefit?

*3-1/The project site is ... owned by the State of Hawaii.

What is the status/classification of the State land title?

*3-8/... Lihue Plantation Company has discontinued its use of Makaleha Spring water in April 1991.

In this case, why do other parts of the RDEIS refer to LPC irrigation requirements?

*3-8/... lease (GL S-3827), which expires on May 10, 1994 ...

Hawaii Revised Statutes requires the State Board of Land and Natural Resources (BLNR) to adopt a plan for disposition such leases two years prior to their expiration (May 10, 1992 in this case). The RDEIS (dated May 13, 1992) must reference this plan and more fully describe its implications. In addition, there are other newly-legislated requirements for water leasing (such as consultation with individual HHL beneficiaries) which should be noted.

*3-8 & 3-11/BIOLOGICAL & CULTURAL RESOURCES

These sections should also reference the Hawaii Stream Assessment database, report, and recommendations.

*3-16/3.5.6 Interim Instream Flow Standard

This section seems to imply that the proposed project would require amendment of the interim instream flow standards.

*3-16/3.5.7 State Department of Hawaiian Home Lands

Future water supply requirements ... are estimated ... to be about 5.5 million gallons.

5.5 million gallons per what time period? What sources are available to meet this demand? Under what mechanisms could water developed by the proposed project be utilized by DHHL now and in the future, and in such a case how would the municipal supply system compensate for its municipal water losses?

*4-2/An extension of its [LPC] present water rights would require review by the State Water Commission.

Under current law, the State BLNR holds responsibility for any "extension" of present LPC water rights as derived from BLNR auhtority over water lease issuance. The relationship between BLNR leasing authority and Water Commision control over instream flow standards needs to be more thoroughly examined.

*4-7/4.4 UNRESOLVED ISSUES

Future development and water needs of Anahola, Kamalomalo, and Moloaa Hawaiian home Lands, as well as the proposed project's consistency with Hawaii Water Plan's reservations of water to DHHL uses, should also be cited as unresolved issues.

*APPENDIX A/Letter of 2/18/92 from LPC to W.W. Paty, Jr (DLNR).

The RDEIS does not appear to address LPC concern 3) regarding proposed Kauai Department of Water Supply intakes to be constructed, and the discrete and cumulative impacts that might result.

*APPENDIX B/Letter of 9/15/87 from DHHL to M.T. Miura (OEQC).

The RDEIS does not adequately nor quantitatively respond to the stated concern that "further development of Makaleha Springs should reserve a portion of the yield to ... (DHHL's) beneficiaries."

*APPENDIX B/Letter of 9/8/87 from UH Environmental Center to M.T. Miura (OEQC)

This letter states that "The water rights issue is highly significant and inadequately resolved in the Draft EIS. The impacts on down stream users are the most important issues of this project and this document does not adequately address these impacts." These inadequacies remain unresolved by the RDEIS. In particular, the water rights of Hawaiian Home Lands; appurtenant, riparian and Hawaiian water rights; and other uses declared to the State Water Commission in 1989 remain completely neglected.

Thank you for responding to our comments and for revising the RDEIS to address our concerns.

David C. Penn

David C. Penn for Elizabeth Pa Martin, President

pc: Governor John Waihe'e (c/o OEQC)
Andrew Monden (DOWALD)
James Pedersen (Portugal and Associates, Inc.)

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER AND LAND DEVELOPMENT
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JAN 4 1994

Ms. Elizabeth Pa Martin
Native Hawaiian Advisory Council
1088 Bishop Street, Suite 1204
Honolulu, Hawaii 96813

Dear Ms. Martin:

Revised Draft Environmental Impact Statement (RDEIS) Upper Makaleha Springs Water Resources Development, Kapaa, Kauai, Hawaii

Thank you for your comments regarding the subject project. Our review of all correspondence on this matter indicates that your letter was not responded to earlier. We offer the following responses to your comments:

We have noted in the RDEIS the current Department of Land and Natural Resources (DLNR) changes. The project is consistent with the Hawaii Water Plan and the Kauai water use and development plan.

The source of the project evaluation criteria was the State's consultant, applying as objective evaluation as possible. Water conservation is an important issue, and it has and will continue to be addressed by the purveyor with the help of the Mayor and the County Council, but an additional water supply is still needed now. Any savings from conservation will add to the county's ability to operate it's system.

We have revised the addressal on water rights and land ownership. The Lihue Plantation Company (LPC) lease contains its irrigation requirements. Any new leases will comply with newly-legislated requirements. Appropriate references will be made to the Hawaii stream assessment report. The Kauai Department of Water (DW) does have an agreement with LPC, regarding this project.

The 5.5 mgd is an estimate made for the future and amounts to about 10% of the amount that can be diverted from the drainage basins. There is no know time table for the need for this water by the Hawaiian Homes Land (HHL). The estimate will need to be updated as more concrete plans are developed by HHL.

The future development and water needs of the area including the Hawaiian Home Lands is dynamic and remains unresolved, but this project's additional supply should provide a wider base of developed resources, combined with improved water conservation methods and regulations.

Notwithstanding the unresolved issues regarding water rights, there are significant reasons, as brought out by Hurricane Iniki, why the Makaleha spring source is an important water source which should be developed.

Because of its elevation, this spring source will be a completely gravity source. It will therefore not require any power for pumping. It will save barrels of oil every year into perpetuity for future generations. It will therefore also save the DW and the customers approximately $60,000 annually just from not having to pump.

Evaluation by the USGS indicate that this spring is a groundwater source and not from a stream source. This will allow the source to be used without having to receive surface water treatment. Surface water treatment (SWT) for the construction of a one mgd plant would cost in 1994 dollars, approximately $3,500,000.00, a huge cost, compared to the approximately $950,000.00 for this spring source. In addition a SWT plant would require approximately $1,000,000.00 annual operations and maintenance costs.

The above two factors are significant to the social, economic and environmental benefit of the residents of Kauai and Hawaii, regardless of race, ethnic culture or creed. The most important benefit, however, is the fact that this source will be hurricane and power outage proof! The Makaleha water system already has a tunnel source which provides water by gravity to the Kapaa-Wailua area. During hurricane Iniki and after, this system stayed in operation uninterrupted because it did not require power. It provided much needed water to the State's Mahelona hospital, the county's Civil Defense Command Center and FEMA's headquarters, the Kapaa Elementary, Intermediate and High school complex and residents within this system, plus filing water wagons and fire trucks servicing water throughout Kauai. The present system did drain down during the day and did not have enough for fire protection but replensished itself at night. The addition of the Makaleha springs will make this system all the better. <u>It will significantly improve the health, safety and welfare of all the people of Kauai.</u>

If you have any questions on this matter, please have your staff call Mr. Edward Lau of the Project Development Branch at 587-0227.

Sincerely,

MANABU TAGOMORI
Manager-Chief Engineer

EL:ek

JOHN WAIHEE
GOVERNOR OF HAWAII

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

WILLIAM W. PATY, CHAIRPERSON
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92 JUL 7 A10:06
DIV. OF WATER & LAND DEVELOPMENT

A.M. ✓
C.A. ✓

REF:OCEA:KCK

JUL 7 1992

FILE NO.: 92-738
DOC. ID.: 897

Honorable Brian J. Choy, Director
Office of Environmental Quality Control
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

Dear Mr. Choy:

Subject: Revised Draft Environmental Impact Statement for the Upper Makaleha Springs Water Resource Development Kapaa, Kauai, Hawaii, TMK: 4-6-01: 01

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

Brief Description:

The EIS is intended to examine alternatives for increasing the potable water supply for the Wailua-Kapaa area on Kauai. The lack of available water has curtailed a number of land use development projects. If, within the next 20 years, the area is fully developed as outlined in the Kauai County General Plan and the resident population increases to predicted levels, the average water demand will more than double to 5.63 mgd. Alternatives considered were: (A) No Project Option; (B) Drill a New Well at Akulikuli Ridge; (C) Enlarge Existing Tunnels; (D) Impoundment of a Surface Water Supply; (E) Tap Natural Springs in the Makaleha Mountains; (F) Water Conservation in the Wailua-Kapaa Area. Alternatives A, B, and F would have little or no impact upon the streams. Alternative C would have the greatest impact on the stream, according to the EIS, due to possible sediment loading during construction. Alternatives D and E would reduce

flows in the Makaleha Stream. Alternative E was rated the most desirable alternative because of its more cost effective development approach. The other alternatives in order of desirability were F, C, D, B, A. The E alternative would tap the natural springs in the Makaleha Mountains through construction of an underground cut-off trench, a small intake structure, and an 8-inch pipe along the north side of Makaleha Valley and would supply a flow of 500-700 gallons per minute. Makaleha Stream is a major tributary of the Kapaa Stream and approximately 8% of its total discharge is supplied by Makaleha Spring.

Division of Aquatic Resources Comments:

Although the draft EIS is clearly written, the analysis provided in the section dealing with aquatic resources is outdated and to a large extent ranges from misleading to gross error. The last recorded communication with the Division of Aquatic Resources concerning the project was 1987. Two native gobies, Awaous stamineus and Lentipes concolor, were found in Makaleha Stream along with the native shrimp, Atyoida bisulcata. The latter is dismissed as some kind of accidental import, which is almost certainly wrong. Atyoida is an excellent climber that migrates quite easily upstream. The astounding statement is made that "aquatic fauna in the stream are characterized by low diversity", even though "eleven of the fourteen species are endemic to Hawaii." In Hawaiian streams with their characteristically depauperate fauna, that is high diversity! The fact that 11 endemic species were found should have sounded a warning bell. We strongly suspect that all 5 native fish species, all of which are endemic, are found in the stream, but the reconnaissance surveys were not extensive enough to adequately define species distribution. The deficiency of the analysis was exemplified by the following italicized statement, set in bold type in the EIS and placed in quotation marks, citing a series of old references:

> "Adult gobies spawn over a period of months in freshwater, mostly in the lower reaches of streams. Hatchlings are carried out to sea by stream current where they spend a marine existence as plankton. Then these metamorphose into post-larvae (hinana) near the mouths of streams, settle on appropriate substrata, and migrate upstream to the places of permanent residences."

We now know that the first sentence applies only to one of the three inland gobies, Awaous stamineus, and is not entirely true even for this species. Lentipes concolor, by contrast, spawns year around within the same areas they occupy throughout the year. The remainder of the statement, however, is true, but the analysis suggests that the Lentipes found in the Makaleha "may represent a captive adult population". One might wonder how the fish got there. In reality, the presence of Lentipes in the upper reaches of streams that are completely dry in the lower and middle reaches is common, and studies have shown that these fish in fact

have completed their diadromous life cycle. Intermittent flows through the dry area will support migration between the sea and these seemingly isolated habitats. The analysis tends to belittle the biological value of the stream, but it should be noted that the Hawaii Stream Assessment Report (dated 1991 but not referenced despite its central importance for this project) gave the Kapaa Stream, which includes the Makaleha Stream, its highest "outstanding" rating for the stream's aquatic biological resources.

The discussion of biological value is largely focused on the absence of "threatened or endangered" species. This misses the point and diverts attention from the real problem. Indeed, the freshwater stream species are not yet on the brink of extinction, but the decision made now will determine the future of all of our native aquatic organisms and ecosystems. Hawaii is in the fortunate position of being able to prevent the inexorable slide to extinction in aquatic ecosystems, if favorable decisions to protect essential habitat are made now, before the otherwise inevitable crisis stage arrives. That does not infer that these populations are thriving and are in no need of special protection. Much habitat has been lost, populations have declined markedly based on verbal descriptions of past abundance, and threats from accidentally introduced foreign species have surged. It does mean that the surviving habitats need to be considered in a broader perspective within representative ecosystems. Hawaii has a rare opportunity to assure perpetuation of our unique freshwater ecosystems before their native, mostly endemic organisms are placed in jeopardy of extinction, if a substantive commitment is made now. To wait until these species and ecosystems are clearly endangered would probably mean that recovery efforts at that late date, like most recovery efforts, would be an exercise in futility or at best extremely expensive.

Until an extensive stream protection system is in place and the survival requirements of the native stream biota are better understood, any project which will reduce stream flows must be viewed with extreme caution, especially when that project will impact a stream with recognized biological significance. It should be noted that there is as yet no suitable predictive model to evaluate the potential effects of artificial flow changes on native species populations or ecosystems. We do know that reduced stream flows will almost certainly reduce the suitability of the habitat for native species and at the same time will increase the suitability of the habitat for a variety of alien species, which may then displace the natives. In unmodified streams with naturally occurring flows, the native species have a decided advantage over aliens because they are well adapted to extreme conditions.

We would like to emphasize that stream protection to be effective must have ecosystem protection. Ongoing research supported by the Division of Aquatic Resources is indicating that our island stream ecosystems function differently than aquatic ecosystems in continental situations. They lack many internal buffers that elsewhere help to stabilize ecosystems when upsets occur. A disturbance at any point in a stream may echo throughout the stream, from the highest reaches to the lowest. Disturbances which might not be significant in a continental situation could cause a Hawaiian stream ecosystem to collapse. Impacts to the Makaleha tributary must be treated as an impact on the whole of the Kapaa Stream.

The draft EIS did not consider a potential major impact from this project with regard to Makaleha Springs. It is highly possible that these springs may be part of an as yet undescribed unique subterranean ecosystem containing species presently unknown to science. Dr. Frank Howarth of the Bishop Museum has hypothesized that such hyporheic systems may exist under streams and may also be contained with underground interstitial spaces associated with springs. The concept is not entirely hypothetical, because ongoing studies in France have found and defined such systems. Some preliminary studies of springs on Kauai in fact found some as yet unidentified species apparently surviving in interstitial subterranean habitats. In addition, seeps associated with the springs are likely to sustain a variety of invertebrate species. Since the project definitely represents a major environmental upset for Makaleha Springs and will undoubtedly impact these systems, presuming they exist, some investigation is needed to evaluate Howarth's hypothesis as well as describe the biota associated with seeps.

The matrix, "Comparative Raw Scoring of Project Alternatives," on page 2-16 needs to be re-evaluated. Alternative C has a much lower score, reflecting a greater adverse impact, on the evaluation criteria 1 and 2 (pertaining to surface water quality and aquatic habitats) than any of the other alternatives, including E, even though the described potential impacts -- namely sedimentation resulting from construction errors or accidents, might not only be preventable but would be temporary in nature. Dewatering the stream would have a permanent impact.

If the project is to proceed, the draft EIS recommends that biological monitoring should be instituted for the stream, then assigns the task to the Division of Aquatic Resources. We strongly agree that some kind of a monitoring program should be conditional for approval of the project but note that we have never been contacted about the matter. Such monitoring is both complex and time-consuming and would require a commitment of financial and manpower resources beyond our existing capabilities. We could however incorporate this area in our Statewide stream monitoring program if sufficient funding was made available.

In summary, we do not believe that this draft EIS has dealt adequately with the substantive environmental issues associated with this project and that the deficiencies are great enough to warrant its rejection. The bias towards development is evident in its statement, "The proposed project will fulfill the primary purpose of the Kealia Forest Reserve which is to serve as a source of water supply." That is a very narrow view that excludes the basic protective philosophy of such a reserve. The analysis of impacts of the project on the Kapaa Stream is outdated, error-prone, and misdirected. Consideration of impacts on a possible subterranean spring ecosystem itself is totally ignored and should unquestionably be incorporated including requisite field studies, in the EIS. Closer examination of the alternatives is needed, along with some more definitive commitment regarding plans for biological monitoring of the stream.

Under the circumstances other alternatives -- F, B, and C in that order -- appear to be preferential to E with reference to protecting stream and possibly subterranean spring biological resources.

We concur with the Draft EIS's assessment that no historic sites are present in the proposed project site. Therefore, we believe that this project will have "no effect" on significant historic sites.

It should be noted that as a result of our fieldcheck in 1987, our office asked to be notified 5 days prior to the construction of the access road, so our office staff could be present to archaeologically monitor the grading -- given the possibility the work could expose a buried habitation deposit or artifacts. Based on past experience, subsurface discoveries have been covered by slope wash, and Hammatt's (1986) survey indicated this was a possibility and one of the reasons why he did not find any historic sites. Monitoring might find such buried sites.

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

Very truly yours,

John P. Keppeler II

for WILLIAM W. PATY

cc: DOWALD
Portugal & Associates, Inc.

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER AND LAND DEVELOPMENT
P.O. BOX 373
HONOLULU, HAWAII 96809

JAN 10 1994

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TO: Mr. Keith Ahue, Chairperson
Board of Land and Natural Resources

FROM: Manabu Tagomori, Manager-Chief Engineer
Division of Water & Land Development

SUBJECT: **Revised Draft Environmental Assessment, Makaleha Springs Water Resource Development, Kapaa, Kauai, Hawaii**

Thank you for your comments regarding the subject project. Our review of all the correspondences on this matter indicates that your letter was not responsed earlier. However, our response, substantially addressing concerns and comments stated in your letter, were mailed separately to the Divisions of Aquatic Resources and Historic Preservations (Copies attached).

sa

Enc.

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Water and Land Development

JAN 4 1994

TO: Dr. Don Hibbard, Director
Historic Preservation Division

FROM: Manabu Tagomori, Manager-Chief Engineer

SUBJECT: **Revised Draft Environmental Impact Statement, Makaleha Springs Water Resource Development, Kapaa, Kauai, Hawaii**

Thank you for your comments regarding the subject project.

Please be informed that the earlier concept of constructing an access road along the Makaleha stream has been eliminated from the overall project scope.

Should you have any questions on this matter, please have your staff call Mr. Edward Lau at the Project Development Branch at Extension 70227.

SA:ek

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER AND LAND DEVELOPMENT
P.O. BOX 373
HONOLULU, HAWAII 96809

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JOHN P. KEPPELER, II
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TO: Mr. Henry Sakuda, Administrator
Division of Aquatic Resources (DAR)

FROM: Manabu Tagomori, Mgr & Ch Engr, DOWALD

SUBJECT: Draft Environmental Impact Statement (DEIS) for the Upper Makaleha Springs Water Resource Development, Kapaa-Wailua, Kauai

REF: (a) DAR memo of April 23, 1993 to OCEA, same subj.

1. The following comments are in response to reference (a) and our discussions with the Chairman on/about August 30, 1993.

2. The revised DEIS for this project was not rejected by the OEQC. However, since the accountability of the DEIS/EIS is a matter between DOWALD and OEQC, the following comments will address other items in ref. (a).

3. In a meeting to address items raised by DAR on or about August 17, 1992, DAR indicated that additional stream surveys were needed and offered to perform more aquatic biological surveys of the upper Makaleha stream by September 30, 1992. However, on September 11, 1992 hurricane Iniki intervened. DAR indicated that the survey should not be done until May or June 1993 to allow the environment to recover from the hurricane. However, unknown to DOWALD, DAR did conduct a survey in October 1992 (ref. (a)) and during our discussion of August 30, 1993, DAR indicated that no more surveys were required.

4. DOWALD feels that DAR has overlooked some important issues. There are significant reasons, as brought out by hurricane Iniki, why the Makaleha spring source is an important water source which should be developed.

a. Gravity source. Because of its elevation, this spring source will be a completely gravity source. It will therefore not require any power for pumping and save barrels of oil every year into perpetuity. It will therefore also save the DW and the customers approximately $60,000 annually just from not having to pump.

b. Ground water. Flow measurements by the USGS show that this spring source is ground water and not from a stream source. This fact will allow the source to be used without having to receive surface water treatment. Surface water treatment for the construction of a one mgd plant would cost in 1994 dollars, approximately $3,500,000.00, a big cost, compared to the approximately $1,049,600 for the spring source. Therefore if a source down stream were to be used as recommended by DAR, the taxpayers would have to pay the extra capital cost, plus an annual operating and maintenance cost against almost no annual cost for the spring source. This project provides a significant beneficial social impact, of conserving fiscal resources of the people.

c. Hurricane & Power Outage Proof. The Makaleha water system already has a tunnel source which provides water by gravity to the Kapaa-Wailua area. During hurricane Iniki and after, this system stayed in operation uninterrupted because it did not require power. It provided much needed water to the State's Mahelona hospital, the county's Civil Defense Command Center and FEMA's headquarters, the Kapaa Elementary, Intermediate and High school complex and residents within this system, plus filling water wagons and fire trucks servicing water throughout Kauai. The present system did drain down during the day and did not have enough for fire protection but replenished itself at night. The addition of the Makaleha springs will make this system all the better. It will significantly improve the health, safety and welfare of the people.

5. We acknowledge DAR's report that there are important native inland fish species and the native opae in the stream. We are also aware that while they are important none of these species are on the endangered list.

6. The following will address the applicable comments of reference (a). Reference (a) concludes that Dr. Timbol's assertions concerning the presence of native opae are "wrong". This strong statement makes a surprising conclusion; it assumes that October, 1992 survey conditions should have resembled stream characteristics that were observed by Dr. Timbol in August, 1986, as well as March and April, 1990. Based upon the field experience of Dr. Timbol, I believe that a more reasonable conclusion would note that a significant variation in stream fauna composition was observed. Experience has shown that the greater field observations frequently yield a greater range of environmental conditions. The question posed by this entire project is not "wrong" analysis by a very competent aquatic biologist; rather, the project team made this conclusion based upon a different set of field conditions and results which led to a different conclusion concerning the composition and abundance of stream biota.

7. We accept that each survey condition as factual. The variability in Stream conditions does indicate a dynamic aquatic environment of the native opae and other species in these reaches of the Makaleha Stream. For these and other reasons, DAR has assigned a high biological value to the Upper Makaleha Stream and concludes that it should not be disturbed. It should be pointed out that the flow from Makaleha stream along with its biota is already capable of being totally dewatered by the Makaleha Ditch during low flow periods. The stream flow within the stream reach between the Makaleha Spring area and the Makaleha Ditch intake will be reduced only 8 - 17%. The County of Kauai Department of Water Supply has an informal agreement with the Lihue Plantation Company (LPC), requiring that DW reduce or cease pumping water from the spring source during low flow periods when flows in the Makaleha ditch reach 50 mgd. Thus, the effect of water withdrawal from Makaleha Stream below the Makaleha Ditch intake will remain the same; only the ultimate use and method of withdrawal will be changed with the installation of the spring development.

8. Reference (a) also points out that another alternative would be to "...divert water from Kapaa Stream below the Makaleha tributary". We agree that a diversion could probably be constructed on the lower end of Makaleha Stream. However, this alternative would use a surface water supply that would require construction of a pumping station and a surface water treatment plant that we indicated earlier would cost $3,500,000.00 to build, plus annual operating and maintenance costs. This approach would not meet one of DW's primary objectives, i.e., to provide a "gravity system", that is so important to uninterrupted supply during emergencies. A new well would even be cheaper than withdrawing water from the lower reaches of Makaleha Stream, but would also not meet DW's objective of gravity flow.

9. Hurricane Iniki and its aftermath have generated significant financial burdens the County budget. While there may be some adverse effects to the biota in the upper reaches of Makaleha Stream, the biota from that reach which flows to the lower area are completely consumed by the Makaleha Ditch. The diversion is only 8 - 17% in the upper reach. None of the biota are on the endangered listing. On the other hand, this water source will provide significant economic, social, health, safety and welfare benefits.

EL:ek

c: OCEA

JOHN WAIHEE
GOVERNOR OF HAWAII

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DIV. OF WATER &
LAND DEVELOPMENT

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

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

In reply, please refer to:
92-179/epo

July 9, 1992

'92 JUL 14 A9:50

OFC. OF ENV.
QUALITY CONT.

TO: The Honorable John Waihee
Governor, State of Hawaii

c/o Director, Office of Environmental Quality Control
220 South King Street
Honolulu, Hawaii 96813

FROM: FOR John C. Lewin, M.D.
Director of Health

SUBJECT: Revised Draft Environmental Impact Statement (DEIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii (April 1992)
TMK: 4-6-01:01

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

1. The revised DEIS indicates that the project will include the development of a new source of potable water. As new sources of water are developed, it will be necessary to comply with Department of Health (DOH) Administrative Rules, Chapter 11-20, "Potable Water Systems." Section 11-20-29 of Chapter 20 requires that all new sources of potable water serving a public water system be approved by the Director of Health prior to its use. Such an approval is based primarily upon the submission of a satisfactory engineering report which addresses the requirements set in Section 11-20-29.

2. DOH Administrative Rules, Chapter 11-20, "Potable Water Systems", Section 30 requires that new or substantially modified distribution systems for public water systems be approved by the Director. However, if the water system is under the jurisdiction of the County of Kauai, the Department of Water will be responsible for the review and approval of the plans.

3. Page 4-6 of the revised DEIS states that, "It is believed that the proposed intake structure will afford effective protection against potential surface contamination." However, the minimal information provided in the revised DEIS seems to indicate that the proposed intake design is very susceptible to being under the influence of surface water runoff. A catchment structure located at the base of the valley wall and constructed with only concrete rubble masonry and a metal plate cover would be prone to surface water runoff contamination and undesirable seepage.

4. In Section 11-20-29, source approval (Item no. 1) will also be dependent upon compliance with the United States Environmental Protection Agency's (EPA) Surface Water Treatment Rule (SWTR). The DOH will require the owner or operator of the spring collection system to provide data which will be used to determine if this source is under the direct influence of surface water. Necessary data shall include, but not be limited to, turbidity, temperature, pH, microscopic particulate analysis, etc. If evidence of surface water influence is found, the spring source will require treatment. We are concerned that the ranking of alternatives may be very inaccurate as the possibility of water treatment is not addressed adequately.

5. Page 4-6 of the revised DEIS states that "Limited sampling and related analyses of the spring waters indicate that the potential water supply is very acceptable for domestic use." This data should be incorporated into the final EIS to help readers assess the accuracy of this statement.

6. Page 4-6 of the revised DEIS states that, "Because of its (intake structure) proposed setback from the stream, its location will also reduce the likelihood of potential flood inundation during higher stream flow periods." Historical and predicted stream high water levels should be provided in the final EIS to help verify this statement. These elevations should be shown on a cross section diagram, drawn to scale, showing both the Makaleha Stream and the proposed intake structure.

7. As stated in Subsection 2.10.2 of Chapter 2 Project Description of Selected Project Alternative E., the Kauai County Department of Water will not divert water to the Wailua-Kapaa system if Makaleha Stream discharges are sufficient to meet irrigation water requirements of the Plantation and the Department of Hawaiian Home Lands" It is also stated that water diversion from the springs would be adjusted to maintain minimum stream flows. How will the consumer demand be met, especially during times of greatest demand, if the spring water is diverted to meet the irrigation water demands and also to maintain adequate stream flow for the endemic fauna? The potable water source should be reliable and should not be affected by stream flow maintenance or irrigation water demands.

8. The applicant should provide in the final EIS mitigative measures to ensure that there is no degradation of stream water quality during the construction of the proposed facilities.

Due to the question on the reliability of the source to provide water in times of greatest consumer demand, it is recommended that a more reliable source be evaluated or water conservation measures be implemented.

We reserve the right to implement further environmental health requirements when more detailed plans are submitted for our review and approval.

If you should have any questions, please contact Stuart Yamada of the Safe Drinking Water Branch at 586-4258, or Mr. Clyde Takekuma of the Kauai District Health Office at 241-3323.

c: Safe Drinking Water Branch
Kauai District Health Office (Clyde Takekuma)
c: Andrew Monden, DLRN, Division of Water and Land Development
James Pedersen, Portugal and Associates, Inc.

JOHN WAIHEE
GOVERNOR OF HAWAII

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

KEITH W. AHUE, Chairperson
BOARD OF LAND AND NATURAL RESOURCES

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JOHN P. KEPPELER, II
DONA L. HANAIKE

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

REF:WL-EK

JAN 5 1994

Honorable Dr. John C. Lewin
Director
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Lewin:

Revised Draft Environmental Impact Statement (RDEIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your letter regarding the subject project. Our review of all correspondence on this matter indicates that your letter was not responded to earlier. We offer the following responses, in respective order, to your comments:

1. We are aware that once new sources of water are developed, compliance with the Department of Health (DOH) Administrative Rules, Chapter 11-20 "Potable Water Systems", is required. An Engineering Report for the proposed new source of potable water system will be submitted to comply with the requirements set in the Department of Health (DOH) Administrative Rules, Section 11-20-29.

2. The plans for the subject project has been reviewed and approved by the Department of Water (DW), County of Kauai.

3. The intake structure will be covered by a reinforced concrete slab, and not with a metal plate cover. The structure itself is grouted concrete rubble masonry and water tight. The susceptibility to being under the influence of surface water is very remote and highly improbable.

4-7. The Department of Water, County of Kauai will comply with the United States Environmental Protection Agency (EPA) Surface Water Treatment Rules (SWTR) prior to use of the facility.

"Flow measurements by the USGS show that this spring source is groundwater and not from a stream source. The water is expected to be of potable quality, which is typical of the other water tunnel sources in this area. As we mentioned earlier, the structure itself is grouted concrete rubble masonry and water tight to prevent from surface water runoff contamination and undesirable seepage. This should allow the source to be used without having to receive surface water treatment". These statements will be included in the RFEIS.

The Federal Emergency Management has determined that the project area is outside the 500-year flood plain and this will be included in the Revised Final EIS.

8. Mitigative measures to ensure that there is no degradation os stream water quality during the construction of the proposed facilities are adequately addressed in the RDREIS.

There are significant reasons, as brought out by Hurricane Iniki, why the Makaleha spring source is an important water source which should be developed.

Because of its elevation, this spring source will be a completely gravity source. It will, therefore, not require any power for pumping. It will save barrels of oil every year into perpetuity for future generations. It will, therefore, also save the DW and the customers approximately $60,000 annually just from not having to pump.

As we mentioned earlier, evaluation by the USGS indicate that this spring is a groundwater source and not from a stream source. This will allow the source to be used without having to receive surface water treatment. Surface water treatment (SWT) for the construction of a one mgd plant would cost in 1994 dollars, approximately $3,500,000.00, a hugh cost, co,pared to the approximately $950,000.00 for this spring source. In addition a SWT plant would require approximately $1,000,000.00 annual operations and maintenance costs.

The above two factors are significant to the social, economic and environmental benefit of the residents of Kauai and Hawaii, regardless of race, ethnic culture or creed. The most important benefit, however, is the fact that this source will be hurricane and power outage proof! The Makaleha water system already has a tunnel source which provides water by gravity to the Kapaa-Wailua area. During hurricane Iniki and after, this system stayed in operation uninterrupted because it did not require power. It provided much needed water to the State's Mahelona hospital, the county's Civil Defense Command Center and FEMA's headquarters, the Kapaa Elementary, Intermediate and High school complex and residents within this system, plus filling water wagons and fire trucks servicing water throughout Kauai. The present system did drain down during the day and did not have enough for fire protection by replenished itself at night. The addition of the Makaleha springs will make this system all the better. **It will significantly improve the health, safety and welfare of all the people of Kauai.**

We hope we have satisfactorily responded to your comments. If you have any questions on this matter, please have your staff call Mr. Manabu Tagomori of the Division of Water and Land Development at Extension 70230.

Very truly yours,

KEITH W. AHUE

OFFICE OF STATE PLANNING
Office of the Governor
MAILING ADDRESS: P.O. BOX 3540, HONOLULU, HAWAII 96807-3540
STREET ADDRESS: 250 SOUTH HOTEL STREET, 4TH FLOOR
TELEPHONE: (808)587-2846, 587-2800
JOHN WAIHEE, Governor
FAX: Director's Office 587-2848
Planning Division 587-2824

A.M. ___
Z.A. ___

DIV. OF WATER &
LAND DEVELOPMENT

July 7, 1992

'92 JUL -9

Mr. Brian Choy, Director
Office of Environmental Quality Control
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

Dear Mr. Choy:

Subject: Comments on the Revised Draft Enviromental Impact Statement for the Upper Makaleha Springs Water Resource Development Project
Department of Land and Natural Resources
Division of Water Resource Management
Kapaa, Kauai, Hawaii

The Office of State Planning (OSP) have reviewed the subject Revised Draft Environmental Impact Statement (DEIS) and have the following comments.

According to the DEIS, the Applicant, in cooperation with the Kauai County, Department of Water, proposes to tap natural springs on State land in the Makaleha Mountains of East Kauai. A concrete intake basin and approximately 4,000 feet of iron pipe would be constructed to pipe the water to Kapaa for domestic uses. The proposed project would help alleviate existing water shortages in the Kapaa-Wailua area by increasing the existing water supply capacity by approximately 18 percent. The proposed project will fulfill the primary purpose of the Kealia Forest Reserve, which is to serve as a source of water supply.

The DEIS indicates that adverse environmental impacts include degradation of native fish and shrimp habitats and surface water quality, especially during construction. The proposed project would also divert about 1.0 million gallons per day (mgd) of surface water presently allocated to Lihue Plantation Company for irrigation purposes. The DEIS proposes mitiga- tive measures including the use of silt fences and fabric material to reduce potential sedimentation, and periodic monitoring of the aquatic habitat of Upper Makaleha Stream by the Kauai district office of the Division of Aquatic Resources.

Makaleha Stream is tributary to Kapaa Stream, which is listed as a perennial stream in the Hawaii Stream Assessment conducted by the State Commission on Water Resource Management and the National Park Service. The Hawaii Stream Assessment ranks Kapaa Stream as Outstanding in aquatic resources, as well as in recreational resources, and Substantial in riparian and cultural resources. As the proposed project involves the removal and diversion of significant amounts of water from the stream, OSP believes that the proposed project would have major impacts upon these significant resources of the area. The Final EIS should address the impact of the project upon these resources and propose appropriate mitigative measures.

In addition, OSP has recommended in its Five-Year Boundary Review the inclusion of Kapaa Stream in the State Conservation District, which would establish a 100-foot Conservation District corridor on both sides of the Stream because of the outstanding aquatic resources. This designation would provide for the regulation of uses (e.g., construction of structures) adjacent to the stream to help assure stream protection. The Final EIS should include consideration for the recommended Conservation District designation for Kapaa Stream (i.e., how the proposed project would be affected by the designation) and the ultimate effect the project would have on the very values OSP proposes to protect.

Thank you for the opportunity to comment. Should you have any questions, please call the Land Use Division at 587-2886.

Sincerely,

Harold S. Masumoto
Director

c: Andrew Monden, DLNR, Division of Water and Land Development
James Pedersen, Portugal and Associates, Inc.

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER AND LAND DEVELOPMENT
P.O. BOX 373
HONOLULU, HAWAII 96809

KEITH W. AHUE, CHAIRPERSON
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DONA L. HANAIKE

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WATER AND LAND DEVELOPMENT

JAN 4 1994

Honorable Harold Masumoto
Director
Office of State Planning
P.O. Box 3540
Honolulu, Hawaii 96811-3540

Dear Mr. Masumoto:

Revised Draft Environmental Impact Statement (RDEIS)
Upper Makaleha Springs Water Resources Development
Kapaa, Kauai, Hawaii

Thank you for your letter regarding the subject project. We offer the following responses to your comments:

The project involves collecting and utilizing perched, high-level groundwater which percolates down through the Makaleha mountains slopes and appear as a spring discharge. Flow measurements by the USGS show that this spring source is groundwater and not from the stream source. The project will not remove and divert water from the stream, therefore the project will not have major impacts upon significant resources in the area.

Your recommendation, on the inclusion of the Kapaa Stream in the State Conservation District in the Five-Year Boundary review, will be included in the Final Revised EIS.

If you have any questions on this matter, please have your staff call Mr. Edward Lau of the Project Development Branch at Extension 70227.

Sincerely,

MANABU TAGOMORI
Manager-Chief Engineer

SA:ek

JOHN WAIHEE
GOVERNOR

RECEIVED
92 JUL 7 P2:46
DIV. OF WATER &
LAND DEVELOPMENT

BRIAN J. J. CHOY
Director

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185

July 6, 1992

Mr. Andrew Monden
Department of Land and Natural Resources
Division of Water and Land Development
P.O. Box 373
Honolulu, Hawaii 96809

Dear Mr. Monden:

Subject: Revised Draft Environmental Impact Statement for the Upper Makaleha Springs Water Resource Development, Kapaa, Kauai, Hawaii

Thank you for the opportunity to review the subject document. We have the following comments:

1. Pursuant to Hawaii Administrative Rules §11-200-17(b), please provide a summary which concisely discusses the following:
   a) a brief description of the action;
   b) significant beneficial and adverse impacts;
   c) proposed mitigation measures;
   d) alternatives considered;
   e) unresolved issues; and
   f) compatibility with land use plans and policies, and a listing of permits or approvals.

2. Pursuant to Hawaii Administrative Rules §11-200-17(h), please provide a description and the current status of the approvals required for the proposed project.

3. Pursuant to Hawaii Administrative Rules §11-200-17(p), please include your responses to the comments made during the environmental impact statement preparation notice consultation period. A list of those who had no comments should also be included in the document.

4. Please find enclosed correspondence from the Division of Aquatic Resources, Department of Transportation, and U. S. Geological Survey relating to the subject project.

If you have any questions, please call Jeyan Thirugnanam at 586-4185.

Sincerely,

Brian J. J. Choy

Brian J. J. Choy
Director

Enclosures

c: Portugal and Associates

BC:jt

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER AND LAND DEVELOPMENT
P.O. BOX 373
HONOLULU, HAWAII 96809

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DONA L. HANAIKE

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JAN 10 1994

Dr. Bruce Anderson
Interim Director
Office of Environmental
Quality Control
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

Dear Dr. Anderson:

Revised Draft Environmental Impact Statement
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your letter of July 6, 1992 for the subject project. Your concern and comments are adequately incorporated in the Revised Final Environmental Impact Statement.

Permit applications necessary for the subject project are now being prepared. Please be assured that the project will not be constructed unless all approvals are obtained.

If you have any questions regarding this matter, please contact Mr. Edward Lau of the Division of Water and Land Development at 587-0227.

Sincerely,

MANABU TAGOMORI
Manager-Chief Engineer

sa

Sent to LW 1/26

DEPARTMENT OF WATER

COUNTY OF KAUAI
P.O. BOX 1706
LIHUE, HAWAII 96766-5706
PHONE NO: (808) 245-6986 FAX NO. 245-5813

January 22, 1993

Mr. William Paty, Chairperson
BOARD OF LAND & NATURAL RESOURCES
P. O. Box 621
Honolulu, HI 96809

Re: Job No. 12-KW-A, Makaleha Valley Spring Water Source Development, Wailua-Kapaa, Kauai

We have reason to feel that this project is meeting with undue resistance from the State Division of Aquatic Resources (SDAR).

The first draft EIS for this project was completed in September, 1987 and submitted to the Office of Environmental Quality Control (OEQC) for review and approval. Since then, there have been two(2) more submittals to address the reviewing agency's concerns and comments. After all these years and all the review time allotted for the revised drafts, Mr. William Devick, at the eleventh hour submitted concerns regarding hypothetical concepts of an, "as yet undescribed unique subterranean ecosystem continuing species presently unknown to science". He further states that "ongoing studies in France have found and defined such systems." Wouldn't an ecosystem in France differ from the tropical ecosystem in Hawaii?

Devick was asked if these surveys were done or required in past similar projects. He responded that these have not been done before, but should be for this project.

He requires a stream monitoring survey which he states "is both complex and time consuming and would require a commitment of financial and manpower resources beyond our existing capabilities."

At this stage, all we request for is to conduct whatever survey is required as soon as possible. Earlier, the stream survey was scheduled for mid-September. However, due to Hurricane Iniki, the survey was postponed to November, 1992. Now, SDAR states that, "we do not believe that any surveys done before next May or June would be appropriate." SDAR feels that the ecosystems have been scattered by the hurricane. We have enclosed some photographs of the stream area taken in January, 1993. The pictures show and our photographer concurs that the area has had minimal disturbances and there is be no hurricane impact to the ecosystem.

One of the major concerns of SDAR is the possibility of dewatering Makaleha Stream because this, "would have a permanent impact." In other words, all of the listed concerns in their comments to the EIS would come to fruition and almost all living species within the stream would perish.

The Kauai Water Department and Lihue Plantation have an agreement that, in times of drought where the stream flows diminish, we will close our valves and not use any water. We have been informed by Lihue Plantation that in the past, droughts have caused the stream flow to diminish to just a trickle. The point we make here, is that, if this dewatering occurred many times in the past, would not all these impacts have transpired? Wouldn't this have been, "a major environmental upset for Makaleha Springs and will undoubtedly impact these systems?" Perhaps this case in point will render SDAR's comments moot. After all, how much more can the ecosystem be disturbed?

We have attached a copy of our request to the 1987 Legislature for State funding for this project. This report illustrates the importance of the Makaleha Spring Source Development project to the people of Kauai. Also attached are information pertinent to the current status of the project.

Raymond H. Sato
Manager and Chief Engineer

RHS:rm
Attachments

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF WATER AND LAND DEVELOPMENT
P.O. BOX 373
HONOLULU, HAWAII 96809

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JAN 4 1994

Mr. Murl Nielsen
Manager & Chief Engineer
Department of Water
County of Kauai
P.O. Box 1706
Lihue, Hawaii 96766-5706

Dear Mr. Nielsen:

Revised Draft Environmental Impact Statement (RDEIS)
Upper Makaleha Springs Water Resource Development
Kapaa, Kauai, Hawaii

Thank you for your letter regarding the subject project. Your comments will be included in the Revised Final Environmental Assessment.

Sincerely,

MANABU TAGOMORI
Manager-Chief Engineer

SA:ek

State of Hawaii
Department of Land and Natural Resources
DIVISION OF AQUATIC RESOURCES
April 23, 1993

MEMORANDUM

TO: Edward E. Henry, Acting Administrator
Office of Conservation and Environmental Affairs

FROM: Henry Sakuda, Administrator
Division of Aquatic Resources

SUBJECT: Updated comments on Revised Draft Environmental Impact Statement for the Upper Makaleha Springs Water Resource Development, Kauai, File 92-738

Attached is our original review, dated June 1992, of the Revised Draft EIS for the Makaleha Springs Development. The draft EIS was subsequently rejected by OEQC and returned to this Department for resolution of its deficiencies. It should be noted that this was the third rejection of the draft EIS, the previous being in 1990 due in part to comments made by the University of Hawaii's Environmental Center. The Division of Aquatic Resources apparently was bypassed during the earlier review process in 1990, so the latest draft was entirely new to us. We have recently been informed by John Harrison that the Environmental Center did not comment on the latest version because it was essentially unchanged since 1990. This lack of comment appears to have been misinterpreted as an approval of the draft EIS.

Since our expressed concerns were focused on inadequate surveys and misapprehension of the significance of the aquatic biological resources in the Makaleha Springs area and since the draft EIS was produced by this Department, we agreed to conduct a biological survey of Makaleha Stream to make the EIS acceptable. This survey was scheduled for September, but Hurricane Iniki intervened. Because the hurricane devastated the Kauai environment, we concluded that any survey done before summer at the earliest would necessarily describe a nonrepresentative habitat.

Nevertheless, we did include Makaleha in post-hurricane damage assessment surveys performed at the end of October 1992. Contrary to various assertions in the draft EIS, all the native inland fish species were found at that time along with the native opae:

Hawaiian name	Scientific name	Density (no./ft^2)
'O'opu nakea	*Awaous guamensis*	0.08
'O'opu nopili	*Sicyopterus stimpsoni*	0.01
'O'opu hi'ukole	*Lentipes concolor*	0.03
Opae kala'ole	*Atyoida bisulcata*	0.08

The survey was performed over a 5 hour period by 3 biologists using a standardized sampling technique involving 49 randomized point counts. Clumps of fish and shrimp were observed

ENCLOSURE 2

outside of the defined sampling boundaries. Only one exotic fish species, *Poecilia reticulata*, was found in the stream.

The draft EIS reported only a few 'o'opu nakea and no 'o'opu nopili. Although a few 'o'opu hiukole were found, it was concluded that these probably represented a landlocked population. It was speculated that the few opae seen were anthropic releases. All of these assertions are wrong. All three 'o'opu species were widely distributed and common in Makaleha Stream. Despite downstream diversions in Kapa'a Stream, of which Makaleha is a tributary, flows are sufficiently continuous to permit the obligatory life cycle migrations to the sea.

The Makaleha tributary is presently unspoiled by diversion or other development and, under the criteria of the Hawaii Stream Assessment, would receive an "outstanding" rating for its biological resource value. It is not the degraded, biologically insignificant area suggested by the draft EIS. The high biological value of Makaleha has added importance because the remainder of the Kapaa Stream system has been heavily impacted by agricultural and urban development, which should not be allowed to worsen.

The Makaleha Springs area and Stream are in addition generally recognized by aquatic biologists as having unique characteristics that should be protected. Bishop Museum scientists have described the aquatic and surrounding native insect biota as among the most diverse in Hawaii. Up to 5 species of the endemic, biologically important damselfly (*Megalagrion*) inhabit the area. One and possibly two species of native lymnaid snails previously unknown to science have recently been found in Makaleha and have as yet not been described and named. Makaleha Springs and Stream also is a prime candidate for the existence of hyporheic ecosystems. This concept has been attacked by non-biologists but needs to be taken seriously (see the attached abstract of a paper by Dr. Frank Howarth). It would be shamefully irresponsible to proceed with a project that could destroy such an ecosystem out of ignorance, disinterest, and lack of concern.

The draft EIS does not seem to meet statutatory requirements for adequate review of environmental impacts or for full consideration of alteratives. There are in fact alternatives for accessing domestic water without creating the environmental damage of the proposed project. One of the arguments in favor of the proposal in fact may be wrong, namely that the water would not have to be treated (chlorinated) before use. It is our understanding that the springs will be regarded as surface water and that treatment will be mandated. Irregardless, we suggested in our June review that a well would be a preferential alternative. Another, which would be less damaging to Makaleha, would be to divert water from Kapa'a Stream below the Makaleha tributary. The latter alternative, however, would require conditions preventing diversion during drought periods.

We originally planned to carry out a comprehensive biological survey this summer. However, it is obvious that such a survey may be redundant given the results of our survey in October 1992. The data in hand show that Makaleha Stream is an environmentally valuable and probably sensitive area that should not be disturbed. Recent visits by staff, University of Hawaii, and Bishop Museum scientists have shown that the area is beginning to recover from the hurricane, which means that Makaleha will probably retain its high biological value and return to its pre-Iniki condition. Under the circumstances there is strong evidence that the proposed project is unacceptable environmentally and that an alternative should be chosen. The fact that the draft EIS has been rejected three times underscores this fact.

PROSPECTS FOR FINDING A HYPORHEIC ECOSYSTEM IN HAWAII

Francis G. Howarth
B.P. Bishop Museum

Hyporheic ecosystems are distinct communities of aquatic organisms that live within the flooded spaces beneath rivers. Many species are uniquely adapted to live permanently in the strange environment and share morphological features with cave species. Most species are small, a necessity of the often restricted spaces in their habitat. Like other subterranean habitats, the environment is strongly zonal with often separate communities living within each zone. The upper most zone is well aerated and overlaps with the benthic community within the interstices of stream gravel. The most specialized species live in the lower most, poorly oxygenated zone. The dominant animal group is the crustaceans, but a few aquatic insects, worms, snails, and other groups have also been found. Most biological work has been done in Europe, and the ecosystem was recognized in the USA in the early 1970s and more recently in New Zealand. Hawaiian hyporheic habitats remain poorly known, by the evidence strongly suggests that native hyporheic species do exist. The habitat could be colonized by representatives of the interstitial beach and littoral fauna, which is preadapted to living underground. In fact, the mixohaline anchialine ecosystem exposed along Hawaiian coasts confirms that the process has begun. In addition, a few rarely collected stream invertebrates may be waifs from their primary habitats under the stream. For example, a few highly unusual talitrid amphipods have been taken in Hawaiian streams, but intensive sampling has failed to identify their true habitat. Other youthful barren habitats in Hawaii (e.g., lava tubes, new lava flows, and mountain summits) were also assumed to be lifeless until recently when we earnestly began surveying these habitats and found a wonderful array of specialized native species.

State of Hawaii
Department of Land and Natural Resources
DIVISION OF AQUATIC RESOURCES
June 23, 1992

MEMORANDUM

To: Paul Kawamoto, Program Manager
Aquatic Resources and Environmental Protection

From: Bill Devick, Program Manager
Recreational Fisheries

Subject: Revised Draft EIS Review

Comments Requested By: Roger Evans, OCEA
Date of Request: May 27, 1992
Date Received: May 28, 1992

Summary of Proposed Project

Title: Revised Draft Environmental Impact Statement for the Upper Makaleha Springs Water Resource Development, File 92-738

Project By: Department of Land and Natural Resources, Division of Water and Land Development

Location: Kapaa, Kauai

Brief Description: The EIS is intended to examine alternatives for increasing the potable water supply for the Wailua-Kapaa area on Kauai. The lack of available water has curtailed a number of land use development projects. If, within the next 20 years, the area is fully developed as outlined in the Kauai County General Plan and the resident population increases to predicted levels, the average water demand will more than double to 5.63 mgd. Alternatives considered were: (A) No Project Option; (B) Drill a New Well at Akulikuli Ridge; (C) Enlarge Existing Tunnels; (D) Impoundment of a Surface Water Supply; (E) Tap Natural Springs in the Makaleha Mountains; (F) Water Conservation in the Wailua-Kapaa Area. Alternatives A, B, and F would have little or no impact upon the streams. Alternative C would have the greatest impact on the stream, according to the EIS, due to possible sediment loading during construction. Alternatives D and E would reduce flows in the Makaleha Stream. Alternative E was rated the most desirable alternative because of its more cost effective development approach. The other alternatives in order of desirability were F, C, D, B, A. The E alternative would tap the natural springs in the Makaleha Mountains through construction of an underground cut-off trench, a small intake structure, and an 8-inch pipe along the north side of Makaleha Valley and would supply a flow of 500-700 gallons per minute. Makaleha Stream is a major tributary of the Kapaa Stream and approximately 8% of its total discharge is supplied by Makaleha Spring.

Comments: Although the draft EIS is clearly written, the analysis provided in the section dealing with aquatic resources is outdated and to a large extent ranges from misleading to gross error. The last recorded communication with the Division of Aquatic Resources concerning the project was 1987. Two native gobies, *Awaous stamineus* and *Lentipes concolor*, were found in Makaleha Stream along with the native shrimp, *Atyoida bisulcata*. The latter is dismissed as some kind of accidental import, which is almost certainly wrong. *Atyoida* is an excellent climber that migrates quite easily upstream. The astounding statement is made that "aquatic fauna in the stream are characterized by low diversity", even though "eleven of the fourteen species are endemic to Hawaii." In Hawaiian streams with their characteristically depauperate fauna, that is high diversity! The fact that 11 *endemic* species were found should have sounded a warning bell. We strongly suspect that all 5 native fish species, all of which are endemic, are found in the stream, but the reconnaissance surveys were not extensive enough to adequately define species distribution. The deficiency of the analysis was exemplified by the following italicized statement, set in bold type in the EIS and placed in quotation marks, citing a series of old references:

> ***"Adult gobies spawn over a period of months in freshwater, mostly in the lower reaches of streams. Hatchlings are carried out to sea by stream current where they spend a marine existence as plankton. Then these metamorphose into post-larvae (hinana) near the mouths of streams, settle on appropriate substrata, and migrate upstream to the places of permanent residences."***

We now know that the first sentence applies only to one of the three inland gobies, *Awaous stamineus*, and is not entirely true even for this species. *Lentipes concolor*, by contrast, spawns year around within the same areas they occupy throughout the year. The remainder of the statement, however, is true, but the analysis suggests that the *Lentipes* found in the Makaleha "may represent a captive adult population". One might wonder how the fish got there. In reality, the presence of *Lentipes* in the upper reaches of streams that are completely dry in the lower and middle reaches is common, and studies have shown that these fish in fact have completed their diadromous life cycle. Intermittent flows through the dry area will support migration between the sea and these seemingly isolated habitats. The analysis tends to belittle the biological value of the stream, but it should be noted that the Hawaii Stream Assessment Report (dated 1991 but not referenced despite its central importance for this project) gave the Kapaa Stream, which includes the Makaleha Stream, its highest "outstanding" rating for the stream's aquatic biological resources.

The discussion of biological value is largely focused on the absence of "threatened or endangered" species. This misses the point and diverts attention from the real problem. Indeed, the freshwater stream species are not yet on the brink of extinction, but the decisions made now will determine the future of all of our native aquatic organisms and ecosystems. *Hawaii is in the fortunate position of being able to prevent the inexorable slide to extinction in aquatic ecosystems, if favorable decisions to protect essential habitat are made now*, before the otherwise inevitable crisis stage arrives. <u>That does not infer that these populations are thriving and are in no need of special protection</u>. Much habitat has been lost, populations have declined markedly based on verbal descriptions of past abundance, and threats from accidentally introduced foreign species have surged. <u>It does mean that the surviving habitats need to be considered in a broader perspective within representative ecosystems</u>. Hawaii has a rare opportunity to assure perpetuation of our unique freshwater ecosystems before their native, mostly endemic organisms are placed in jeopardy of extinction; if a substantive commitment is

made now. To wait until these species and ecosystems are clearly endangered would probably mean that recovery efforts at that late date, like most recovery efforts, would be an exercise in futility or at best extremely expensive.

Until an extensive stream protection system is in place and the survival requirements of the native stream biota are better understood, any project which will reduce stream flows must be viewed with extreme caution, especially when that project will impact a stream with recognized biological significance. It should be noted that there is as yet no suitable predictive model to evaluate the potential effects of artificial flow changes on native species populations or ecosystems. We do know that reduced stream flows will almost certainly reduce the suitability of the habitat for native species and at the same time will increase the suitability of the habitat for a variety of alien species, which may then displace the natives. In unmodified streams with naturally occurring flows, the native species have a decided advantage over aliens because they are well adapted to extreme conditions.

We would like to emphasize that *stream protection to be effective must be ecosystem* protection. Ongoing research supported by the Division of Aquatic Resources is indicating that our island stream ecosystems function differently than aquatic ecosystems in continental situations. They lack many internal buffers that elsewhere help to stabilize ecosystems when upsets occur. A disturbance at any point in a stream may echo throughout the stream, from the highest reaches to the lowest. Disturbances which might not be significant in a continental situation could cause a Hawaiian stream ecosystem to collapse. Impacts to the Makaleha tributary must be treated as an impact on the whole of the Kapaa Stream.

The draft EIS did not consider a potential major impact from this project with regard to Makaleha Springs. It is highly possible that these springs may be part of an as yet undescribed unique subterranean ecosystem containing species presently unknown to science. Dr. Frank Howarth of the Bishop Museum has hypothesized that such hyporheic systems may exist under streams and may also be contained within underground interstitial spaces associated with springs. The concept is not entirely hypothetical, because ongoing studies in France have found and defined such systems. Some preliminary studies of springs on Kauai in fact found some as yet unidentified species apparently surviving in interstitial subterranean habitats. In addition, seeps associated with the springs are likely to sustain a variety of invertebrate species. Since the project definitely represent a major environmental upset for Makaleha Springs and will undoubtedly impact these systems, presuming they exist, some investigation is needed to evaluate Howarth's hypothesis as well as describe the biota associated with seeps.

The matrix, "Comparative Raw Scoring of Project Alternatives," on page 2-16 needs to be re-evaluated. Alternative C has a much lower score, reflecting a greater adverse impact, on the evaluation criteria 1 and 2 (pertaining to surface water quality and aquatic habitats) than any of the other alternatives, including E, even though the described potential impacts--namely sedimentation resulting from construction errors or accidents, might not only be preventable but would be temporary in nature. Dewatering the stream would have a permanent impact.

If the project is to proceed, the draft EIS recommends that biological monitoring should be instituted for the stream, then assigns the task to the Division of Aquatic Resources. We strongly agree that some kind of a monitoring program should be conditional for approval of the project but note that we have never been contacted about the matter. Such monitoring is both

complex and time-consuming and would require a commitment of financial and manpower resources beyond our existing capabilities. We could however incorporate this area in our Statewide stream monitoring program if sufficient funding was made available.

In summary, we do not believe that this draft EIS has dealt adequately with the substantive environmental issues associated with this project and that the deficiencies are great enough to warrant its rejection. The bias towards development is evident in its statement, "The proposed project will fulfill the primary purpose of the Kealia Forest Reserve which is to serve as a source of water supply." That is a very narrow view that excludes the basic protective philosophy of such a reserve. The analysis of impacts of the project on the Kapaa Stream is outdated, error-prone, and misdirected. Consideration of impacts on a possible subterranean spring ecosystem itself is totally ignored and should unquestionably be incorporated, including requisite field studies, in the EIS. Closer examination of the alternatives is needed, along with some more definitive commitment regarding plans for biological monitoring of the stream.

Under the circumstances other alternatives-- F, B, and C in that order-- appear to be preferential to E with reference to protecting stream and possibly subterranean spring biological resources.

Bill Devick

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TO: Mr. Henry Sakuda, Administrator
Division of Aquatic Resources (DAR)

FROM: Manabu Tagomori, Mgr & Ch Engr, DOWALD

SUBJECT: Draft Environmental Impact Statement (DEIS) for the Upper Makaleha Springs Water Resource Development, Kapaa-Wailua, Kauai

REF: (a) DAR memo of April 23, 1993 to OCEA, same subj.

1. The following comments are in response to reference (a) and our discussions with the Chairman on/about August 30, 1993.

2. The revised DEIS for this project was not rejected by the OEQC. However, since the accountability of the DEIS/EIS is a matter between DOWALD and OEQC, the following comments will address other items in ref. (a).

3. In a meeting to address items raised by DAR on or about August 17, 1992, DAR indicated that additional stream surveys were needed and offered to perform more aquatic biological surveys of the upper Makaleha stream by September 30, 1992. However, on September 11, 1992 hurricane Iniki intervened. DAR indicated that the survey should not be done until May or June 1993 to allow the environment to recover from the hurricane. However, unknown to DOWALD, DAR did conduct a survey in October 1992 (ref. (a)) and during our discussion of August 30, 1993, DAR indicated that no more surveys were required.

4. DOWALD feels that DAR has overlooked some important issues. There are significant reasons, as brought out by hurricane Iniki, why the Makaleha spring source is an important water source which should be developed.

a. Gravity source. Because of its elevation, this spring source will be a completely gravity source. It will therefore not require any power for pumping and save barrels of oil every year into perpetuity. It will therefore also save the DW and the customers approximately $60,000 annually just from not having to pump.

b. Ground water. Flow measurements by the USGS show that this spring source is ground water and not from a stream source. This fact will allow the source to be used without having to receive surface water treatment. Surface water treatment for the construction of a one mgd plant would cost in 1994 dollars, approximately $3,500,000.00, a big cost, compared to the approximately $1,049,600 for the spring source. Therefore if a source down stream were to be used as recommended by DAR, the taxpayers would have to pay the extra capital cost, plus an annual operating and maintenance cost against almost no annual cost for the spring source. This project provides a significant beneficial social impact, of conserving fiscal resources of the people.

c. Hurricane & Power Outage Proof. The Makaleha water system already has a tunnel source which provides water by gravity to the Kapaa-Wailua area. During hurricane Iniki and after, this system stayed in operation uninterrupted because it did not require power. It provided much needed water to the State's Mahelona hospital, the county's Civil Defense Command Center and FEMA's headquarters, the Kapaa Elementary, Intermediate and High school complex and residents within this system, plus filling water wagons and fire trucks servicing water throughout Kauai. The present system did drain down during the day and did not have enough for fire protection but replenished itself at night. The addition of the Makaleha springs will make this system all the better. It will significantly improve the health, safety and welfare of the people.

5. We acknowledge DAR's report that there are important native inland fish species and the native opae in the stream. We are also aware that while they are important none of these species are on the endangered list.

6. The following will address the applicable comments of reference (a). Reference (a) concludes that Dr. Timbol's assertions concerning the presence of native opae are "wrong". This strong statement makes a surprising conclusion; it assumes that October, 1992 survey conditions should have resembled stream characteristics that were observed by Dr. Timbol in August, 1986, as well as March and April, 1990. Based upon the field experience of Dr. Timbol, I believe that a more reasonable conclusion would note that a significant variation in stream fauna composition was observed. Experience has shown that the greater field observations frequently yield a greater range of environmental conditions. The question posed by this entire project is not "wrong" analysis by a very competent aquatic biologist; rather, the project team made this conclusion based upon a different set of field conditions and results which led to a different conclusion concerning the composition and abundance of stream biota.

7. We accept that each survey condition as factual. The variability in Stream conditions does indicate a dynamic aquatic environment of the native opae and other species in these reaches of the Makaleha Stream. For these and other reasons, DAR has assigned a high biological value to the Upper Makaleha Stream and concludes that it should not be disturbed. It should be pointed out that the flow from Makaleha stream along with its biota is already capable of being totally dewatered by the Makaleha Ditch during low flow periods. The stream flow within the stream reach between the Makaleha Spring area and the Makaleha Ditch intake will be reduced only 8 - 17%. The County of Kauai Department of Water Supply has an informal agreement with the Lihue Plantation Company (LPC), requiring that DW reduce or cease pumping water from the spring source during low flow periods when flows in the Makaleha ditch reach 50 mgd. Thus, the effect of water withdrawal from Makaleha Stream below the Makaleha Ditch intake will remain the same; only the ultimate use and method of withdrawal will be changed with the installation of the spring development.

8. Reference (a) also points out that another alternative would be to "...divert water from Kapaa Stream below the Makaleha tributary". We agree that a diversion could probably be constructed on the lower end of Makaleha Stream. However, this alternative would use a surface water supply that would require construction of a pumping station and a surface water treatment plant that we indicated earlier would cost $3,500,000.00 to build, plus annual operating and maintenance costs. This approach would not meet one of DW's primary objectives, i.e., to provide a "gravity system", that is so important to uninterrupted supply during emergencies. A new well would even be cheaper than withdrawing water from the lower reaches of Makaleha Stream, but would also not meet DW's objective of gravity flow.

9. Hurricane Iniki and its aftermath have generated significant financial burdens the County budget. While there may be some adverse effects to the biota in the upper reaches of Makaleha Stream, the biota from that reach which flows to the lower area are completely consumed by the Makaleha Ditch. The diversion is only 8 - 17% in the upper reach. None of the biota are on the endangered listing. On the other hand, this water source will provide significant economic, social, health, safety and welfare benefits.

EL:ek

c: OCEA

APPENDIX D

AQUATIC BIOLOGICAL STUDIES

Amadeo Timbol, Ph.D.

A DESCRIPTIVE STUDY OF SELECTED BIOLOGICAL AND PHYSICOCHEMICAL CHARACTERISTICS OF MAKALEHA STREAM, KAUAI

by

Amadeo S. Timbol, Ph. D.
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Prepared for

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May 8, 1990

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1. INTRODUCTION

Makaleha Stream is a tributary of Kapaa Stream in Kapaa town on eastern Kauai (Fig. 1). It is perennial (flows year round). In 1986, a biological reconnaissance was done for Portugal and Associates, Inc. for use in the preparation of a draft EIS for a proposed well for the Kauai County Board of Water Supply (Timbol 1986). The draft EIS elicited questions regarding the native goby fishes living in Makaleha. Aside from this study, there are no other published data on the aquatic macrofauna in Makaleha Stream.

1.1 Study Personnel and Acknowledgments

Brady Tokuda and Michael Kido, M. S. assisted in the field work. Tokuda helped in backpacking scientific equipment and Kido assisted in the census of the fish and crustacea.

1.2 Aquatic macrofauna in Hawaiian streams.

The fauna is characterized by low diversity of species and a high degree of endemism. In the upper reaches, the predominant native fishes are gobiids. All the native fishes that are restricted to fresh water as adults are diadromous. (Diadromy is a designation for species which are migratory between fresh and salt water). Adult gobies spawn over a period of months in freshwater, mostly in the lower reaches of streams. Hatchlings are carried out to sea by stream current where they spend a marine existence as plankton. These then metamorphose into post-larvae (hinana) near the mouths of streams, settle on appropriate substrata, and migrate upstream to their places of permanent residences (Ego 1956, Tomihama 1972, Maciolek 1977, Timbol, et al. 1980, Kinzie and Ford 1982). These gobiids, as well as most native fresh water macrofauna, therefore, must have suitable environment throughout the stream channel for their upstream and downstream migrations.

This study involves that portion of the Makaleha Stream from just above Makaleha spring down to just below the Lihue Plantation Co. diversion weir. The location of the Makaleha Stream, the spring, and diversion weir are shown in Figure 2. Appendix A includes pictures of the spring, diversion weir, and the control gate to the Makaleha tunnel and ditch.

1.2 Scope of Report

This study is intended to update the 1986 biological data and to determine the physicochemical conditions in which the biota live. These data are needed in order to address the concerns of the Office of Environmental Quality Control in regards to the aquatic life. This report covers six field-work days: March 19, 20, 23, 29, 30 and April 8, 1990.

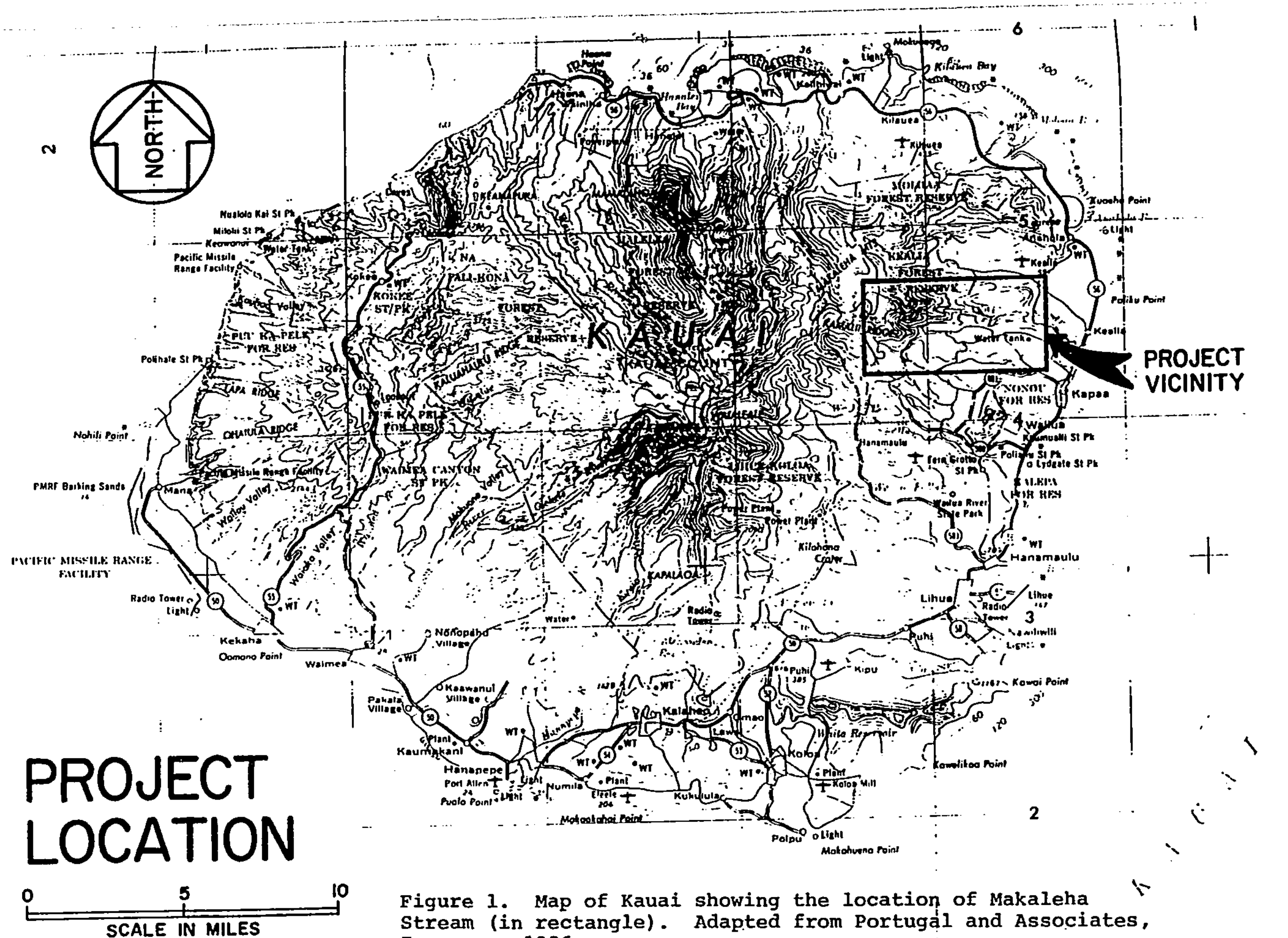

Figure 1. Map of Kauai showing the location of Makaleha Stream (in rectangle). Adapted from Portugal and Associates, Inc. map, 1986.

1.3 Objectives of the Study

The main purpose of this study is to compile a short-term baseline description of that part of Makaleha Stream that may be affected by the proposed county well. It covers about one mile of stream channel. The specific objectives are to:

1. Compile an aquatic macrofauna list consisting of both scientific and local or common names.

2. Make a semi-quantitative estimate of fish, decapod crustaceans and stream macrobenthos.

3. Describe the stream's physicohcemical characteristics, i.e. dissolved oxygen, water temperature, pH, conductance and turbidity.

4. Describe that part of the Makaleha Stream that could be affected by the proposed well using the designated sampling stations as representative stream channel. This involves width, depth, longitudinal gradient, stream substrata, flow velocity and discharge.

5. Identify riparian vegetation on both banks of the sampling stations and estimate the vegetative canopy covering stream channel.

6. Based on the biological and physicochemical features to make an educated guess as to the continued presence of the endemic animals in the stream.

2. MATERIALS AND METHODS

2.1 Sampling Stations

Three sampling stations were studied. Their approximate locations are shown in Figure 2. In this report, station I is also referred to as the "upper " station, station II as "spring" station, and station III as the "weir" station. Pictures of these stations are shown in Appendix A.

2.2 Biological Features

2.2.1 Fish and crustaceans. Fishes, crustaceans and mollusks were counted with the aid of a face mask and snorkel. Boulders, rocks and stones were examined for mollusks. The advantages and disadvantages of the visual method compared with the use of an electroshocker are discussed by Maciolek and Timbol (1980), Timbol and Maciolek (1978), Larimore (1961) and Riggs (1953). The data were converted to number of individuals per 20 meters

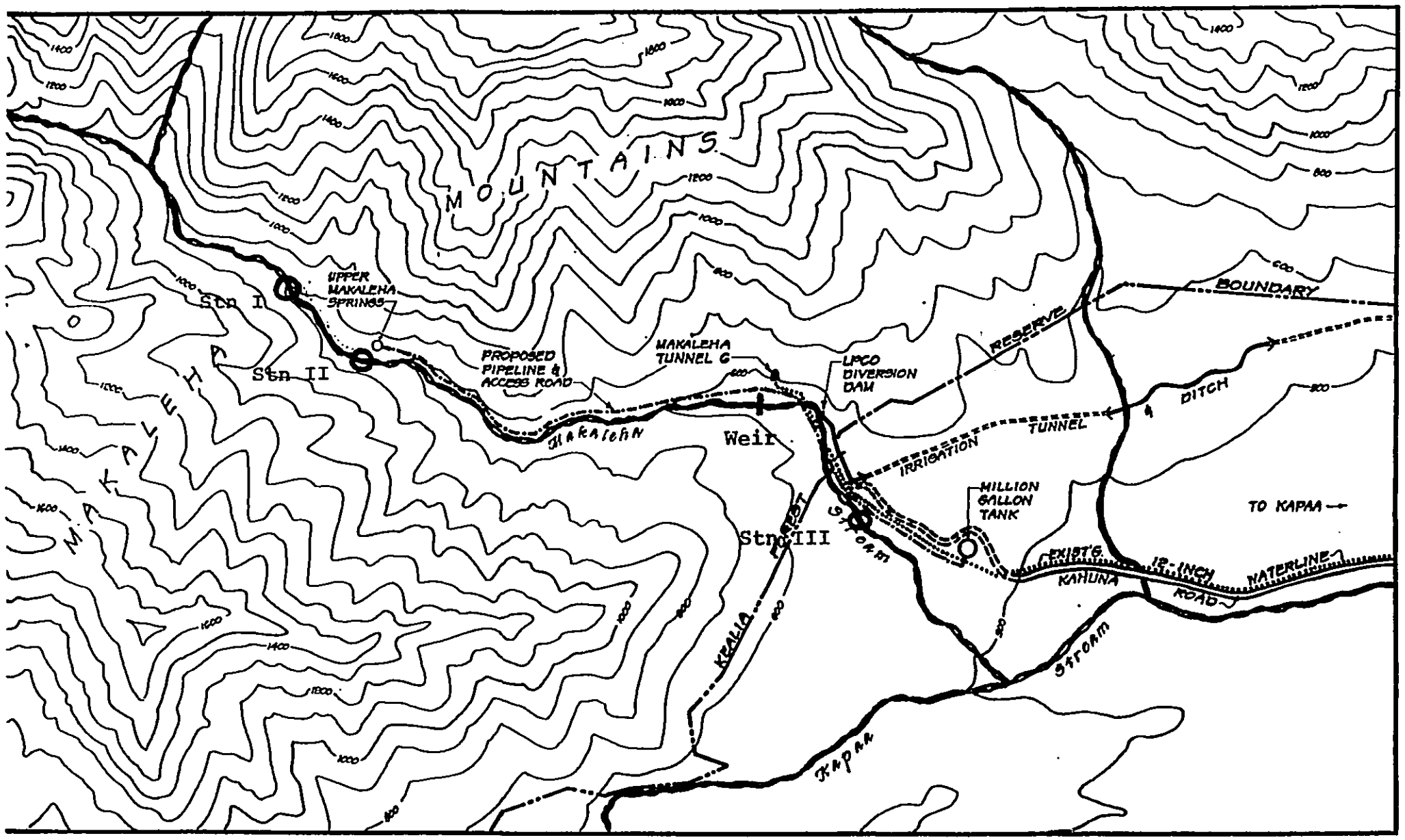

Figure 2. Makaleha Stream showing locations of sampling stations I, II, III (open circles) spring, and the weir that diverts water to the Makaleha tunnel. (Adapted for Portugal and Associates, Inc. 1986.

NORTH

PROJECT SITE

0 500 1,000
SCALE IN FEET

square for each species.

2.2.2 Aquatic macrobenthic animals. The benthic population was obtained with a WILDCO Surber Stream Bottom Sampler which had a frame of 30 cm x 30 cm (12" x 12") and a net mesh size of 728 microns. The procedure required the seating of the lower frame of the sampler, stirring the bottom and gently wiping the pebbles and stones within the frame so that any animal life will float up and drift to the net. All the contents of the net were placed in plastic whirl-paks, preserved in 70 per cent denatured ethyl alcohol and brought to the laboratory where they were sorted, identified, and counted.

Samples were taken in riffles with gravel bottoms at between 30 and 60 cm (12" and 24") water depth.

2.2.3 Riparian vegetation. For the purposes of this study, an estimate of relative cover and abundance for each species was adapted from Elliot and Hall (1977) as shown in Table 1. Most scientific names are from Neal (1965).

Table 1. Vegetative coding system used in categorizing riparian vegetation (from Elliot and Hall 1977).

COVER	ABUNDANCE
< 5% = 1	rare (1 - 4 plants) = R
5% - 25% = 2	occasional (5 - 14 plants) = O
26% - 50% = 3	frequent (15 - 29 plants) = F
51% - 75% = 4	abundant (30 - 99 plants) = A
76% - 100% = 5	very abundant (> 100 plants) = V

The area sampled was confined horizontally (i.e. across the stream) to within 3 meters of the waters edge and vertically (i.e. upstream - downstream) to within 10 meters on either side of the center of the sample station. Vegetation beyond this area was noted only if: 1/ the canopy of the stream was involved and 2/ if interesting native plants were observed.

As significant physical differences may exist between the right and left banks of a stream, each was treated separately (note: left and right was always determined

looking upstream). A riparian vegetation list was therefore compiled separately for each bank and generally plants are listed beginning with plants closest to the waters' edge. An asterisk (*) after a species indicates a tree species involved in creating the canopy over the stream channel.

The vegetative cover of the stream (canopy) affects the amount of sunlight reaching its surface. This may be another important factor in the overall energy production of the ecosystem. The canopy was estimated as % shaded. A 100% shaded condition indicates that the canopy completely covered the stream channel, 50% shaded indicates that the canopy covered half the stream channel, and so on.

2.3 Physicochemical Features

2.3.1 Channel width, depth, and flow velocity. Channel width was obtained by stretching a 100-ft tape across the channel. Depth was measured from one bank to the other at foot intervals at the upper two stations and at three-foot intervals at the lower two stations using the calibrated Swoffer flow meter model 2100 rod. Flow velocity was measured with the Swoffer flow meter for depth. Flow values obtained are from 0.6 of depth. The flow meter is accurate to within 1% and precision is a standard deviation of plus or minus 0.01 ft/s.

2.3.2 Discharge. Discharge was derived from the width, depth, length, and flow velocity data using the Reid (1961) equation: Q(cfs) = WDV, where W is channel width in feet, D is the mean channel depth in feet, and V is mean velocity in feet.

2.3.3. Longitudinal gradient. The data for this parameter was obtained by measuring the stream length from USGS topographic maps using a map measurer. Elevations were also obtained from the same topographic maps.

2.3.4 Substrate. The substrate of each of the sampling station was determined by above water visual examination. The substrate was sketched, photographed and quantified using a modified system adapted from the Wentworth classification of particle size (table 2). The plant cover of exposed and submerged substrate was also estimated as it may be an important habitat component affecting species composition and abundance.

Table 2. Substrate coding system (modified Wentworth: Bovee and Cochnauer 1977) used in characterizing the substrate.

Substrate	Particle size, range (mm)
1. Bedrock	solid, lava slab
2. Exposed boulder	250 - 4,000 mm (10 in.-13 ft)
3. Submerged boulder	same as above
4. Cobble	65 - 250 mm (2.6 in.-10 in.)
5. Gravel	5 - 65 mm (0.2 in.-2.6 in.)
6. Sand	1 - 5 mm (0.04 - 0.2 in.)
7. Silt	1 mm (0.04 in.)

2.3.5 Water temperature. An alcohol thermometer was used for these data. Water temperature was cross checked with the oxygen meter and conductivity meter. These meters are also equipped to measure water temperature.

2.3.6 Conductance. Water conductivity was measured with a YSI model 33 meter at subsurface in the same place where dissolved oxygen was measured. The meter has an accuracy of plus or minus 2.5% maximum error. Conductivity is expressed in micromhos/centimeter (umhos/cm).

2.3.7 Dissolved oxygen. This was measured with a YSI 57 dissolved oxygen meter at subsurface from an area representative of the sampling station. The meter measured oxygen in mg/L. The data were converted to per cent saturation. The meter accuracy is given at 0.1 mg/L.

2.3.8 pH. This feature was measured with a Digisense pH meter model 5994 (Cole-Parmer Instrument Co.) at subsurface level at the same place where dissolved oxygen and conductance were measured. The accuracy for this meter is 0.01 pH unit. The meter was calibrated at each sampling site in accordance with the procedure manual.

2.3.9 Turbidity. A Hach Portalab Turbidimeter model 16800 was used to measure turbidity. Accuracy is plus or minus 5% of full scale.

3. RESULTS AND DISCUSSION

3.1 Biological Features

3.1.1 Aquatic macrofauna. Table 3 lists the macrofauna in Makaleha stream. It includes their common and/or local names, origin, and listing in scientific and/or official register.

Table 3. List of macrofauna in Makaleha Stream, Kauai (March - April 1990).

Scientific Names	Common Names	Origin	Listing
Annelida			
Oligochaeta	earthworm	unknown	none
Insects			
Diptera:			
Chironomidae	midge larvae		
1. *Orthocladius grimshawi*		alien(?)	none
2. *Calepsectra hawaiiensis*		endemic	none
Culcidae	mosquito larvae	alien(?)	none
Tipulidae	cranefly larvae	endemic	none
Trichoptera	caddisfly larvae		
1. *Cheumatopsyche analis*	caddisfly	alien	none
2. *Oxyethira maya*	microcaddisfly	alien	none
Coleoptera			
Staphylinidae	rove beetles	unknown	none
Odonata: Zygoptera			

Megalagrion sp..	damselfly naiad	endemic	none
Crustacea			
Decapoda			
1. *Atyoida bisulcata*	'opae-kala'ole (mountain shrimp)	endemic	none
Fishes			
1. *Awaous stamineus*	'o'opu-nakea	endemic	special concern (Deacon et al. 1979) depleted (Miller 1972)
2. *Lentipes concolor*	'o'opu-alamo'o	endemic	threatened (Deacon, et al. 1979) Depleted (Miller 1972)
3. *Poecilia reticulata*	wild guppy	alien	none
Amphibia			
1. *Rana rugosa* tadpoles	wrinkled frog	alien	none

Terms used:

Alien = brought to Hawaii either intentionally or accidentally by man.

Depleted = indicates that the organism is still found in numbers adequate for survival but has been heavily depleted and continues to decline substantially (Miller 1972).

Endangered = one which is in danger of extinction throughout all or a significant portion of its range (Deacon et al. 1979).

Endemic = found in nature only in Hawaii.

Special concern = are those species that could become threatened or endangered by relatively minor disturbances to their habitat or that require additional information to

determine their survival (Deacon et al. 1979).

Threatened = facing extinction, needs special protective measures.

Fourteen animal species were found in Makaleha Stream. They include 8 insects, 3 fish, 1 crustacea, 1 amphibia, and 1 annelida. Of the 14, 11 species are endemic to Hawaii. Two of these endemic ('opae-kala'ole, 'o'opu-nakea) are of some economic importance.

Two endemic species are listed in scientific publications as THREATENED. The goby fish ('o'opu-nakea) is listed OF SPECIAL CONCERN by Deacon, et al. (1979) and depleted by Miller (1972) but has no legal protection (Johnson 1987). The second, also a goby fish ('o'opu-alamo'o), is listed OF SPECIAL CONCERN by Deacon, et al. (1979) and like the preceding species, has no legal protection (Johnson 1987, USFWS 1989). It has been recommended for endangered status by the Honolulu Office of the USFWS (Ford 1990 personal communication). (For definition of DEPLETED, see footnote in table 3, above. Miller's DEPLETED is about equivalent to Deacon, et al.'s OF SPECIAL CONCERN.).

Six in the list are alien species. The wild guppy was introduced to Hawaii for mosquito control. The insect species are known to serve as food for the larger aquatic animals (e.g. 'o'opu-nakea). One species is of unknown origin.

The endemic goby 'o'opu-alamo'o (and probably all the gobies in the species inventory) is diadromous, a designation for species which are migratory between fresh and salt water. The life history of this species can be generalized as follows: spawning may occur over a period of months (July-December), in the lower reaches of the streams. Hatchlings are carried to the sea by stream flow where they grow and develop over a period of between four and seven months as plankton (Ego 1956. Tomihama 1972, Kinzie and Ford 1982. Radtke. Kinzie and Folsom 1988). The larvae then metamorphose into post-larvae known as **hinana** near the mouths of streams, settle on appropriate substrata, and migrate upstream to their places of permanent residence. This life style requires an unimpeded passageway from the stream mouth to the upper elevations.

3.1.2 Distribution and relative abundances. The occurrence and relative abundances of the fish, crustacea, annelida, and amphibia are shown in Table 4.

Table 4. Distribution and relative abundances of crustaceans, fishes and amphibia in Makaleha stream, Kauai (March-April 1990).

Scientific Name (Common Name)	Sampling Station I	II	III
A. Crustacea			
Atyoida bisulcata * ('opae-kala'ole)	0	0	0
B. Fishes			
Awaous stamineus ('o'opu-nakea)	+	++	+++
Lentipes concolor ('o'opu-alamo'o)	+	+	+
Poecilia reticulata (wild guppy)	0	0	+++
C. Amphibia			
Rana rugosa * (wrinkled frog)	0	0	0

Legend: +++ = abundant (6 - 10)
++ = common (2 - 5)
+ = uncommon (1)
0 = not collected or seen, possibly absent.

* Indicates that these were found in Makaleha but not in the designated sampling stations. Both of these species were found in the very high elevations at Makaleha.

3.1.3.1 Crustacea and amphibia. The 'opae-kala'ole, *Atyoida bisulcata*, was not found in the designated stations but in the very high elevations as already explained. At the time of our survey, the collecting stations were one degree Celsius colder than the upper elevations. This is due to the open canopy at the elevations where the Atyids were found.

The *Rana rugosa* tadpoles were also found in the warmer water in shallow pools nearest the stream bank outside of the designated stations. They were found in higher elevations than our highest sampling station (I).

3.1.3.2 Fishes. Three fish species were collected. Two are endemic to Hawaii (found only in Hawaii and nowhere else) and both are true gobies (with fused pelvic fins to form a suction disc). Both of these species are listed in scientific publications as "threatened." This designation, however, do not have official standing and therefore are not under federal government protection. These were found in all three stations at Makaleha. There are more nakea than alamo'o. Based on size classification, the alamo'o living at Makaleha are adults. In the 1986 study, the same situation was also true. Based on these two short-time study, it appears that the alamo'o are captive population, meaning there is no recruitment.

The nakea supports a small commercial and recreational fishery on Kauai with Hanalei and Wainiha rivers as the prime fishing areas. The last time it was sold in the markets, two years ago, it was $10.00 a pound. This is the largest of the endemic gobies, reaching a minimum of over 30 cm standard length in Kauai streams. It is well known for its downstream migrations usually in association with freshets or flash floods. Spawning occurs near the mouth of rivers and streams. The best published information on this goby is Ego (1956) but there are extensive on-going studies on the nakea by University of Hawaii (Robert Kinzie), Kauai Community College (Mike Kido) and Department of Land and Natural Resources (Don Heacock) scientists.

The alamo'o has no commercial value at present. In old Hawaii, the alamo'o was considered "a sign of bad luck to find one in a net when fishing for other fish" (Titcomb, 1972, p. 127). It is, however, listed as "threatened" in scientific publications and have been recommended for the endangered list by the USFWS unit in Honolulu. A description of this species is found in the 1986 draft EIS for this project (Timbol 1986). The life history of the alamo'o has not been studied but several authors (e.g. Lau 1973, Maciolek 1977, Timbol, et al. 1980, Kinzie and Ford 1982) imply that this species is diadromous. On the other hand, Nishimoto and Fitzimmons 1986, pp. 184-185), the alamo'o "probably has no spawning migration but rather spawns throughout the length of a stream."

The absence of a certain species in a stream could be as significant as its presence. For the Makaleha, we have not found the 'o'opu-nopili (Sicyopterus stimpsoni), an endemic and a true goby. It was absent in 1986 and is still absent in 1990. This species has been recommended by Timbol and Maciolek (1978) as an indicator species. Its decline in population density, or in extreme case, its disappearance in a stream is a good indication of serious degradation. Extensive information on the biology of the nopili is available in Tomihama (1972) and Yuen (1986).

The other fish species, the wild guppy (Poecilia reticulata), was introduced to Hawaii to help control the mosquito population. It thrives in shallow, slow flowing and warmer water. Its presence in Makaleha also indicates less than pristine quality of the stream. In contrast, this poeciliid has not been collected in Wainiha River despite of a year-long, monthly collected there (Timbol 1989b).

3.1.3.3 Aquatic macrobenthic animals. Nine species of macrobenthos were found living in or around the stream substrate. Their distribution and relative abundances are in Table 5. Eight of these are aquatic insects or semi-aquatic insects. The ninth is an earthworm. The most important components of the insect population are the chironomids and caddisflies larvae. These form the major food source of the fish and large crustacean population in the stream.

Table 5. Distribution and relative abundances of aquatic macrobenthic animals in Makaleha stream, Kauai (March -April 1990).

Scientific Name (Common Name)	Sampling Station I	II	III
A. Annelida			
Oligochaeta	o	+	o
A. INSECTS			
I. Diptera (Flies)			
1. *Orthocladius grimshawi*	++	o	++
2. *Calepsectra hawaiiensis* (midge larva)	++	o	++
Culcidae (mosquito larva)	o	+	++
Tipulidae (cranefly larvae)	+	o	o
II. Trichoptera (caddisflies)			
1. *Cheumatopsyche analis* (caddislfy larva)	+ +	+	++
2. *Oxyethira maya* (microcaddisfly larva)	+	+	+
III. Coleoptera (beetles)			
1. Staphylinidae (rove beetle)	++	o	o
IV. Odonata			
Zygoptera (Damselfly) *Megalagrion sp.* (damselfly naiad)	o	+	o

Legend: +++ = abundant (6-10)

++ = common (2-5
+ = uncommon (1)
0 = not collected, possibly absent

Two insect species are found in all four stations: the Cheumatopsyche analis (caddisfly larva), Oxyethira maya (microcaddisfly). On the basis of abundance the caddisflies are more numerous than the microcaddisflies. It appears that in Makaleha, these Trichoptera larvae form the bulk of food for the gobies.

Station III harbors the most species of insect, six out of eight. Both stations I and II each has five species. However, the species at station II which is in the immediate vicinity of the spring proposed for development has unusual macrobenthic biota. This is where damselfly naiad and earthworm were collected. These two species are not in the two other stations. In addition, station II has no midgefly larvae, a unique situation for a stream in Hawaii since the midgefly larva usually are the most numerous in terms of numbers.

3.1.3 Riparian vegetation

Riparian vegetation (i.e. vegetation alongside a stream or river) may be an important source of energy input for lotic (flowing-water) ecosystems. Allochthonous material has been shown to play a significant role in energy input for woodland streams in temperate climate (Minshall 1967, Fisher and Likens 1973). However, whether or not this is also true for Hawaiian streams has yet to be studied.

The stream channel appears to be highly colonized by non-native plants as evidenced by the common presence of yellow guava (Psidium guajava), the hau bush (Hibiscus tiliaceus), banana (Musa paradisiaca), and weedy species like honohono-kukui (Oplismenus hirtellus).

Perhaps the most significant impact of alien plants on the stream itself is in the extensive canopy created by tree species. The channel is shaded throughout most of its length significantly reducing sunlight reaching the water's surface. Yellow guava (Psidium guajava) is the most common component of the riparian canopy although the hau bush (Hibiscus tiliaceus) and the rose apple (Syzygium jambos) contribute to the canopy in lower portions of the stream.

In one fairly long section of stream above station III up to Station II, the hau bush (Hibiscus tiliaceus) has completely overgrown the channel. The dense root mats in the stream created by such a condition may block the upstream migration of diadromous species like the goby fishes

('o'opu). An introduced species, wild bamboo (Schizostachyum glaucifolium), located on the left bank between station III and station II contribute to the considerable shading of a significant portion of the stream channel.

Despite the common presence of introduced plants, significant patches of native vegetation. The native fiber plant olona (Touchardia latifolia) was observed upstream from the higher elevation station I.

The streamside vegetation is highly susceptible to high water during flood. It is not uncommon therefore to see the vegetation laid down and strands of loose vegetation hanging incredibly high on the banks. Riparian vegetation is therefore constantly in a state of flux and only very hardy species can survive for any length of time alongside the stream. This may be one factor which clears the way for hardy species like yellow guava (Psidium guajava) and other introduced tree-like plants which now dominate the water's edge. A more comprehensive work on the vegetation of the Makaleha watershed can be found in Linney and Char (1986).

The riparian vegetation and vegetative canopy over stream channel is summarized in the following table 6.

Table 6. Riparian vegetation in sampling stations at Makaleha stream, Kauai (March - April 1990).

STATION I: Upper station

Canopy - 50% shaded	Coverage	Abundance
left bank		
uluhe fern (Dicranopterus linearis)	1	R
tree fern (Cibotium sp.)	2	R
'ama'u fern (Sadleria sp.)	4	A
lantana (Lantana camara)	4	A
yellow guava * (Psidium guajava)	4	A

right bank

fishtail fern (Nephrolepis biserrata)	2	O
juvenile 'ama'u fern (Sadleria sp.)	5	V
hau bush * (Hibiscus tiliaceus)	5	V
yellow guava * (Psidium guajava)	5	V
ti leaf (Cordylina terminalis)	2	O
'ie'ie (Freycinetia arborea)	1	R

STATION II: Spring station

Canopy - 40% shaded

	Coverage	Abundance
left bank		
laua'e fern (Microsorium scolopendria)	4	V
ohia-lehua (Metrosideros polymorpha)	5	V
honohono-kukui (Oplismenus hirtelus)	5	V
yellow guava * (Psidium guajava)	5	F
hau bush * (Hibiscus tiliaceus)	1	R
right bank		
night cestrum (Cestrum noctornum)	1	R
taro (Colocasia esculenta)	1	R
wild ginger (Zingiber zerumbet)	2	F
yellow guava * (Psidium guajava)	5	F
mountain apple (Syzygium malaccensis)	3	O
banana (Musa paradisiaca)	2	O
'ohi'a-lehua (Metrosideros polymorpha)	1	R
hau bush * (Hibiscus tiliaceus)	2	O

STATION III: Weir station

Canopy - 100% shaded	Coverage	Abundance
left bank		
wild bamboo * (Schizostachyum glaucifolium)	5	V
Wedelia trilobata	2	O
yellow guava * (Psidium guajava)	1	R
hau bush (Hibiscus tiliaceus)	3	F
rose apple (Syzygium jambos)	4	A
right bank		
Wedelia trilobata	2	O
hau bush (Hibiscus tiliaceus)	5	V
yellow ginger (Hedychium flavescens)	4	V
yellow guava (Psidium guajava)	3	F

Legend: R = rare
O = occasional
F = frequent
A = abundant
V = very abundant

3.2 Physicochemical

Sampling was done under "rainy" conditions. It took two days to do the field work for these data.

3.2.1 Channel width, depth, and flow velocity.

Makaleha stream is characterized by narrow stream channels in the upper elevations, from 5 to 10 feet width, widens at mid elevations (15 feet) and is widest at the lowest elevation. It is shallow, only 0.4 ft at the upper elevations, becoming a foot deep at mid elevations and a little bit more than two feet at the lowest elevation. Its flow velocity is faster at the upper elevation (1.8 ft/s), slowing to a third of its original velocity at mid elevations down to one-sixth at the lowest elevation.

Makaleha Stream is subject to strong freshets that more than doubles the depth, width and velocity. For example, on April 8, Station II (in the vicinity of the

spring, almost doubled in width (from 24 ft to 40 ft) in less than an hour. We obtained 12 measurements at subsurface flow velocities (the only one we could take safely) in one at one location at two feet from the bank. Flow velocities thus obtained ranged from a low 6.00 to a high 7.91 ft/sec (mean 6.97).

The data obtained is summarized in the table that follows (table 7).

Table 7. Width, depth and flow velocity in Makaleha Stream and Spring, Kauai. (March - April 1990)

Stations	Parameters		
	Width (ft)	Depth (ft) mean (range)	Flow Velocity (ft/s) mean (range)
I	23	1.2 (0.6-2.3)	1.60 (1.14-2.21)
II	25	1.2 (0.3-1.3)	1.95 (0.14-4.57)
III	14	1.9 (0.8-2.1)	2.46 (0.75-3.33)
Spring			
Outlet A	1.5	0.35	1.75 (1.68-1.86)
Outlet B	5.0	0.55 (0.07-0.88)	0.24 (0.04-1.81)

3.2.2 Discharge at the Makaleha Stream and Spring

Discharge is the total volume of stream water passing a point in a given period of time. Discharge data for Makaleha Stream come from one measurement only. They should be considered preliminary. The values, however, permit comparison between stations. The discharge at each sampling station are in Table 8.

Table 8. Discharge at Makaleha Stream and Spring, Kauai, March 29 and 30, 1990.

Station	Mean Q (cfs)	Range (cfs)
I	44.2	15.7 - 116.9
II	58.5	1.1 - 148.5
III	65.4	8.4 - 97.9
Spring		
Outlet A	0.92	0.88 - 0.98
Outlet B	0.66	0.01 - 7.96
Total Spring	1.58	0.89 - 8.94

Discharge at Makaleha shows an increase in a downstream direction (Station 1 down through Station III) . This indicates that there are tributaries that add to the mainstream. Between stations I and II, there is an increase of about 14.3 cfs, most of it comes from a small waterfall coming from the left bank (Figure 3 and Appendix A). Between stations II and III, the increase is less than half (6.9 cfs), the increase coming mainly from at least two permanent seepages on the left bank which trickle into the mainstream Pictures of these seepages (intermittents 1 and 2) are in Appendix A. THE INCREASE IN DISCHARGE OF ABOUT 6.9 CFS INCLUDES THE 1.6 CFS FROM THE SPRING. Without the water contributed by the spring, the increase in discharge between Stations II and III is about 5.3 cfs.

Overall, the surface flow at the main channel between Stations II and III will be about 60.1 cfs (65.4 - 5.3). Looking at it another way, the discharge of the spring comprise about 8% of the total. This estimate is much lower than that given in the draft EIS (one-sixth of Makaleha Streams total, Portugal and Associates, Inc. 1986 p. 10) which is about 17%. It should be noted that both this study and the Portugal figure are based on limited data and should be considered preliminary.

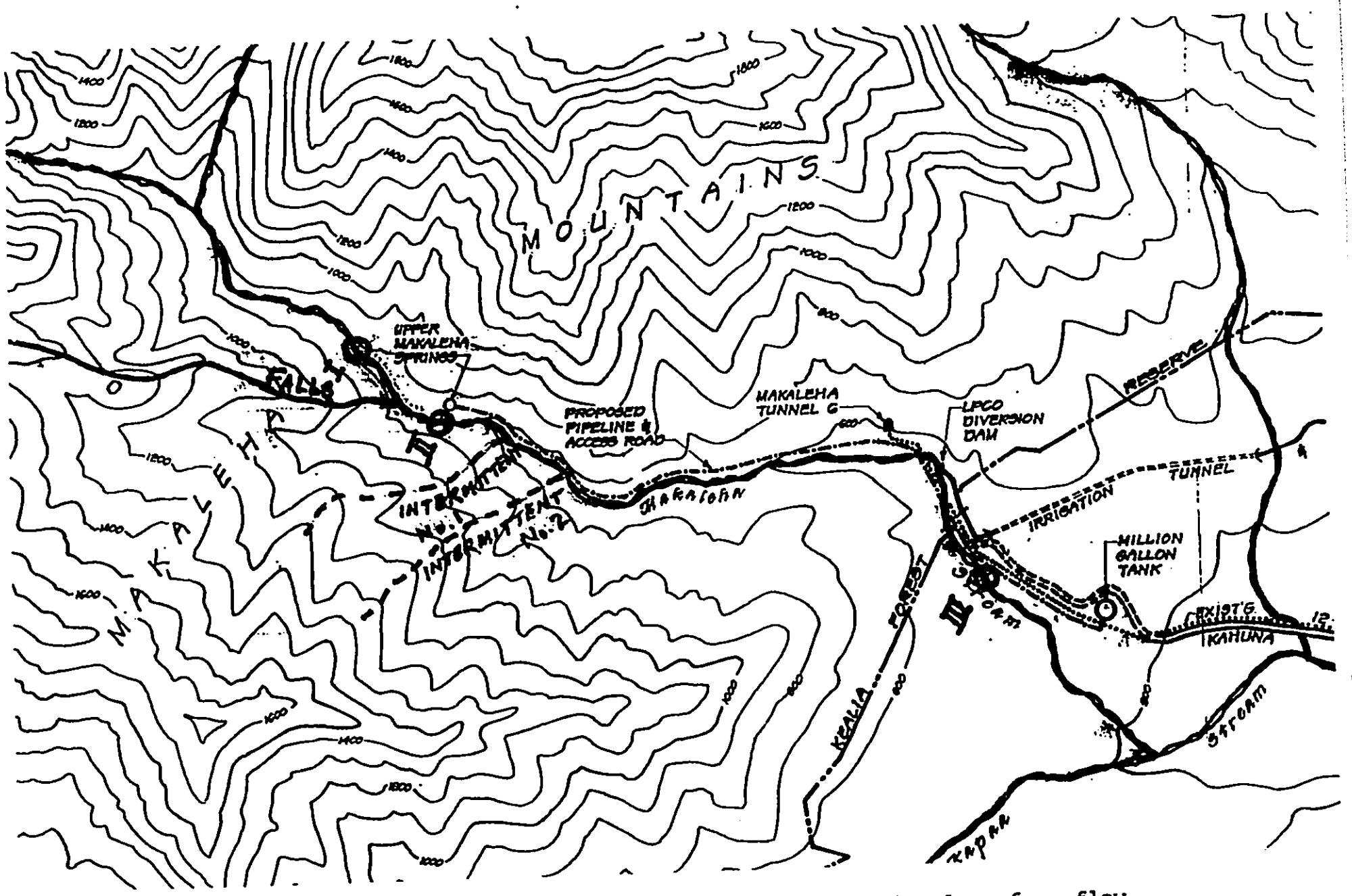

Figure 3. Makaleha Stream showing the main sources for additional surface flow between Stn I and II (falls) and between II and III (two intermittents).

3.2.3 Longitudinal gradient.

The gradient of a stream is the slope of its longitudinal course and is expressed as vertical descent per unit of horizontal distance (Reid 1961). Generally the headwaters exhibit a steep slope, while the lower elevations exhibit a more gentle slope. Figure 4 shows the longitudinal gradient for the Kapaa-Makaleha mainstream channel. Its source is at 1800 ft. From its source to the ocean, the water travels 48576 ft (9.2 miles). The gradient is only 3.7%. Compared with the three major rivers on Kauai, the Kapaa-Makaleha system is gentler (Wainiha 7.6%, South Fork Wailua 5.6%, Hanalei 5.4%; Timbol 1977). However, if only Makaleha Stream is taken into consideration, the gradient is a very steep 29%.

Longitudinal gradient affects flow velocity. Other things being equal, the steeper the gradient, the higher the flow velocity.

3.2.4 Substratum.

The substratum is an important physical parameter of lotic ecosystems. In Hawaii, the substrate is characterized by solid lava bedrock, varying sizes of exposed or submerged weathered basalt particles, plant detritus, organic material, and varying degrees of vegetation covering the substratum. Substrate composition has important biological implications because it determines available aquatic habitat and affects physicochemical parameters such as dissolved oxygen.

Slope is an important determinant of substrate type as affects the velocities of stream flows and the resultant scarification of the streambed. Makaleha descends from an elevation of approximately 1800 feet, travels 1.8 miles before it enters Kapaa Stream. From the Kapaa-Makaleha junction, water flows another seven miles plus to sea level (Fig. 4). High velocities are evidenced at higher elevations in the narrowness of the channel and the predominance of bedrock. High channel velocities may also be a factor in the low abundance of algae observed on the substrate throughout the stream system.

As in any lotic system in Hawaii it should be noted that substrate parameters especially in the lower portions of the stream where velocities are amplified, are highly variable and subject to drastic change during periods of flood.

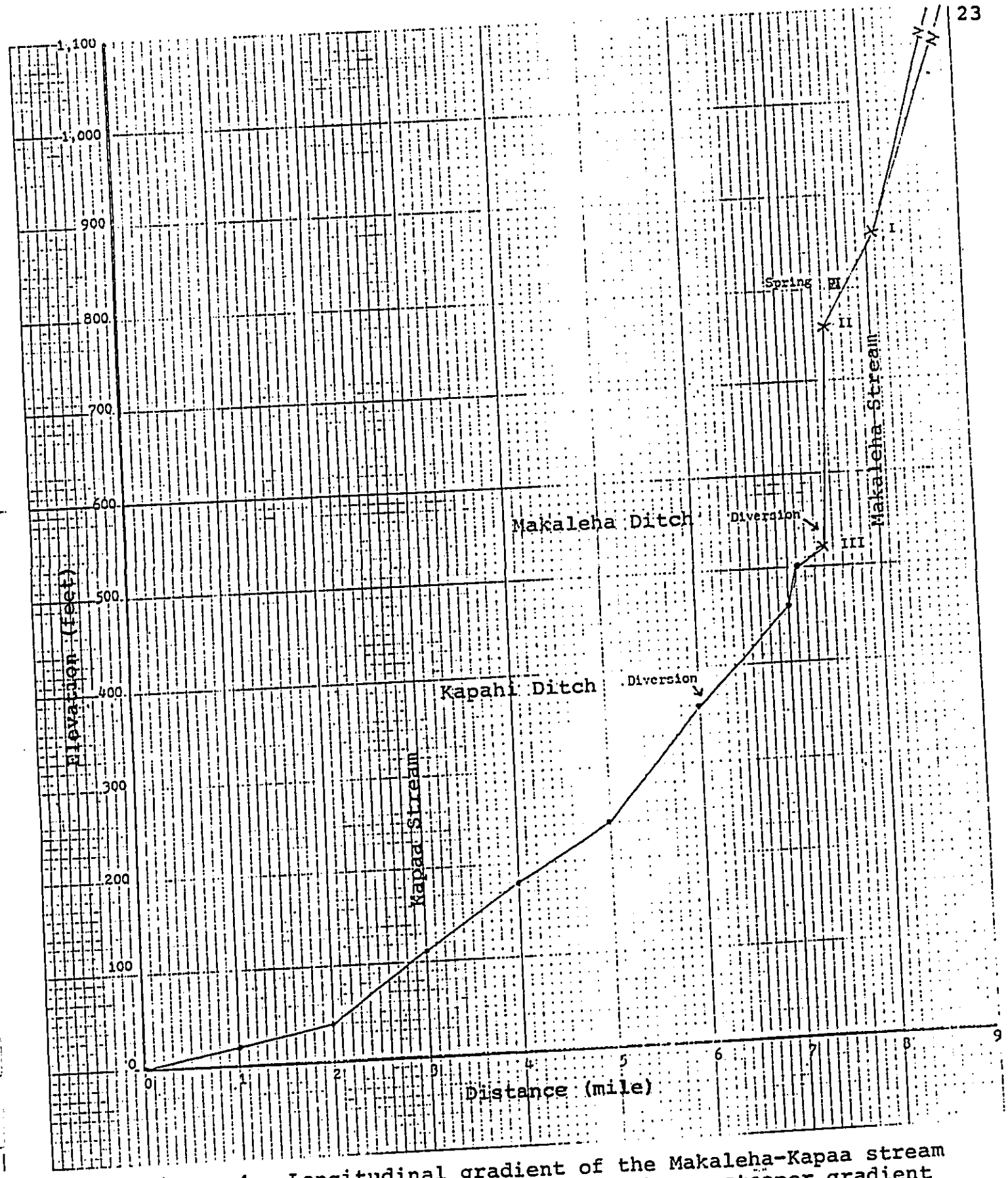

Figure 4. Longitudinal gradient of the Makaleha-Kapaa stream system (3.7%). Makaleha Stream alone has a steeper gradient (29%). This also shows existing diversion weirs. The proposed development is marked "spring."

Table 9. Substrate in the three sampling stations at Makaleha stream, Kauai (Wentworth scale: Bovee and Cochnauer 1977).

Station I: Upper station, elevation 750 ft

Substrate	% Coverage
1/bedrock	30
2/ exposed boulder	30
3/ submerged boulder	20
4/ cobble	10
5/ gravel	10
6/ sand	0
7/ silt	0

Station II: Spring station, 690 ft

1/ bedrock	30
2/ exposed boulder	20
3/ submerged boulder	15
4/ cobble	20
5/ gravel	10
6/ sand	5
7/ silt	0

Station III: Weir station, 500 ft

1/ bedrock	30
2/ exposed boulder	20
3/ submerged boulder	10
4/ cobble	20
5/ gravel	10

6/ sand	10
7/ silt	0

Makaleha stream, using the sampling stations as representative of the entire stream, shows a substrate of bedrock and boulder. At the high elevations, there is no sand and silt, a minimum of sand at middle elevation and some sand and silt at the lower elevations. That the mean particle size decreases in a downstream direction is normal for streams (Hynes 1970).

3.2.5 Temperature, conductance, dissolved oxygen, pH, and turbidity

These short-term data reflect only the conditions at the time of sampling. They may be useful for comparative purposes only. Since Makaleha stream has not been studied for conductance, dissolved oxygen, and pH, these first time data will be valuable as the "before springs development" if the planned development takes place. Future studies could use these for baseline data. These data are summarized in Table 10.

Subsurface water temperature is between 15 and 17 degrees Celsius with the uppermost station I two degrees cooler than the lower station III. This range is well within the range of unaltered stream in Hawaii (Timbol and Maciolek 1978) and within the living (tolerance) limit of native gobies (Hathaway 1978).

Conductance indicates total dissolved solids in water (Cole 1979). Results show a very low conductance, ranging from a low 40 microhms (umhos) at the upper station I, gradually increasing with decreasing elevation to 57 at the lowest station III. These values are much lower than those for Kauai streams which have farms within their drainage areas (ave. 131 umhos, Timbol and Maciolek 1978). On the other hand, conductance for Makaleha Stream compares favorably with those obtained at Limahuli Stream (51 through 71 umhos, Timbol 1989a) and the much larger Wainiha River (53 through 83 umhos, Timbol 1989b).

The pH is from slightly acidic in all three stations studied. This is well within the range of slightly acidic to slightly alkaline water for normal Hawaiian streams. This condition comes from organic acids from decomposing plant materials in the watershed which tend to make stream water acidic but is neutralized as the water flows over volcanic rock.

Dissolved oxygen was measured as mg/L and converted to

per cent saturation. Makaleha stream water is oxygen saturated, from the upper elevations down to the lowest elevation. Considering the low water temperature, the oxygen available for the aquatic animals is considerable, from 9.60 to 10.00 mg/L (actual values obtained). These indicate clean, high velocity, bubbling water.

Turbidity measures an optical property of the water sample which results from the scattering and absorbing of light by particulate matter present. There is no direct relationship between turbidity as read by the instrument and the weight concentration of the matter present. Makaleha Stream turbidity of 2.5 to 2.6 NTU is a little higher than what is expected reflecting the rainy condition during the field work. When it has not been raining, turbidity was only about 1.0 NTU (unpublished data).

Table 10. Summary of water temperature, conductance, dissolved oxygen, pH, and turbidity obtained in Makaleha stream, Kauai (March - April 1990).

Physicochemical Parameters	Sampling Stations I	II	III
Water temperature (degree Celsius)	15	15	17
Conductance (umhos/cm)	40	40	57
pH	6.82	6.08	6.82
Dissolved oxygen (per cent saturation)	95	99	99
Turbidity (NTU)	2.6	2.5	2.5

4. SUMMARY

4.1 Biological

4.1.1 Fish, crustacea, and amphibia

Three fish species and one crustacean species were found in Makaleha Stream. Of the three fish species, the poeciliid P. reticulata is the more abundant by numbers. The other two species are both endemic: the 'o'opu-nakea (A. stamineus) is the more common and is found in all sizes. The 'o'opu-alamo'o (L. concolor) is represented only with adult individuals and as expected, they are not as abundant as the nakea. Both of these species are listed as NEEDING PROTECTION but have no legal protection. The A. stamineus ('o'opu-nakea) supports a small ethnic fishery on Kauai.

The endemic decapod crustacean, ~opae-kala'ole (A. bisulcata) is harvested for home consumption. However, in Makaleha, these are represented in very small numbers and are found only in the elevations higher than the sampling stations.

The wrinkled frog, Rana rugosa, is ubiquitous in Hawaiian streams especially where the water is warm.

4.1.2 Insect larvae and other benthic organism

The macrobenthic residents consist of at least nine species; one annelid and eight insects. It must be noted that the insect population in Makaleha are low in numbers. The highest are only common (2-5 per square foot) as compared with Limahuli Stream where they are very abundant (> 10 per square foot, Timbol 1989a). The caddisflies larvae are found in all three stations sampled and in Makaleha, they form the bulk of available for the fishes.

4.1.3 Riparian vegetation

The riparian vegetation is dominantly alien contributing significantly to the vegetative canopy over the stream channel. These are the ubiquitous yellow guava, and in lower elevations, the hau bush and rose apple trees mingle with the dominant guava.

4.2. Physicochemical Features

4.2.1 Width, depth, flow velocity

Makaleha Stream as represented by sampling stations is about 25 feet wide at the high elevations and narrower by 10 feet at the lower elevation due to channelization at the lower elevation. It is about 1.2 feet in depth at the higher elevation but deepens downstream, again an effect of

channelization. The flow velocity is about 1.60 ft/s at the upper elevation, gathers momentum as it flows downstream to 1.95 at station II and still faster to 2.46 at the lower Station III.

4.2.2 Discharge

Based on one time measurement, the discharge at the upper elevation is about 44 cfs, increases at mid-elevation to 59 and further increases up 65 cfs. The spring which is at mid-elevation contributes 1.6 cfs to the stream or about 8% of the total.

4.2.3 Longitudinal gradient

From source to the ocean, the Makaleha-Kapaa stream system has a average 3.7% gradient. For Makaleha Stream only, the gradient is a steep 29%.

4.2.4 Substrata

The substrate at Makaleha consists mostly of bedrock and boulder at all elevations. The lower elevation station has also considerable cobble.

5. CONCLUSION AND RECOMMENDATIONS

5.1 The 'o'opu-nakea will survive the development, the 'o'opu-alamo'o and the 'opae-kala'ole may not survive where there will be dewatering but the present populations upstream of the development may survive.

Makaleha Stream on the east side of Kauai is small if compared with the well known Kauai streams such as Wailua, Hanalei and Wainiha. Like its larger counterparts, its substrate consists of lava bedrock and large boulders at high elevations and boulder, cobble. and gravel at low elevations. It's water is cold, has low conductance, slightly acidic and oxygen saturated.

Makaleha Stream has unique characteristics. Its flow is totally exported from its channel during low flows by a tunnel (Makaleha Ditch) at 580 feet elevation just before it joins the Kapaa mainstream. Again, at 360 feet elevation, the Kapahi ditch drains all surface flow from the Kapaa mainstream channel at low flows. Despite of these double dewatering, Makaleha Stream harbors endemic fish and prawns, one of which (A. stamineus) is definitely diadromous, the two (prawn A. bisulcata, fish S. stimpsoni) may also be diadromous but there is a question whether that condition is obligatory (Couret, personal communication; Nishimoto and Fitzsimmons 1986).

The Water Department of Kauai County is proposing to tap the springs for domestic use. Although not similar to the first two diversions, this proposal also will decrease the mainstream surface flow. Assuming that all of the surface flow coming from the spring does not add to the mainstream flow, the decrease will be between 8 and 17% (this study for the lower value; Portugal and Associates 1986 for the latter).

An analysis of the sizes of these animals based on the residents in the three sampling stations indicate that the A. stamineus consists of all sizes. This indicates that despite of the two diversion weirs and the consequent dewatering, the post-larvae (hinana) are still able to overcome the obstacles on their way to Makaleha. On the other hand, the absence of small (post-larvae, juveniles) L. concolor, indicates that the fish living at Makaleha may be a "captive population." For one reason or another, the L. concolor post-larvae migrating from the lower elevations do not survive the same obstacles. The prawn A. bisulcata, may or may not be recruiting from outside. We do not have enough data to even risk an educated guess whether this species could overcome the present barriers to their migration.

The main interest in this study is to assemble physicochemical and biological data upon which to base an educated guess regarding the continued survival of the three endemic inhabitants at Makaleha. Since the physicochemical features of Makaleha Stream (only) compare favorably with those of Limahuli Stream, a comparatively pristine stream on the northshore of Kauai, which supports a healthy complement of native aquatic fauna, Makaleha stream could also continue to support the endemic aquatic fauna that is now living there.

The proposed dewatering due to spring development will degrade the physicochemical parameters but the extent of degradation is not now known. For sure, the 'o'opu-nakea (A. stamineus) will survive since this species is found even in highly degraded streams such as the Huleia Stream. The continued survival of the 'o'opu-alamo'o (L. concolor) at about the lower section of Makaleha Stream between the spring down to where Makaleha joins Kapaa Stream depends on the extent of dewatering and other conditions discussed next. The captive 'o'opu-alamo'o living upstream of the spring will survive since that portion of Makaleha Stream will not be affected by the proposed development. The crustacean 'opae-kala'ole population which was found upstream of the spring only, will also survive the proposed development.

Since the longitudinal gradient for Makaleha Stream is a very steep 29%, even a lowered flow between the Spring and Station III will maintain a velocity which will aerate the surface flow with adequate oxygen.

The vegetative canopy, if maintained in its present condition could buffer the expected lowered surface water flow from excessive insolation to keep water temperature within tolerance limit of the endemic fauna.

It must be emphasized that this conclusion is at best an educated guess since it is based on short-term data.

5.2 Recommendations

To minimize the potential negative effect of the proposed spring, the following are presented for consideration:

5.2.1 Minimize removal of riparian vegetation

Avoid the removal of streamside vegetation and if a considerable stretch of the stream bank must be cleared, it should be replanted as soon as possible. Riparian clearing may cause high insolation resulting in elevated water temperatures and excessive evaporation. Excessive evaporation could lead to reduced stream flow. Reduced stream flow means HIGHER WATER TEMPERATURES. Work done by Timbol and Maciolek (1978) show that stream channels without riparian vegetative canopy have higher water temperatures than stream with such canopy.

The effects of elevated temperatures can be divided into three categories: lethal, metabolic, and behavioral. Lethal temperatures make up the range within which the animal will die. Metabolic effects are "delayed effects" as in growth acceleration resulting in the inability to reach and/or pass a critical point in the animal's life cycle (Andrewartha and Birch 1954). Behavioral effects are the organism's responses to the environment.

5.2.1.1 Lethal temperatures. Laboratory studies done by Hathaway (1979) showed that the lethal temperature for adult Awaous stamineus ('o'opu-nakea) is between (first death to final death) 37.2 and 38.8 degrees centigrade with 50% (LT50) of the fish dying at 38.1 degrees centigrade. The post-larvae (hinana) are slightly more tolerant with range for mortality between 39.0 and 39.3 degrees centigrade with LT50 at 39.3 degrees centigrade. However, little is known about the effect of elevated temperature on the vitality of the postlarvae.

5.2.1.1 Behavioral effects. A motile animal will leave an area when conditions become unfavorable and will not voluntarily remain in the area until conditions become lethal. Thus, there will be a decrease in numbers as those that can leave will do so. Timbol and Maciolek (1978) found that altered (channelized) streams have higher water

temperatures than unaltered ones. In the unaltered streams, native species were dominant in both number of species and biomass. Alien species were dominant in altered streams.

5.2.2 Keep maintenance roads as far away from the stream as possible.

The impact of maintenance roads comes from the resulting erosion and siltation in the streambed. Water turbidity and excessive sedimentation will alter the character of the stream. Burns (1972) reported turbidities greater than 3,000 ppm resulting from such constructions. Excessive sedimentation may alter the biological character of the stream. Fine particulate matter will become suspended in the water increasing turbidity and decreasing light penetration resulting in reduced primary productivity. Fine particles also have the effect of clogging the gills of fish which could cause suffocation. Settling of particles in rapids and riffles will reduce the natural habitats of the economically and biologically valuable endemic residents of Makaleha Stream.

Another reason for keeping the road as far away from the stream as possible is the fatal effect of gasoline, oil and other petrochemical that will drip from maintenance vehicles on the endemic aquatic fauna.

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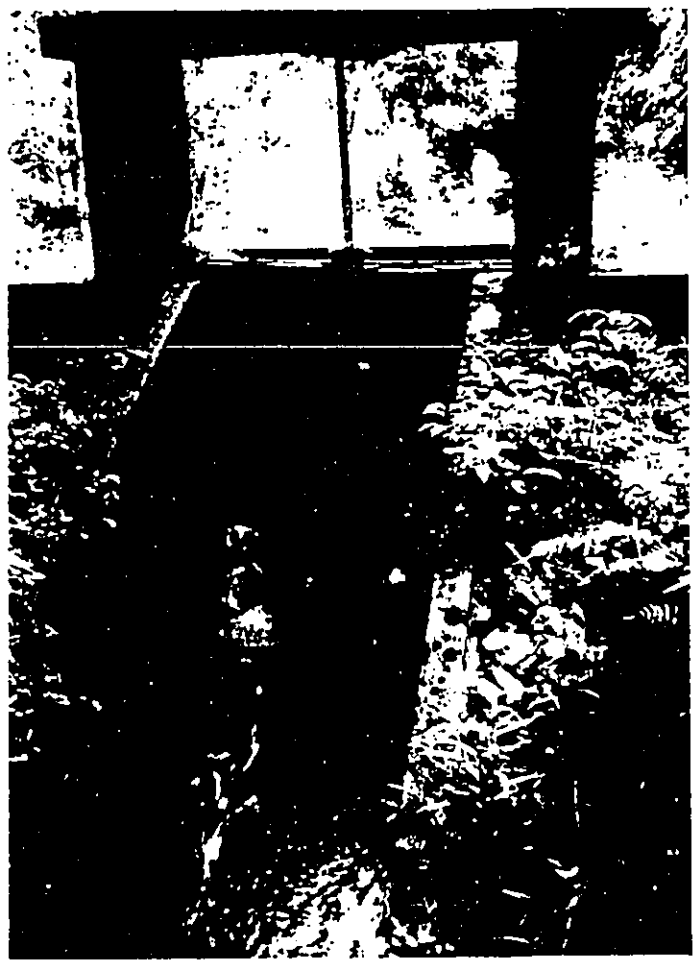
RECEIVED AS FOLLOWS

A. Station III or weir station

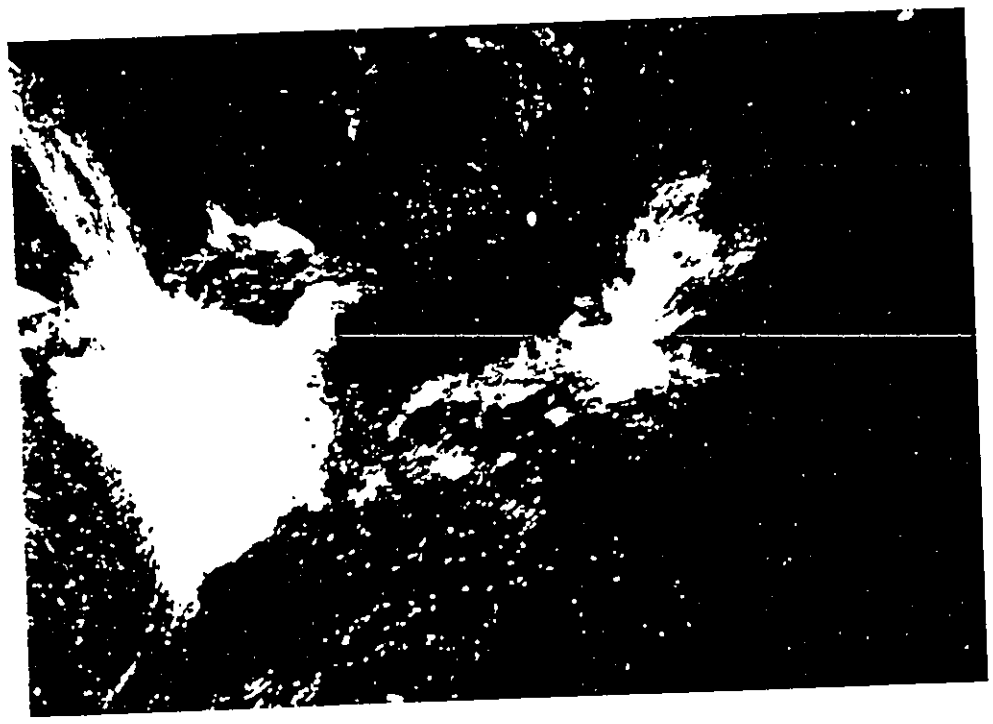
B. Diversion weir



C. Makaleha gate to tunnel. Gate is closed.

RECEIVED AS FOLLOWS

A. Station II or Spring station



B. Spring surface flow as it joins the mainstream. On the left is outlet A and the right is outlet B.

RECEIVED AS FOLLOWS

A. Waterfall

B. Intermittent no. 1

C. Intermittent no. 2

A. Waterfall as it joins the main-stream just below stn. I.

B. Intermittent no. 1 on the left bank between stn II and stn III.

C. Intermittent no. 2 on the left bank between stn II and stn III just down-stream of no. 1.

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Biological Reconnaissance of Makaleha Tributary and the Mainstream Channel for Kapaa Stream, Kauai

by

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Aquatic Biologist

Introduction

This study was made for Portugal and Associates in connection with a proposed well for the Kauai County Board of Water Supply in the vicinity of Makaleha Stream, a tributary of Kapaa Stream.

Streams were an essential part in the sustenance and growth of Hawaiian culture. The latest survey showed no less than 336 permanent streams (Timbol and Maciolek 1978). Water from most of these streams has been diverted for agriculture, industrial and domestic uses. The continuing increased demand for water for cultural purposes has placed great pressure to modify and develop the remaining exploitable streams. At the same time, there is an increased environmental awareness among the citizenry. Decisions regarding water use are becoming more and more important.

Streams also provide habitat for a variety of aquatic animals. Freshwater dwelling fishes, shrimps and prawns, and at least one snail are descendants of marine forms. The goby fishes spend their entire adult lives in freshwater yet must spend their larval lives as members of the marine zooplankton community. For example, the Awaous stamineus ('o'opu-nākea) migrates downstream to spawn in either fresh or estuarine water. Female fish attach hundreds of eggs to the surface of rocks where they are fertilized by male fish. Within 24 hours, the eggs hatch and the larvae are swept downstream and into the sea. These larvae then metamorphose into fry known as hinana near the mouths of streams, settle on appropriate substrate, and migrate upstream to their places of permanent residences (Ego 1956). This goby fish, as well as most endemic freshwater macrofauna, must have suitable environmental conditions throughout the stream channel for their upstream and downstream migrations.

The objectives of this study are:

1) to compile a list of resident aquatic macrofauna in Makaleha tributary and the mainstream channel for Kapaa Stream;
2) to identify species of sport, subsistence or commercial fishery value as well as rare, threatened or endangered species present;
3) to determine distribution and relative abundances of aquatic macrofauna for Makaleha tributary and for the mainstream Kapaa;
4) to discuss the possible effects of dewatering on important stream macrofauna; and
5) to make an assessment of the stream's ecological quality status on the basis of its biological and physical features.

As far as can be determined, there are no published biological work on Makaleha tributary or Kapaa Stream.

Study Area

Makaleha tributary, located in Kapaa on eastern Kauai, flows continously year round. Water is exported from its channels by way of the Makaleha Ditch for irrigation of sugarcane. The amount diverted for such purpose has been recorded since 1936. The average, from 1937 through 1975, was 6.73 ft^3/s (0.191 m^3/s) with a maximum of 31 ft^3/s (0.88 m^3/s) to no flow at times (USGS 1976). Another diversion, Kapahi Ditch, exports water from the mainstream channel of Kapaa Stream below the Makaleha Ditch.

Methods and Materials

Physical Parameters

Each sampling site was examined visually, according to bottom type, vegetative cover, water clarity, and flow velocity. Bottom type was determined subjectively. The composition of the substrate was approximated (i. e. bedrock 60%, boulder 40%) using the following modified Wentworth classification of particle size:

Substrate	Size Range (mm) or Description
Bedrock	solid, lava slab
Boulder	250-4000
Cobble	65-250
Gravel	5-65
Sand	1-5
Silt	1
Plant Materials	Mosses, liverwort, filamentous algae, leaf litter in various stages of decomposition

Water clarity as an indication of the amount of suspended sediment present was determined subjectively. The term clear indicates visibility greater than 600 mm depth and slightly turbid corresponded to visibility at between 150 and 600 mm depth.

Flow velocity was measured by timing the movement of a float over a known distance. Repeated trials were made until three results were obtained that appeared representative of the main body of flow. Velocity was reported as an average of these three measurements.

Biological Parameters

A basic area of 20 x 1 m of stream channel was examined for each sampling area. Conspicuous animals (1/2 inch minimum size) which could be seen were identified and counted. When necessary, a face mask and snorkel were used. Boulders, rocks, and stones were examined for snails and insect larvae. Data is reported in a semi-quantitative basis. Absent (0) means that the species was not seen at that site. Uncommon (+) indicates that only one animal was sighted, while common (++) means that between 2 and 5 were observed. Abundant (+++) means between 6 and 10 were seen, and very abundant (++++) means many individuals, from 11 to 100 or more.

Terms used in designating the origin of animals are: endemic, means occuring naturally in Hawaii only; indigenous, means occuring naturally in Hawaii and also elsewhere; native species include both endemic and indigenous; alien, means that the animal was brought to Hawaii either intentionally or accidentally. A species has economic value if it has sport, recreational, subsistence or commercial value. Amphidromous species are those which engage in completely free movement between fresh and marine water, not for the purpose of breeding (Myers 1949). This behavior involves the passive downstream passage of eggs or larvae to the ocean during freshet flow with later active upstream migration.

The list of biota was checked for endangered and threatened species using the following list and scientific publications: USFWS List of Endangered and Threatened Species (1977), Deacon et al. (1979) and Miller (1972). Endangered species means that species is in danger of extinction throughout all or significant portion of its range (Deacon et al. 1979). A threatened species is one which is likely to become threatened or endangered by relatively minor disturbances to their habitat or that require additional information to determine their status (Deacon et al. 1979). These definitions do not have legal status under the Federal Rare and Endangered Species Law.

Streamside vegetation were identified only with their common names. Their scientific names can be obtained by using any of the numerous books on Hawaiian plants.

Results

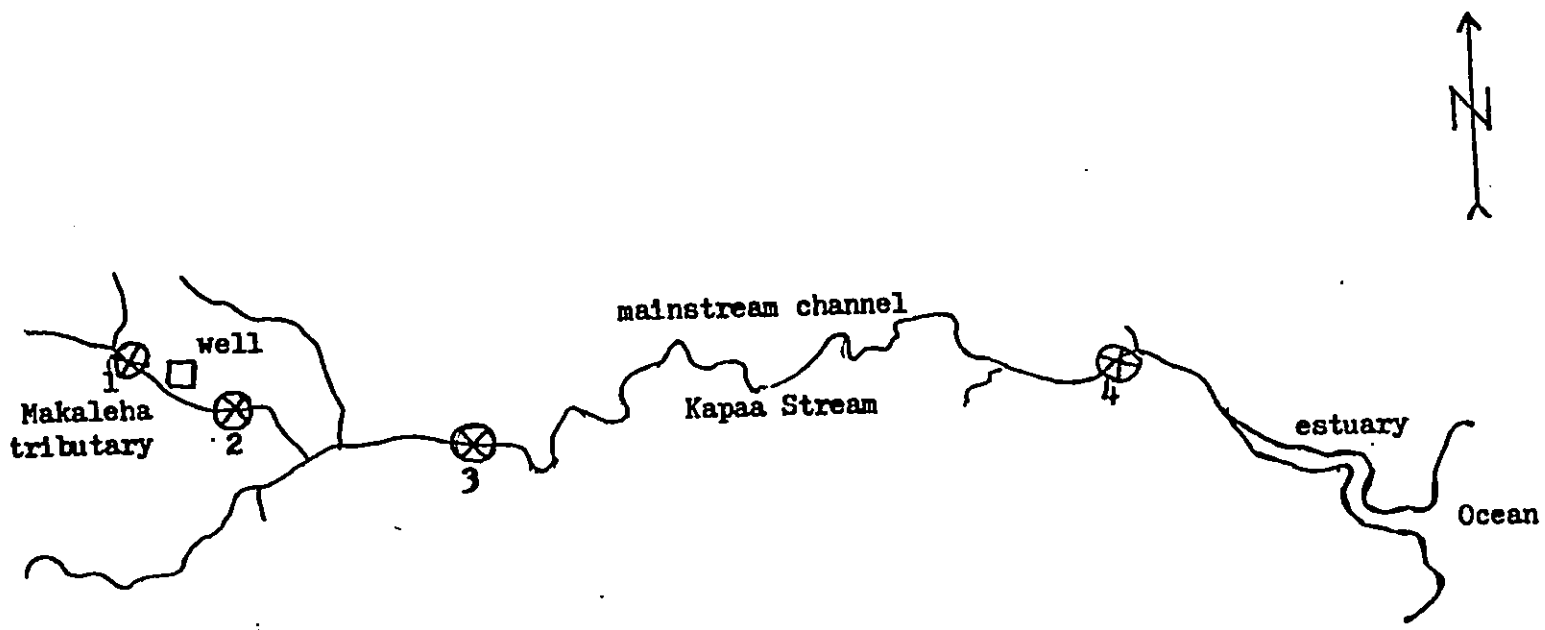
Field work was done on two successive days, August 7 and 8, 1986.

Sampling Stations

Four sampling stations were studied, two on Makaleha tributary and two on the mainstream channel for Kapaa Stream. Their approximate locations are shown in Figure 1.

Station 1. Upper Makaleha, elevation 1000 ft. Located at the upper reaches of Makaleha, this station is just upstream of the immediate area of the proposed well. The water at the time of sampling was cool (73°F = 22.8°C), clear and fast flowing measured at about 0.4 m/second. The 20 m length of stream sampled was characterized subjectively as 95% cascade and 5% fast flowing pools. The substrate consists mostly of bedrock and large boulders and hardly any gravel; no sand nor silt (98 - 2% ratio). There is no vegetative canopy covering the sampling station. Stream side vegetation is about 80% yellow guava and the rest is Lantana and uluhe fern. The dominant vegetation in the drainage area is hau bush. Two areas were sampled for aquatic macrofauna in this sampling station.

Station 2. Lower Makaleha, elevation 600 ft. This is about 0.7 mile downstream of Station 1. It is in the vicinity of the Makaleha Ditch intake. The water was cool (76°F = 24.4°C), clear and fast flowing; about 0.4 m/second on the natural channel, 0.6 m/second on the open ditch leading to the intake but very slow (0.04 m/second) downstream of the diversion weir. The substrate



proposed well

sampling station

Figure 1. Stream channels for Makaleha tributary and mainstream Kapaa showing locations of sampling stations and proposed well.

on the natural channel consists of 60% gravel, 10% boulder and 30% of sand and silt. The riparian vegetation consists of hau on the right side, rose apple on the left side. This stretch of the stream channel is covered totally by vegetative canopy of hau and rose apple. Three areas were sampled: on the natural channel upstream of the diversion weir, on the natural channel downstream of the diversion weir, and on the open ditch leading to the intake.

Station 3. Kapaa mainstream channel, elevation 400 ft. This is located about 1.1 miles downstream of station 2. It is in the vicinity of the gauging station for the Kapahi Ditch. The physical features for this sampling station were measured at the natural channel leading to the ditch intake. Water was clear, cool (76°F = 24.4°C) and fast flowing (0.6 m/second). The substrate consisted of about 60% gravel, 10% boulder, and 30% sand and silt. The riparian vegetation is hau on both sides and the station has no vegetative canopy. Two areas were sampled: one at the above described location and the second on the pool downstream of the diversion weir. The second area had slightly turbid water, was warmer (80°F = 26.7°C) and was not flowing.

Station 4. Lower Kapaa mainstream, elevation about 50 ft. This is about 4.5 miles downstream of station 3 and about 2 miles upstream of the stream mouth. The water was slightly turbid, slow flowing (0.3 m/second) and warmer (83°F = 28.3°C). The substrate consisted of gravel (50 %) and sand (50%) but the whole area is covered with a thin layer of silt. The riparian vegetation consisted of yellow guava on the right bank and hau on the left bank. The station is covered in about 60% of the overhead area, the cover consisting of monkeypod.

Biological

These biological data are representative only of Makaleha tributary and the mainstream channel for Kapaa Stream (excluding the estuary). Other tributaries for Kapaa Stream (Kapahi, Kealia, Maiakii, Moalepe, and Mimino) were not sampled.

The visual observation technique used here has unique features, different from the electroshocking method used by other workers such as USFWS (1977), Norton et al. (1978), Timbol and Maciolek (1978), and Kinzie and Ford (1982). Visual observation is more "efficient" on non-secretive species (i.e. A. stamineus or 'o'opu-nākea). On the other hand, electroshocking allows the detection and capture of species that are hidden diurnally (i.e. Clarias fuscus or Chinese catfish). The limitations of using electrocking are discussed in Maciolek and Timbol (1980), Riggs (1953), and Larimore (1961). The strengths and weaknesses of each technique should be considered in comparing results of one technique with those of the other.

1. Inventory. At least 18 species of aquatic and semi-aquatic animals were found in Makaleha tributary and mainstream Kapaa (Table 1). There are 9 fishes, 3 amphibians, 4 crustaceans, 1 mollusk, and 1 insect. Eight species are native to Hawaii while 10 are alien. Of the eight natives, 6 are endemic and of the endemics, 4 are fishes.

The important components of the aquatic macrofauna are the amphidromous species, namely 4 fishes, and 2 crustaceans. Of these 6 amphidromous species, 2 (A. stamineus, L. concolor) are listed as threatened in scientific publications (see Table 1). The L. concolor, the rarest of Hawaiian freshwater fishes, had been recommended for the endangered species list (Maciolek 1977) but "presently lacks sufficient data on which such listing may be warranted" (Kinzie et al. 1984, p. 1).

Table 1. List of Aquatic Macrofauna in Makaleha tributary and Kapaa mainstream, Kauai (August 7-8, 1986).

Scientific Name	Local Name	Origin	List[1]
Fishes			
1. Awaous genivittatus	'o'opu-naniha	indigenous	none
2. Awaous stamineus	'o'opu-nākea	endemic	depleted (Miller 1972), special concern (Deacon et al. 1979)
3. Eleotris sandwicensis	'o'opu-ōkuhe	endemic	none
4. Gambusia affinis	mosquitofish	alien	none
5. Kuhlia sandvicensis	aholehole	endemic	none
6. Lentipes concolor	'o'opu-alamo'o	endemic	Special concern (Deacon et al. 1979)
7. Poecilia reticulata	wild guppy	alien	none
8. Sarotherodon mossambica	tilapia	alien	none
9. Xiphophorus helleri	swordtail	alien	none
Amphibians			
1. Bufo marinus (eggs, tadpoles)	toad	alien	none
2. Rana rugosa (tadpoles, young)	wrinkled frog	alien	none
3. Rana catesbeiana (tadpoles)	bullfrog	alien	none
Crustaceans			
1. Atya bisulcata	'ōpae-kalaʻole	endemic	none
2. Macrobrachium grandimanus	'ōpae-'oeha'a	endemic	none
3. Macrobrachium lar	Tahitian prawn	alien	none
4. Procambarus clarkii	crayfish	alien	none
Mollusks			
1. Melania sp.	pond snail	indigenous	none
Insects			
1. Cheumatopsyche sp.	caddisfly	alien	none

[1]Considered as rare, endangered or depleted in official register or scientific publications.

The more important of these resident animals are the two threatened fish species (L. concolor, A. stamineus), the endemic shrimp, A. bisulcata, and the alien fish, S. mossambica. Each is briefly described as follows:

a. Lentipes concolor ('o'opu-alamo'o)

The L. concolor is a small goby (up to 8 cm, from tip to snout to base of caudal fin) that exhibits sexual dimorphism. Its body is subcylindrical, with a few small, scattered cycloid scales on the posterior half of the body. The male is larger with a brownish anterior half of the body and bright orange to purple posteriorly. The female is brownish on its entire body. The life history of the L. concolor has not been fully studied although some information is available in Lau (1973), Maciolek (1977), Jordan and Evermann(1903), Timbol, Sutter and Parrish (1980), Kinzie and Ford (1982), Kinzie et al. (1984), and Nishimoto and Fitzsimons (1986). Mature L. concolor can be found in middle and upper reaches of the stream, from 50 to 500 m elevation. Unlike the A. stamineus (next) which exhibits downstream migrations in association with freshets or flash floods for spawning purposes (1956), the L. concolor probably has no spawning migration but spawns throughout the length of a stream (Nishimoto and Fitzimons 1986).

b. Awaous stamineus ('o'opu-nākea)

This goby fish is the largest (up to 35 cm) of the endemic freshwater gobies. The adults reside in the upper and middle reaches (50 - 300 m elevation) of the stream. It migrates downstream to spawn. The larvae spend some time in the sea and the resulting postlarvae return up the streams. This goby supports a limited, ethnic fishery on Kauai. It was last sold for $9.89/lb at Kapaa Big Save Store in December 1985. Additional information regarding this goby fish is found in the introductory section.

c. Sarotherodon mossambica (tilapia)

This alien, cichlid fish was first brought to Hawaii in 1951 from Singapore. It has variable color from dark brown grey to silver grey, sometimes with about six verticle dark bands. The dorsal fin with 27-29 spiny and soft dorsal rays. It can attain a weight from three to five pounds. While it seems to prefer brackish water found in the mouths of rivers, it can live and reproduce in pure fresh water. It has some economic value, as bait fish for tuna and food fish. Modest quantities are sold in local markets. It provides good fishing especially for youngsters.

d. Atya bisulcata ('ōpae-kala'ole)

This small, endemic caridean decapod shrimp, attains only up to 8 cm length. The adults live in the middle and upper reaches of streams that flow year-round. Postlarval atyids are commonly found in the lower reaches (see Table 2). The A. bisulcata ranges from olive brown to black in color. It is a detrital (suspended organic matter) feeder and usually abundant in most streams where it thrives in fast-flowing riffles. This shrimp is amphidromous but it has been suggested that it can also complete its life cycle in freshwater (Couret 1976). It is harvested for home consumption on Kauai and possibly on the other islands except on Oahu.

2. Distribution and Relative Abundances. Of the 18 species only one, A. stamineus ('o'opu-nākea), was found in all four stations sampled. This species is ubiquitous in most streams in the State (Timbol 1977). Two species (A.

bisulcata, Cheumatopsyche sp.) were found only in Makaleha tributary (Stations 1 and 2) while 8 were found only in the Kapaa mainstream channel. In general, there is an increase in the number of species in a downstream direction.

An important feature is the low density of the two threatened species. The A. stamineus (No. 2 among the fishes in Table 2) is common, meaning there were only between 2 and 5 in a 20 x 1 m stretch of stream channel. The fishes were larger at the upper and middle sampling stations (Stations 1 and 2). Those in Station 3 were of mixed sizes, large and small, while those in the lowest elevation (Station 4) consisted only of postlarvae (hinana). The second threatened species, L. concolor, was not only low in density but was also found only in the upper reaches of Makaleha tributary (Station 1). All the L. concolor gobies were adults, between 8 and 13 cm total length.

Physical Features

Although Makaleha tributary and the mainstream channel for Kapaa Stream form a single continuous channel from the Makaleha Mountain down to the sea, the physical features of the two are different. Makaleha tributary is characterized by fast flowing, clear, cool water. Kapaa mainstream is characterized by slightly turbid, slower flow and warmer water (see Sampling Stations). Water from both streams is diverted for agricultural purposes by way of the Makaleha and Kapahi ditches. Including the aquatic macrofauna and vegetation found in the drainage areas, the upper Makaleha tributary has the characteristics of an almost pristine stream with an Ecological Quality Status I (Pristine-Preservation) according to the classification set by Timbol and Maciolek (1978) and the Hawaii Department of Health (1977). A stream designated as Pristine-Preservation has a high environmental (no cultural modifications) and biological quality (presence of the economically valuable A. stamineus and the rarest of freshwater gobies, L. concolor: both threatened species). On the other hand, the lower Makaleha and mainstream Kapaa suffer from dewatering by way of Makaleha and Kapahi ditches. Roads also follow and crisscross both segments, sources of oil and silt. These have Ecological Quality Status III (Exploitive-Consumptive). An exploitive-consumptive stream has moderate to low natural and/or water quality. It is well exploited, modified and degraded.

Potential Adverse Effect of Dewatering

A simplistic description of a perennial stream's immediate water source is a water table located at a higher level than the stream floor. The yielding portion of the water table shrinks and expands with the dry and wet seasons (Hynes 1975). Artificial withdrawal (dewatering, as in pumping out) from the water table could result in the lowering of flow velocity, decrease in water depth, and some loss of stream habitat. The magnitude of these losses depend upon how much water is withdrawn.

The potential adverse effect of dewatering on the aquatic macrofauna could be numerous. A discussion of all known potential adverse effects will be voluminous and beyond the scope of this study. Discussions will be limited to elevated water temperature, an immediate result of dewatering. Lowered water level in the channel will lead to a rapid increase of water temperature, among other effects.

The effects of elevated water temperatures can be divided into three categories: behavioral, metabolic, and lethal. Behavioral effects include the immediate positive and negative responses. Metabolic effects are "delayed action" effects as in growth acceleration resulting in the inability to reach and/or pass a critical point in the life cycle (Andrewartha and Birch 1954). Lethal temperatures define the range within which the animal will die.

Table 2. Distribution and Relative Abundances of Aquatic Macrofauna in Makaleha tributary and Kapaa mainstream, Kauai (Aug. 7-8, 1986) (++++ = very abundant, +++ = abundant, ++ = common, + = uncommon, 0 = absent or not seen)

Scientific Name	Sampling Stations			
	Makaleha tributary		Mainstream Channel Kapaa	
	I	II	III	IV
Fishes				
1. *Awaous genevittatus*	0	0	0	++
2. *Awaous stamineus*	++	++	+	+++
3. *Eleotris sandwicensis*	0	0	0	+++
4. *Gambusia affinis*	0	+	++	0
5. *Kuhlia sandvicensis*	0	0	++	+
6. *Lentipes concolor*	++	0	0	0
7. *Poecilia reticulata*	0	++	++++	+++
8. *Sarotherodon mossambica*	0	0	0	++
9. *Xiphophorus helleri*	0	+	+++	0
Amphibians				
1. *Bufo marinus*	0	0	0	++
2. *Rana rugosa*	+++	0	++++	0
3. *Rana catesbeiana*	+++	+++	0	+
Crustaceans				
1. *Atya bisulcata*	+++	+++	0	0
2. *Macrobrachium grandimanus*	0	0	0	++
3. *Macrobrachium lar*	0	0	0	++
4. *Procambarus clarkii*	0	0	++	0
Mollusks				
1. *Melania* sp.	0	0	+++	0
Insects				
1. *Cheumatopsyche* sp.	+++	++	0	0

1. Behavioral. A motile animal (i.e. fish) will elect to leave an area when physicochemical conditions become unfavorable, and will generally not voluntarily remain in the area until conditions become lethal. In a study on channelized streams, highest temperatures cross-stream were measured near the edge of the channel where water velocity is lowest (Parrish et al. 1978). It is easiest for stream animals to move at the channel edge. This effect would make it difficult for the postlarvae to complete a normal migration upstream from the sea.

2. Metabolic. Laboratory growth tests showed increased growth rate with increasing temperature up to 30-32°C in the postlarvae A. stamineus (Parrish et al. 1978, Hathaway 1978). Above these temperatures, growth rate was reduced. At the least, this growth characteristic constitutes a chronic physiological stress.

3. Lethal. The upper lethal temperature limits for A. stamineus ('o'opunākea) adults in laboratory tests ranged between 37.2 and 38.8°C with 50% of the animals dead (LT_{50}) at 38.1°C (Hathaway 1978). Postlarvae (hinana) were more resistent with a range between 39.0 and 39.3°C and LT_{50} at 39.3°C. L. concolor ('o'opu-alamo'o) adults died at between 35.9 and 36.3°C with the LT_{50} at 36.1°C. The endemic shrimp, A. bisulcata ('ōpae-kala'ole) adults died at between 34.0 and 34.5°C with LT_{50} at 34.2°C. On the other hand, Hathaway (1978) found the alien species, S. mossambica (tilapia), to be much more tolerant of elevated temperatures. It had lethal temperatures of between 42.7 and 43.1°C with LT_{50} of 42.9°C. Thus, the tilapia will survive the three endemic animals.

Conclusions and Recommendations

Conclusions

1. The upper Makaleha tributary is of high quality. In contrast, the lower Makaleha tributary and the mainstream channel for Kapaa Stream are of poor quality and highly degraded.

2. The extent of dewatering will determine the extent of elevated temperatures in the remaining water. When the water becomes too warm, the stream animals will leave the area if they can. If they are unable to leave, the animals will undergo variable growth rate. If the water becomes excessively heated, the endemic species will die first.

Recommendation

The adverse impact of dewatering on vertebrate and invertebrate animal populations can be minimized by controlling the removal of water to provide adequate flows during the dry seasons. Specifically, enough water should be left in the channel to maintain water temperature at no more than 30°C. The lethal temperatures discussed in the result section are laboratory values. In the actual field situation, mortality would normally occur at somewhat lower temperatures and successful spawning would be restricted to much lower temperatures yet.

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APPENDIX E

FLORA SURVEY

Char & Associates

FLORA SURVEY

MAKALEHA STREAM, ISLAND OF KAUA'I

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SUMMARY

A botanical survey was made along Kapa'a road from the water tank to Makaleha Stream, and thence along the stream to the site of the springs and the proposed catchment. A total of 123 plant species (26 ferns and fern allies, 97 flowering plants) were found in three basic habitats: open field, stream bank, and closed forest. By far, most species were exotic, having been introduced after the arrival of Western man, though a number of native and a few of Polynesian introduction were also encountered. No species listed, proposed, or candidate for listing by Federal or State government as rare, threatened, or endangered were found in the study area. A list of all species found in the course of this study is given at the end of this report.

METHODS

A walk-through survey method was employed for this work. Notes were made on community composition and structure. Plants not recognized in the field were collected and brought back for identification. The work was carried out on 22 December 1986 by two professional botanists, and required 16 person-hours of field time.

DESCRIPTION OF PLANT COMMUNITIES

OPEN FIELD

This type of habitat was restricted to the area immediately bordering the water tank and road. The dominant was California grass (Brachiaria mutica), a valuable forage grass of adjacent pastures. Along fences, and elsewhere, where weed clearing is not carried out, tree species from the nearby forests were found to be invading: guava (Psidium guajava), haole koa (Leucaena leucocephala), roseapple (Syzygium jambos), and swamp gum (Eucalyptus robusta). Around the water tank and along the road, constant disturbance of the soil favored the growth of many species of annual herbaceous weeds and forbs. Two plantings were also showing signs of spreading: coconut (Cocos nucifera) and wedelia (Wedelia trilobata). In this habitat, all species were exotic; no natives or Polynesian introductions were found.

STREAM BANK

This was the most restricted of the habitat types, most extensive along the lower part of the stream where the banks were low, and the forest set back a bit. It was highly disturbed by trampling, cutting, and flooding. Steeper areas were dominated by palm grass (Setaria palmaefolia) and yellow ginger (Hedychium flavescens). Level areas subject to trampling were dominated by

annual and perennial weeds of low stature, generally less than a foot high. Kamanamana (Adenostemma lavenia) was a common native plant in such situations. Areas not subject to trampling were dominated by weeds of slightly higher stature, but still less than two feet high, including a number of exotic ferns. The grass honohono-kukui (Oplismenus hirtellus) was abundant throughout, and might well be considered the dominant plant, though many other species were present in almost equal quantities. The only plants of greater stature were banana, or mai'a, (Musa x paradisiaca), guava (Psidium guajava), and the highly invasive and undesirable rose myrtle (Rhodomyrtus tomentosus).

CLOSED FOREST

This habitat type covered the largest area within the study site, and was represented by a number of localized variations. Trees were generally less than 25 feet tall, with only occasional trees emerging above the canopy. The emergents were Albizia sp., formerly a common forestry planting, now considered undesirable because of the weakness of the wood. The closed canopy consisted of hau (Hibiscus tiliaceus), roseapple (Syzygium jambos), and kukui (Aleurites moluccana). Locally, any one or more of these could be found coexisting with each other or alone, even excluding all other species. In the upper reaches of the study area, especially near the springs, mountainapple (Syzygium malaccensis) tended to replace roseapple (Syzygium jambos). On the left bank of the stream (looking upstream) there were two extensive patches of bamboo. Less commonly, scattered elements of the native forest,such as 'ohia-lehua (Metrosideros species), tree ferns (Cibotium species), and kopiko (Psychotria aff. kaduana) were found.

POTENTIAL ENVIRONMENTAL PROBLEMS AND CONCERNS

There are no plant communities or individual species located in the study site in need of protection. No rare, endangered, or threatened species, as listed by the U.S. Fish and Wildlife service (1980) were found. The best examples of native forest were found beneath cliffs on the left side of the stream (looking upstream), well out of the area proposed for the pipeline. A number of ferns and the single species of lobeliad are of some botanical interest, though apparently not rare.

The right side (looking upstream) was an almost unbroken tangle of Syzygium (rose- and mountainapple) and hau (Hibiscus) over boulders. In at least one area just below the confluence of the springs and the stream, there is a ridge that very closely approaches the streamside. This occurs in two places on the left bank of the stream. While no floristic problems are foreseen, the density of the tangle over such a narrow, bouldery area may present engineering problems in construction of an access roadway. There may be further problems with road construction and stream quality (erosion and siltation).

PLANT SPECIES FOUND IN THE STUDY SITE

A list of all species found in the course of this survey follows. Plants are arranged in three groups: Ferns and Fern Allies, Monocots, and Dicots. Within each group, plants are arranged alphabetically by family, and in alphabetic order within each family. Names of ferns and fern allies follow the system of Lamoureux (unpublished manuscript, in ed.) Names of flowering plants follow the system of St. John (1973) except where names in more recent treatments have been accepted. Common vernacular names follow the scientific names, and generally conform to Porter's (1972) and St. John's usage. The status of the species is then given using the following code: endemic (E) - species native only to Hawai'i; indigenous (I) - species native to Hawai'i as well as other places; Polynesian introductions (P) - species not native to Hawai'i but brought by the Hawaiians; and exotic (X) - species not native to Hawai'i but brought subsequent to the arrival of Western man. Finally, note is made of the presence (+) or absence (-) of the species in each of the three habitats: O - open field; S - stream bank; F - closed forest.

PLANT SPECIES LIST

		status	habitat O S F
FERNS AND FERN ALLIES			
Adiantaceae			
Adiantum capillus-veneris L.	'iwa'iwa	I	- - +
Athyriaceae			
Athyrium macraei (Hook. & Grev.) Copel.	athyrium	E	- - +
Athyriopsis japonica (Thunb.) Ching	athyriopsis	X	- - +
Diplazium sandwichianum (Presl.) Diels	ho'i'o	X	- - +
Blechnaceae			
Blechnum occidentale L.	blechnum	X	- + +
Dicksoniaceae			
Cibotium chamissoi Kaulf.	hapu'u-i'i	E	- - +
Cibotium splendens (Gaud.) Krajina ex Skottsb.	hapu'u-pulu	E	- - +
Elaphoglossaceae			
Elaphoglossum crassifolium (Gaud.) Anders. & Crosby	'ekaha-ula	E	- - +
Gleicheniaceae			
Dicranopteris linearis (Burm.) Underw.	uluhe	I	- - +
Grammitaceae			
Grammitis tenella Kaulf.	kolokolo	E	- - +
Hymenophyllaceae			
Gonocormus minutus (Blume) v.d.Bosch	gonocormus	I	- - +
Lindsaeaceae			
Sphenomeris chinensis (L.) Maxon	pala'a	I	- - +
Lycopodiaceae			
Lycopodium phyllanthum Hook. & Arn.	wawae'iole	E	- - +
Nephrolepidaceae			
Nephrolepis biserrata (Sw.) Schott	fishtail fern	X	+ + -
Nephrolepis exaltata (L.) Schott	ni'ani'au	I	- - +
Nephrolepis multiflora (Roxb.) Jarrett ex Morton	hairy sword-fern	X	+ + +
Polypodiaceae			
Phlebodium aureum (L.) J. Sm	laua'e-haole	X	- - +
Phymatosorus scolopendria (Burm.) Picchi-Serm.	laua'e	X	- + +
Pleopeltis thunbergiana Kaulf.	'ekaha-'akolea	I	- - +
Psilotaceae			
Psilotum nudum (L.) Beauv.	moa, pipi	I	- + +

Selaginellaceae			
Selaginella arbuscula (Kaulf.) Spring	lepelepe-a-moa	E	- - +
Thelypteridaceae			
Christella dentata (Forsk.) Brownsey & Jermy	downy wood-fern	X	+ + +
Christella parasitica (L.) Leveille	oak-fern	X	+ + +
Cyclosorus interruptus (Willd.) H. Ito	cyclosorus	I	- - +
Pneumatopteris sandwicensis (Brack.) Holtt.	pneumatopteris	E	- - +
Vittariaceae			
Vittaria elongata Sw.	oheohe	I	- - +
FLOWERING PLANTS			
MONOCOTS			
Araceae			
Alocasia macrorrhiza (L.) Schott	'ape	P	+ + -
Colocasia esculenta (L.) Schott	taro	P	- + +
Commelinaceae			
Commelina diffusa Burm. f.	honohono	X	+ + +
Cyperaceae			
Cyperus aff. *cyperoides* (L.) Ktze.	cyperus	I	- + +
Kyllinga brevifolia Rottb.	kyllinga	X	- + +
Dioscoreaceae			
Dioscorea bulbifera L.	pi'oi	P	- - +
Dioscorea pentaphylla L.	pi'ia	P	- + +
Gramineae			
Bamboo sp. 1		X	+ - -
Bamboo sp. 2		X?	- - +
Brachiaria mutica (Forsk.) Stapf	California grass	X	+ - -
Cenchrus echinatus L.	sandbur	X	+ - -
Chloris inflata Link	swollen finger-grass	X	+ - -
Coix lachryma-jobi L.	Job's tears	X	+ + -
Cynodon dactylon (L.) Pers.	Bermuda grass	X	+ - -
Digitaria sp.	crab grass	X	- + -
Eleusine indica (L.) Gaertn.	goose grass	X	+ - -
Oplismenus hirtellus (L.) Beauv.	honohono-kukui	X	- + +
Paspalum conjugatum Berg.	Hilo grass	X	+ + -
Paspalum fimbriatum HBK	Columbia grass	X	+ - -
Paspalum sp.		X	+ - -
Sacciolepis indica (L.) Chase	Glenwood grass	X	+ + +
Setaria geniculata (Poir.) Beauv.	perennial foxtail	X	- - +
Setaria palmaefolia (Koen.) Stapf	palm grass	X	- + -
Sporobolus aff. *africanus* (Poir.) Robyns and Tournay	African dropseed	X	+ + -

Iridaceae			
Tritonia crocosmifolia Nichols.	montbretia	X	- + -
Liliaceae			
Cordyline terminalis (L.) Kunth	ti	P	- + +
Musaceae			
Musa x *paradisiaca* L.	mai'a	P	- + +
Orchidaceae			
Spathoglottis plicata Bl.	spathoglottis	X	+ + +
Palmae			
Cocos nucifera L.	coconut, niu	P	+ - -
Roystonea sp.	royal palm	X	- - +
Pandanaceae			
Freycinetia arborea Gaud.	ie'ie	E	- - +
Pandanus tectorius Warb.	hala	I	- - +
Zingiberaceae			
Hedychium flavescens Carey in Roscoe	yellow ginger	X	+ + -
Zingiber zerumbet (L.) Roscoe in Sm.	'awapuhi kua hiwi	P	- + +
DICOTS			
Acanthaceae			
Thunbergia fragrans Roxb.	white thunbergia	X	+ - -
Anacardiaceae			
Mangifera indica L.	mango	X	+ + +
Schinus terebinthifolius Raddi	Christmasberry	X	+ + +
Bignoniaceae			
Spathodea campanulata Beauv.	African tuliptree	X	+ - -
Caryophyllaceae			
Drymaria cordata (L.) Willd. ex R. & S.	drymaria	X	- + +
Compositae			
Adenostemma lavenia (L.) Ktze.	kamanamana	I	- + -
Ageratum conyzoides L.	ageratum	X	+ + -
Bidens pilosa L.	Spanish needle	X	+ + -
Conyza canadensis (L.) Cronq.	Canada fleabane	X	+ + -
Crassocephalum crepidiodes (Benth.) A. Moore	crassocephalum	X	+ + -
Elephantopus mollis HBK.	elephant's foot	X	+ - -
Emilia fosbergii Nicolson	Flora's paintbrush	X	+ + -
Erechtites valerianaefolia (Wolf) DC.	erechtites	X	+ + +
Pluchea odorata (L.) Cass.	pluchea	X	+ + +
Pseudoelephantopus spicatus (Juss. ex Aubl.) Gleason	false elephant's foot	X	- + -

Siegesbeckia orientalis L.	siegesbeckia	X	- + -
Vernonia cinerea (L.) Less.	ironweed	X	+ + -
Youngia japonica (L.) DC.	oriental hawks-beard	X	+ + +
Wedelia trilobata (L.) Hitchc.	wedelia	X	+ - -
Unknown composite		X	- + -
Convolvulaceae			
Ipomoea alba L.	koali-pehu	I	- - +
Ipomoea obscura (L.) Ker-Gawl	bindweed	X	+ - -
Euphorbiaceae			
Aleurites moluccana J. R. and G. Forst.	kukui	P	- + +
Euphorbia geniculata Ortega	wild spurge	X	+ - -
Euphorbia glomerifera (Millsp.) L. C. Wheeler	spurge	X	+ - -
Euphorbia hirta L.	hairy spurge	X	+ - -
Euphorbia thymifolia L.	thyme-leaved spurge	X	+ - -
Phyllanthus debilis Klein ex Willd.	phyllanthus	X	+ + -
Lauraceae			
Persea americana Mill	avocado	X	- + +
Leguminosae			
Albizia sp.	albizia	X	- + +
Cassia lechenaultiana DC.	partridge pea, lauki	X	+ + -
Desmodium canum (Gmel.) Schinz and Thell.	Spanish-clover	X	+ + -
Desmodium triflorum (L.) DC.	beggarweed	X	+ - -
Desmodium uncinatum (Jacq.) DC.	Spanish-clover	X	- + -
Indigofera suffruticosa Mill.	indigo	X	+ - -
Leucaena leucocephala (Lam.) deWit	haole koa	X	+ + +
Mimosa pudica L.	sleepinggrass, pua-hilahila	X	+ + -
Phaseolus lathyroides L.	wild bushbean	X	+ - -
Lobeliaceae			
Cyanea sp.	cyanea	E	- - +
Lythraceae			
Cuphea carthagenensis (Jacq.) Macbride	Columbian cuphea	X	+ + -
Malvaceae			
Hibiscus tiliaceus L.	hau	I	+ + +
Sida acuta Burm. f.	'ilima	X	+ - -
Unknown malvacea		X	+ - -
Myrtaceae			
Eucalyptus robusta Sm.	swamp gum	X	+ - -
Metrosiderus collina (J.R. and G. Forst.) Gray, subsp. *polymorpha* (Gaud.) Rock	'ohi'a-lehua	E	- - +
Metrosideros sp.	'ohi'a-lehua	E	- - +
Psidium cattleianum Sabine	strawberry guava	X	- + -

Psidium guajava L.	guava	X	+ + +
Rhodomyrtus tomentosa (Ait.) Hassk.	rose myrtle	X	+ + +
Syzygium jambos L.	roseapple	X	+ + +
Syzygium malaccensis L.	mountain apple	P	- - +
Nyctaginaceae			
Pisonia umbellifera (J.R. & G. Forst.) Seem.	papala-kepau	I	- + +
Onagraceae			
Ludwigia octivalvis (Jacq.) Raven	primrose willow	X	- + +
Oxalidaceae			
Oxalis corniculata L.	yellow wood-sorrel	X	+ + -
Piperaceae			
Peperomia tetraphylla (Forst. f.) H. and A.	'ala'ala-wai-nui	E	- - +
Peperomia sp.	'ala'ala-wai-nui	E	- - +
Plantaginaceae			
Plantago major L.	common plantain	X	+ + -
Rosaceae			
Rubus rosaefolius Sm.	thimbleberry	X	- + +
Rubiaceae			
Psychotria aff. *kaduana* (C. & S.) Fosb.	kopiko	E	- - +
Spermacoce laevis Lam.	buttonweed	X	+ - -
Solanaceae			
Cestrum nocturnum L.	night cestrum	X	- + +
Urticaceae			
Boehmeria grandis (H. & A.) Heller	akoka	E	- - +
Pipturus aff. *helleri* Skottsb.	mamaki	E	- - +
Verbenaceae			
Lantana camara L.	lantana, lakana	X	+ + +
Stachytarpheta jamaicensis (L.) Vahl	Jamaica vervain	X	+ + -

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APPENDIX F

WILDLIFE RESOURCES SURVEYS

Phillip L. Bruner
Wildlife Biologist

Michael H. Kido
Environmental Consultant

FAUNAL SURVEY OF MAKALEHA VALLEY, KAPAA, KAUAI

Prepared for

Portugal and Associates, Inc.

By

Phillip L. Bruner M.S.
Assistant Professor of Biology
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29 December 1986

FAUNAL SURVEY OF MAKALEHA VALLEY, KAPAA, KAUAI

INTRODUCTION

The purpose of this report is to summarize the findings of a one day (23 December 1986) faunal survey of Makaleha Valley, Kapaa, Kauai (for exact locality of survey see Fig. 1). References to pertinent literature as well as unpublished reports and personal communications from ornithologists familiar with the area are provided in order to give a broader perspective of faunal activity in the area and similar habitat elsewhere on Kauai. Finally the possible effects on the faunal community during and following development is discussed.

The objectives of the field survey were:

1- To document which birds occur on the project site and at what relative densities.

2- To determine if endangered species occur on the property and whether or not they might be adversely effected by the proposed development.

2- To compare the results of the field survey with published and unpublished data in order to more accurately describe what species likely occur in the area.

GENERAL SITE DESCRIPTION

Weather during the survey was clear with little or no wind. Habitat along the Makaleha stream is comprised primarily of exotic vegetation while the steep forested walls of the valley contain a greater number of native trees such as Ohia (Metrosideros collina). The cleared pasturelands around the water tank area at the mouth of the valley provide an additional habitat type.

STUDY METHODS

Field observations were taken with the aid of binoculars and by listening for vocalizations as I walked along a trail that followed the stream. A series of four minute counts were taken approximately every 100-200 m along the trail (Fig.1). These counts recorded all the birds seen and heard during the four minute time period. These data together with observations made while walking were used to

calculate the relative abundance estimates given in Table 1.

Observations of feral mammals were limited to visual evidence in the form of tracks and scats. No attempts were made to trap mammals in order to obtain data on their relative abundance or distribution.

Scientific names used in this report follow those given in the recent (6th edition) American Ornithologists' Union Checklist (A.O.U. 1983) and Hawaii's Birds (Hawaii Audubon Society 1984).

RESULTS AND DISCUSSION

Resident (Native) Birds:

White-tailed Tropicbird (*Phaethon lepturus*) This seabird occurs on most high volcanic islands in the tropical Pacific (Hawaii Audubon Society 1984); Pratt et al. in press). A total of six White-tailed Tropicbirds were recorded during the survey. All were seen soaring along cliff faces above Makaleha Stream. This species is common on Kauai. They forage at sea but breed and roost on rocky ledges in high mountainous areas.

Common 'Amakihi (*Hemignathus virens*) One 'Amakihi was seen foraging in a Ohia tree located about 50 m above Makaleha Stream. This

endemic forest bird is widespread and relatively common in the upper elevation forests of all the main Hawaiian islands (Hawaii Audubon Society 1984; Pratt et all. in press). It was a little surprising to find this species in the project area given the low elevation of this site. Typically 'Amakihi are restricted to elevations usually above 2,000 ft. Recent observations on Oahu (S.Conant pers. comm.) and Maui (H.D.Pratt pers. comm.) report 'Amakihi from elevations as low as 800 ft. These birds are likely individuals which may on occasion forage at lower than normal elevation but retreat to higher elevation at night to avoid exposure to mosquito transmitted diseases (H.D. Pratt pers. comm.).

Hawaiian Duck (Koloa) (Anas wyvilliana)

The endemic and endangered Hawaiian Duck, also known as Koloa, inhabits ponds and streams on Kauai (Shallenberger 1977). It has been reintroduced recently to other islands in Hawaii and appears to be making some strides in recovering from its endangered status (Div. of Forestry and Wildlife unpublished documents, U.S. Fish and Wildlife Service 1985). One Koloa was discovered in Makaleha Stream (see Fig. 1 for locality). This sighting is not unexpected as Koloa typically frequent this

type of habitat on Kauai (Berger 1972). Future more long term surveys of Makaleha Stream might reveal whether or not a breeding population occurs in the area or if this sighting merely represents a straggler which may or may not be permanently resident at this site.

Other native birds not recorded on the field survey but which could potentially occur in the Makaleha Valley project area include: 'Apapane (Himatione sanguinea) 'Elepaio (Chasiempis sandwichensis), Black-crowned Night Heron (Nycticorax nycticorax), Wandering Tattler (Heteroscelus incanus) Lesser Golden Plover (Pluvialis dominica fulva) and Short-eared Owl (Asio flammeus sandwichensis) (Berger 1972; Hawaii Audubon Society 1984).

Introduced (Exotic) Birds:

A total of six species of exotic birds were recorded during the field survey (see Table 1). Japanese White-eye (Zosterops japonicus) was the most common. Exotic species which could potentially occur in the area but were not found during the field survey include: White-rumped Shama (Copsychus malabaricus); Red-billed Leiothrix (Leiothrix lutea); Greater Necklaced Laughing-Thrush (Gasrutax caerulatus); House Finch (Carpodacus mexicanus) and Nutmeg Mannikin

(Lonchura punctulata) (Hawaii Audubon Society 1984).

Feral Mammals:

Evidence in the form of both tracks and scats revealed that pigs inhabit the valley. Dog tracks were also seen but these may represent domestic animals rather than feral dogs. The gnawed remains of guava fruits (Psidium guajava) along the trail indicated that mice and rats occur in the area. No trapping was attempted in order to determine their relative abundance. The endangered and endemic Hawaiian Hoary Bat (Lasiurus cinereus) was not recorded on the survey. The abundance and distribution of this species in Hawaii is poorly known. However, Tomich (1986) and van Riper and van Riper III (1982) report L. Cinereus from Kauai in habitat similar to Makaleha Valley. It is therefore possible that bats could occur at this site.

CONCLUSIONS AND RECOMMENDATIONS

Makaleha Valley was found to contain the usual mix of exotic and native birds typical of similar habitat at this elevation elsewhere on Kauai. Some species that were expected were not recorded.

This was undoubtedly due to the limited time devoted to the actual field survey. The presence on native birds in the area suggests that the habitat is suitable for more than just exotic birds.

The construction of a pipeline from Makaleha Spring to the water tank at the mouth of the valley will not likely provide a major negative impact on the forest birds in the valley unless significant sections of the forest are destroyed in the process of the pipe's installation. Of greater concern is the disruption of the stream habitat due to construction. The endangered Hawaiian Duck occurs along the stream and would likely be displaced if the stream were significantly altered during or following the pipe's installation. Should the construction of a road be necessary in order to install the pipeline this alteration of the habitat could have a negative impact in two ways. First, the road construction process could disrupt the ecology of the stream through siltation and thus reduce its usefulness as Koloa habitat. Second, the road could allow greater human intrusion into the area and likewise degrade the habitat for Koloa.

Recommendations:

1- Minimize the disturbance of the habitat during installation of the pipeline.

2- If a road is necessary in order to install the pipeline place it as far back from the stream as possible and allow the vegetation to grow back in and obscure the road following construction of the pipeline.

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29 December 1986

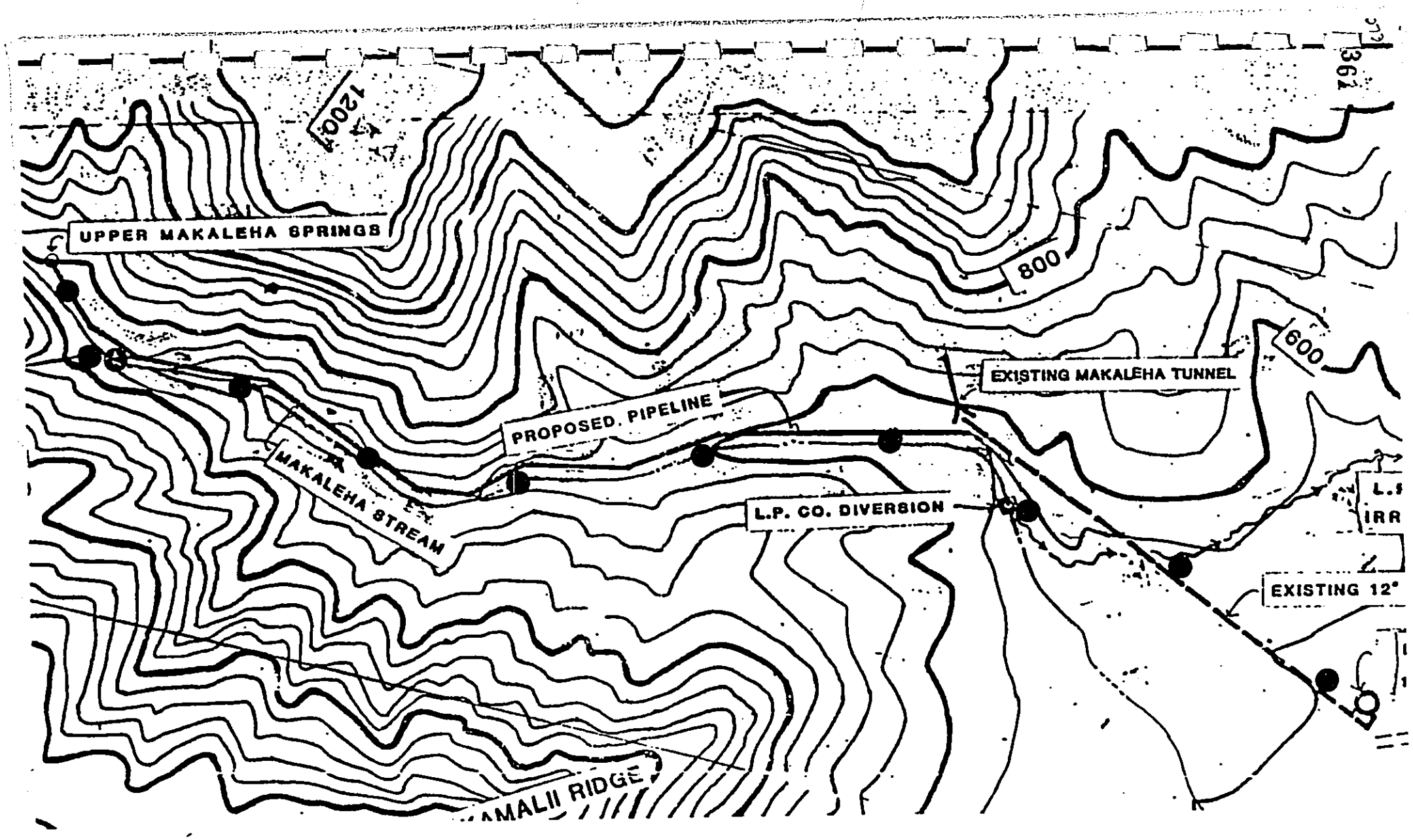

Fig. 1. Project Site Makaleha Valley, Kapaa, Kauai. ✪ = location where Koloa was observed. ● = site of four minute count stations.

TABLE 1

Relative abundance of exotic birds in section of proposed development in Makaleha Valley, Kapaa, Kauai.

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE*
Zebra Dove	Geopelia striata	U = 4
Western Meadowlark	Sturnella neglecta	U = 2
Northern Cardinal	Cardinalis cardinalis	U = 3
Melodious Laughing-thrush	Garrulax canorus	C = 6
Common Myna	Acridotheres tristis	C = 7
Japanese White-eye	Zosterops japonicus	A = 15

* Relative Abundance = Number of times observed during walking survey and/or frequency on four minute counts.

A = Abundant (Average 10+)

C = Common (Average 5-10)

U = Uncommon (Average less than 5)

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A RECONNAISSANCE STUDY

FOR

THE KOLOA OR HAWAIIAN DUCK (*Anas wyvilliana*)

IN THE UPPER MAKALEHA SPRINGS AREA

KAPAA, KAUAI, HAWAII

by

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MAKALEHA SPRINGS

WATER RESOURCE DEVELOPMENT PROJECT

KAPAA,KAUAI

APRIL 1990

A RECONNAISSANCE STUDY FOR THE KOLOA OR HAWAIIAN DUCK (Anas wyvilliana) IN THE UPPER MAKALEHA SPRINGS AREA, KAPAA, KAUAI

Michael H. Kido - April 1990

BACKGROUND

The Koloa, or Hawaiian Duck (Anas wyvilliana), once common on all of the main Hawaiian Islands except Lanai and Kahoolawe (Munro 1944) was once abundant enough to be hunted for food and sport (Swedberg 1967). Due to predation and loss of habitat its numbers have declined significantly and is now listed as endangered by the US Fish and Wildlife Service (Federal Register, Fish and Wildlife Service 1987; 50 CFR 17.11 & 17.12).

In searching the literature and through discussions with wildlife biologists on Kauai, it appears that very little is known about the current range and abundance of the bird, its reproductive biology, or its behavior in the wild. The most comprehensive published report available is that of Swedberg (1967) and subsequently much of the methodology developed for this project is based on Swedberg's observations.

According to Swedberg, the Koloa is highly sensitive to human disturbance and as a consequence prefers habitat not frequented by people. The birds "may use a number of sites on the same day", returning at irregular intervals of a day or more, sometimes abandoning the site altogether when it becomes unsuitable. Swedberg suggests that the Koloa's breeding season is year-round perhaps being more likely to occur from December through May. Nesting apparently has no geographical requirement since Swedberg found "nests or broods...in areas from sea-level to 3,500 foot elevation, from 35 to 125 inches of annual rainfall and in all vegetative types". Nests uncovered by Swedberg were generally near water and associated with hohohono grass (Commelina diffusa). In the photograph of a nest which accompanied the report, I would suggest that Swedberg misidentified this grass which I believe is basket grass (Oplismenus hirtellus) a very common understory groundcover on streambanks in Hawaii.

It is not known whether any one population of Koloa moves from watershed to watershed around the island. In the Hanalei Valley, Koloa are regular inhabitants in the taro patches perhaps increasing in numbers when heavy rains in the mountains drive upland populations down to safer habitat. They are strong, silent flyers almost always observed singly (except during breeding), flying at very low

elevation (approximately 12-15 feet above the river by my experience). In Wainiha Valley, I have observed individuals in the river system from sea-level to approximately 600 foot elevation.

STUDY OBJECTIVES

This study addresses the question of whether or not an established breeding population of Koloa exists in the area affected by the Makaleha Springs Water Resource Development Project, Kapaa, Kauai, Hawaii. A sighting of a solitary Koloa by Phillip Bruner in the faunal survey for the project (figure 1) in a section of stream approximately 75-100 meters downstream of the springs site raised the possibility that this individual was a permanent resident of the site and may possibly represent a breeding population in the area. As another consideration raised by the consultant was that the project could adversely affect Koloa habitat, factors which relate to this concern are included in the results and discussion. The effect of the project specifically on available habitat for the Koloa however, is an engineering and hydrological problem which is out of the scope of this study.

METHODS

Given what is known about the biology of the Koloa, the approximate 4000 foot (1220 meter) length of the Makaleha Stream channel was surveyed for suitable Koloa habitat. The Stream channel was walked from the intake and weir (525 ft elevation) to the terminal pools (1000 foot elevation). Both terminal branches of the stream were surveyed (figure 1). Stream sections which appeared to be good Koloa habitat were flagged on the trail to expedite access to them. Where the trail ended (at the Makaleha Springs - 690 foot elevation) the stream channel itself was followed.

A randomly determined schedule of field trips were made, each beginning at different times and varying in length to increase the likelihood of sighting Koloa. On these field trips, the trail was used to access the marked sites and the stream channel was then followed to search for Koloa. Searches were made both while ascending the stream as well as while descending. Special attention was given to the section of stream where the previous Koloa sighting was made. Unless high water made it hazardous, each field survey was conducted to the terminal pool.

Since it is possible that resident Koloa in the Makaleha Mountains may use the Kapaa River waterway to periodically access the marsh areas near the ocean, observations were made from Kealia Bridge over the study period both during morning and evening hours when human disturbance is minimal. Sightings of Koloa in this area may

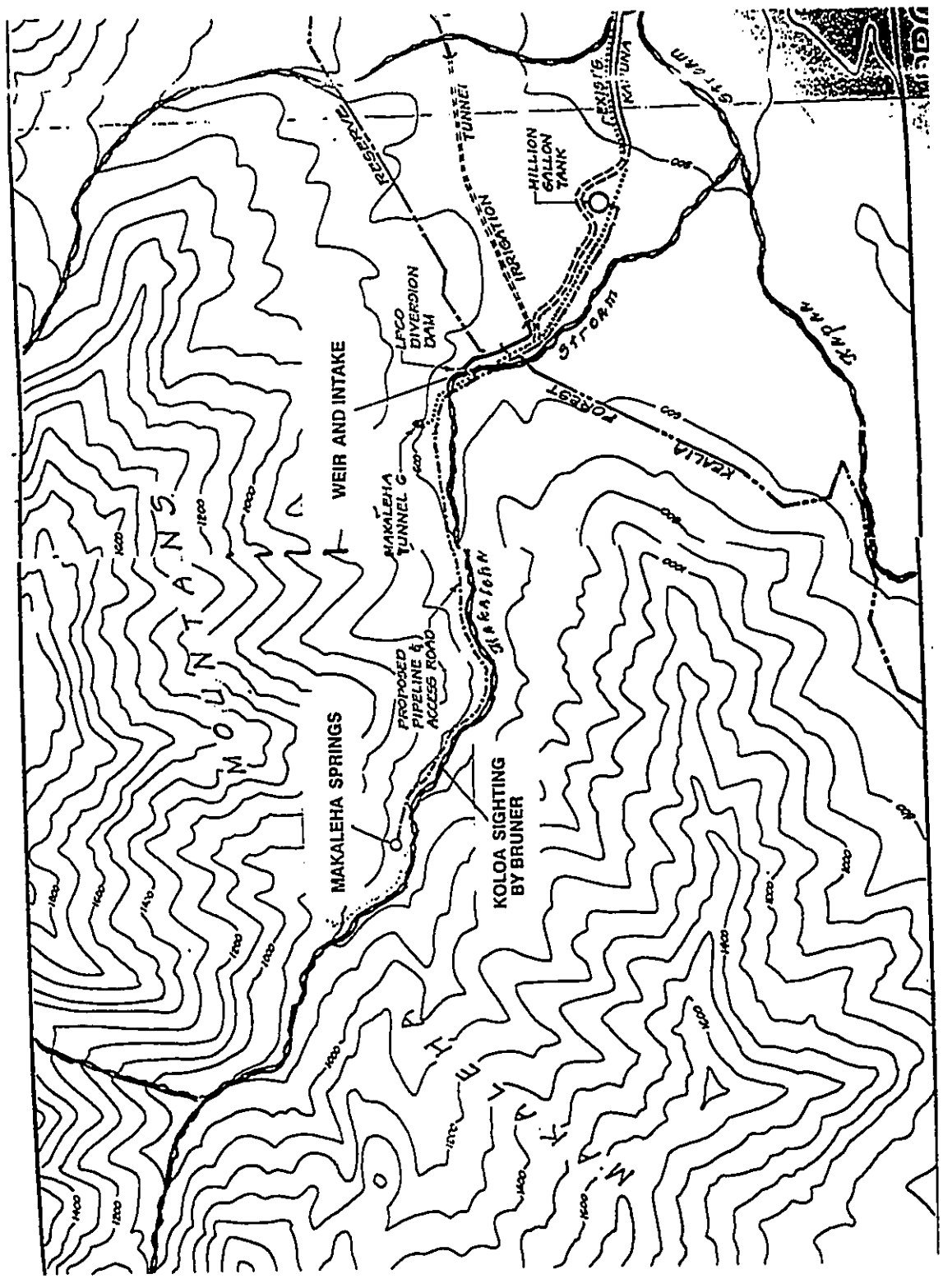

FIGURE 1 - Makaleha Stream , Kapaa, Kauai - Approximate Locations of Koloa Sighting (Bruner) and Observational Sites

be evidence for a permanent population in the mountains.

Altitude readings throughout the project were made with a Gischard Altimeter. The altimeter was zeroed at sea-level and readings are therefore relative to this setting.

RESULTS AND DISCUSSION

Table one summarizes the observational periods for the project. A total of six field trips to Makaleha Stream

TABLE 1 - Observational Periods for Koloa Duck Reconnaissance Makaleha Stream - Kealia Estuary from 3/16/90 - 4/4/90

Date	am 6	7	8	9	10	11	12	1	2	3	4	5	6	7	pm
3/16															
3/19			xxxxxxxxxxxx					xxxxxxxxxxxxxxxxxx							
3/20															
3/21					xxxxxxxxxxxx								zzzz		
3/22															
3/23		zzzz											zzzz		
3/29															
4/01	xxxxxxxxzzz									xxxxxxxxxx					
4/03															
4/04													zzzz		
4/06			xxxxxxxxxxxx									zzzzz			

xxxxx - Makaleha Stream
zzzzz - Kealia Estuary

were conducted along with six short observational periods in Kealia Estuary from 3/16/90 - 4/6/90.

Makaleha Stream

Good habitat for the Koloa was only found in certain stretches of the stream channel in Makaleha. From the intake and weir (525 foot elevation) a dense, closed canopy of hau (Hibiscus tiliaceus) extends upstream several hundred feet. This dense riparian growth gradually gives way to a similarly dense, closed canopy of roseapple (Syzygium jambos) extending to an elevation of 600 feet. This lower section of Makaleha Stream is therefore characterized by a dense, low tangle of riparian canopy and is probably unsuitable habitat for the shy, low-flying Koloa.

Good Koloa habitat however is available where the canopy opens above this 600 foot elevation and is likely the area where the Koloa was sighted previously by Bruner. This area begins an estimated 300-400 feet (92-122 meters) downstream of the Makaleha Springs site and extends upstream of this area another several hundred feet where a dense growth of hau (Hibiscus tiliaceus) again nearly closes out the stream channel. The elevation of the upper limit of this area was recorded at 800 feet.

This area appears well suited to the Koloa since in addition to the open canopy, there are varied sources of food and extensive undergrowths of basket grass (Oplismenus hirtellus) available as nesting grounds. Native vegetation is first noticed in this area with plants such as mamaki (Pipturus albidus), 'ie'ie (Freycinetia arborea), and 'ohi'a-lehua (Metrosideros collina polymorpha) being present in the riparian vegetation. Native damsel flies (Megalagrion sp.) are common as are many other aquatic insects. Native freshwater Limnaeid snails are common on the rocks within the spring, as are native 'opae-kala'ole (Atyoida bisulcata). Within the pool that receives spring water were found two species of endemic freshwater fish, the 'o'opu-nakea (Awaous stamineus) and the 'o'opu-alamo'o (Lentipes concolor). It is not known if any of these serve as important sources of food for the Koloa although it is certainly a possibility.

Above this area the gradient of the stream increases dramatically rising 100 feet through a distance of approximately 150-200 feet (31-61 meters). It is unlikely that the Koloa would prefer such areas although the alien cattle egret (Bulbulcus ibis) and the indigenous Aukuu or Black-crowned Night Heron (Nycticorax nycticorax hoactli) were both observed in this area.

Upstream of this steep-gradient area, the channel levels out and again opens into good Koloa habitat which extends into the "right" (determined facing upstream) canyon to the terminal pool (1000 foot elevation). The smaller canyon to the "left" has a narrow stream channel that is characterized by a closed canopy composed primarily of yellow guava (Psidium guajava). The better Koloa habitat therefore extends into the "right" canyon. Present in riparian vegetation at this higher elevation area are uncommon Hawaiian plant endemics such as the lobelioid Cyanea gayana, the loulu palm (Pritchardia sp.), olona (Touchardia latifolia) and Pisonia umbellifera. Endemic 'o'opu and 'opae are still found in the stream at this elevation. A White-tailed Tropicbird (Phaethon lepturus dorotheae)was observed soaring the cliff face of the "left" tributary.

Although good Koloa habitat does exist in Makaleha Stream at the spring area and also in the stream's higher reaches, no sightings of this endangered waterbird were made in any of the field trips during the study period. Searches through the ground cover in areas of good habitat revealed no Koloa nests or any evidence of their presence.

Kealia Estuary

Six short observational periods were made in the marshlands at sea-level where Kapaa River empties into the ocean (table 1). One unconfirmed sighting of a Koloa in flight was made after sunset on 3/20/90 however darkness prevented a clear view of the animal. Other than this, no sightings of a Koloa were made indicating that if anything, the Koloa is an infrequent visitor to the Kealia marshlands at least during the study period.

Other endangered waterbirds however are probably permanent residents of the marsh. At least two Hawaiian coots (Fulica atra) were always present during the observational periods in the water or foraging through the grass on the stream banks. The Hawaiian Gallinule (Gallinula chloropus) was also observed.

CONCLUSIONS

Based on the findings of this study, it seems unlikely that the Koloa is a permanent resident of the Makaleha Stream system or that there is a breeding population there. The fact however that good habitat is available and that the previous consultant did find a Koloa, may suggest that the area is occasionally used by Koloa. It is possible that Koloa may utilize Makaleha Stream as well as the other high mountain tributaries of Kapaa Stream (Moalepe and Kapahi) on an infrequent but consistent basis throughout the year however a longer study period is required to determine this. It should be stated also that the findings of this study really can only be applied to the present study period and that extrapolation of the results may lead to erroneous conclusions.

Swedberg (1967) locates a Koloa nest in a map in his report that may be within the Makaleha Stream area however without his field notes its exact location is very difficult to ascertain. The present study period is well within the suggested optimum breeding period of December to May which tends to support the conclusion that a breeding population does not reside there however as stated previously, it is entirely possible given the existing habitat that breeding does occur at different times of the year.

A number of factors may be contributing to the less frequent use of Makaleha Stream by the Koloa. One of these is the observation that the canopy is becoming increasing closed by aggressive riparian vegetation such as hau (Hibiscus tiliaceus) which forms a dense tangle that rapid, low flyers like the Koloa probably avoid. Given the "nuptial flight" behavior during mating described by Swedberg (1967), the closed canopy may also be a factor interfering with the bird's breeding behavior.

Other inimical factors may interfere with the Koloa's use of Makaleha Stream. Barking sounds from high in the valley along with tracks on the trail may indicate a feral dog population in the valley which would certainly prey on Koloa. The Aukuu or Black-crowned Night Heron (Nycticorax nycticorax hoactli) observed in the stream is also believed to be a predator of Koloa ducklings (Swedberg 1967). The aggressive Cattle Egret (Bulbus ibis) observed on several occasions in the stream is definitely a competitor of the Koloa and may also be a predator on ducklings as well. Increased human disturbance by hunters, hikers and the like is probably another factor reducing the suitability of the stream to the Koloa.

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APPENDIX G

ARCHAEOLOGICAL RECONNAISSANCE

Cultural Surveys Hawaii

CULTURAL SURVEYS HAWAII
Archaeological Studies
Hallett H. Hammatt, Ph.D.
49 S. Kalaheo Avenue
Kailua, Hawaii 96734
(808) 261-8293

Portugal & Associates, Inc.
RECEIVED
OCT 22 1986
By

October 20, 1986

Mr. Glenn Yamamoto
Portugal and Associates, Inc.
4334 Rice Street, Suite 204
Lihue, Kauai, HI 96766

Subject: Archaeological Planning Reconnaissance of the Mokaleha Stream for Makaleha Springs Water Source Development, Kapa'a, Kauai

Dear Glenn:

At your request an archaeological reconnaissance was conducted for the above project on October 1, 1986, for the purpose of locating and evaluating archaeological sites within the project area and assessing impact of the proposed project.

Proposed Project

It is my understansding that the project includes the construction of a spring catchment system at the Upper Makaleha Springs with a 4,000 foot long pipeline from the Springs to the existing 1 million gallon water tank (see enclosed map). This may involve some road construction at least partially up the valley.

Description of Project Area

Makaleha Valley is a short and steep "V shaped" tributary valley to Kapa'a Stream drainage. It originates in the Makaleha Mountains at the northeast slope of Kapa'a Valley. Farm settlements and pastures of the Kapa'a Homesteads are on the north slope of the main valley. The makai portion of the project area is marked by a million gallon water tank at the end of Kahuna Road. A well maintained trail used by ditch maintenance workers, hunters, and stream fishermen leads to the Lihue Plantation diversion. This is a concrete dam in the stream itself with a diversion tunnel. Above this point the trail crosses the stream and the valley narrows. The trail leads through thick stands of bamboo, hau, fern, guava and ginger generally on the south side of the stream. The valley continues to narrow and the slopes become steep along the trail towards Makaleha Springs. Ground visibility was somewhat limited except under mature forest cover. One small tributary enters the main stream directly below the Springs from the west side.

Previous Related Studies

To our knowledge the only previous archaeological study which relates to this specific area is W. C. Bennett's 1928-1929 Survey of the Island of Kauai (Archaeology of Kauai, Bishop Museum Bulletin 80, 1931).

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Bennett's site 110 is described as taro terraces and bowl at the back of Kapaa Homesteads. "In the foothills of the mountains are many little valleys which contain taro terraces. Single rows of stone mark the division with some 2 foot terraces. Under a large Mango tree was found a bowl." (page 128). He refers to taro terraces and house sites at Kopahi (page 73) which is considerable distance down Kapaa Valley from the project area. Although no terraces were found in the project area itself, they could have occurred in the more gently sloping land nearer the stream confluences in Kapaa Homesteads makai of the project area. They could also occur on the slopes at the mouth of Makaleha Valley south of the proposed pipeline.

Reconnaissance Results

The approximately 4,000 foot long project area was surveyed by 2 archaeologists. It was observed that the route of the proposed pipeline is steep sided and susceptible to flooding. The slopes were examined for possible terracing and other archaeological features but none were observed. The valley slopes appear to be too steep and too constricted to make agricultural terracing practical. If terraces or other archaeological features were present, they would have been destroyed by flooding or covered by slopewash. On the basis of our fieldwork, it appears that the proposed pipeline construction would have no impact on archaeological resources and no further archaeological investigation is recommended. There is a possibility that ancient terraces may occur at the mouth of the valley on the west side of the stream [redacted]. If this area is to be impacted by construction, it should be examined first by an archaeologgist.

If there are any questions concerning the above, please contact me. Thank you very much.

Sincerely,

Hallett H. Hammatt

Hallett H. Hammatt, Ph.D.

HHH:mt

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REFERENCES

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